High-protein exposure during gestation - consequences on food preferences and health in adult rat offspring in self-selection models

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Abstracts

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Editorial

Dear Scientific and Academic Colleagues,

The 21st International Congress of Nutrition (ICN) is organized under the auspices of the International Union of Nutritional Sciences (IUNS) to be celebrated in Buenos Aires, October 15th-20th 2017. The IUNS-ICN is a four-yearly meeting that has been held since 1946. The 2017 IUNS-ICN edition has been conjointly organized by the Argentinian Society of Nutrition (Sociedad Argentina de Nutrición, SAN) and the IUNS Council with the integrative collaboration of the Organizing, Scientific and Executive Committees under the motto "From Sciences to Nutrition Security". The aim of this IUNS 21st ICN is to promote the global exchange of knowledge in Nutritional Sciences. The scientific program comprises 6 Plenary Lectures, 40 keynote Lectures, 108 parallel symposia, 22 sponsored symposia, and 18 satellite symposia.

The congress focuses on every aspect of nutrition issues, going through a wide variety of topics, which will be dealt with from different perspectives in order to enrich our attendees' points of view. Let us mention the tracks of the devised program:
1: Advances in Nutrition Research
2:Nutrition Through Life Course
3: Public Health Nutrition and Environment
4: Nutrition and Management of Diseases
5: Nutrients and Nutritional Assessment
6: Functional Foods and Bioactive Compounds
7: Food culture practices and Nutritional Education
8: Agriculture, Food Science, and Safety

The main goal is to offer a high-level scientific meeting focused on addressing the key aspects of nutrition in a multicultural environment, from state-of-the-art reviews to cutting edge nutritional science information. Sessions are planned to deliver latest investigations and outcomes concerning the impact of nutrition on homeostasis and body metabolism, on dietary intake and nutritional status of the population and the individual for precision nutrition as well on the role of dietary prescriptions in disease management and prevention. Translational research orientated to design and implement strategies and approaches to change dietary behaviors and to develop policies, as well as aspects related to public health issues, Nutrition Education and Climate Change, or Food and Agriculture for Health Maintenance, are included in the program. Six plenary sessions framed the program with eminent speakers covering all health aspects in the life cycle with integrative views on food security. The present supplement accounts for 2029 abstracts from 97 countries, and additional 297 abstracts selected for oral communications. Including the summaries of more than 500 selected guest speakers participating in the scientific symposia.

The distribution of abstracts for the different selected tracks appears below:

TRACK	ORAL	POSTER	TOTAL
Track 1: Advances in Nutrition Research	33	110	143
Track 2: Nutrition Through Life Course	39	276	315
Track 3: Public Health Nutrition and Environment	62	499	561
Track 4: Nutrition and Management of Diseases	33	280	313
Track 5: Nutrients and Nutritional Assessment	32	239	271
Track 6: Functional Foods and Bioactive Compounds	36	129	165
Track 7: Food Culture Practices and Nutritional Education	33	111	144
Track 8: Agriculture, Food Science and Safety	29	88	117
TOTAL	297	1732	2029

In these times of worldwide economic burdens and financial crisis, it has been a challenge to build a solid Nutrition Congress; for that reason, we counted on the advice of the Ethics Committee in order to avoid potential conflicts of interest. Notwithstanding, in parallel, it opens the exceptional occasion to link the multidisciplinary spaces of nutritional sciences, chiefly basic and applied research activities relating Nutrition and Food with Health. Also, food safety, food production, and environmental sustainability are approached in the program.

The 21st ICN organizers wish to recognize and thank the important involvement of young investigators and nutrition professionals from transition countries. A special fee rate for students and participants from low- and middle-income countries was offered to encourage their participation. Travel grants, registration fee discounts, and accommodation reductions for selected young investigators and other awardees were made possible by the contribution from international agencies and the private sector. In this context, IUNS granted 70 scholarships to its Adhering Bodies' affiliates and early career scientists from universities and research institutes from all over the world. We wish to express our genuine appreciation to all attendants, also to invited speakers and international experts and delegates whose participation and interest will undoubtedly produce a successful IUNS 21st ICN for sharing and exchanging knowledge in nutritional sciences for the benefit of the human being.

Prof. Mabel Carrera
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Annals of Nutrition & Metabolism

Opening Lecture:

FIT FOR THE FUTURE: ALIGNING NUTRITIONAL SCIENCES FOR THE SERVICE OF HUMANITY

Prentice, Andrew M.

PhD, FMedSci, MRC Unit The Gambia & MRC International Nutrition Group. London School of Hygiene & Tropical Medicine. London. United Kingdom.

Nutrients, water and oxygen are the fundamental needs of human existence. This simple statement emphasises the salience of nutritional sciences and the contribution that we can make to optimising human health and combatting disease. But our discipline is beset by challenges that we must address if we are to be fit to serve the best interests of our fellow beings into the future. I will focus on five of these challenges working upwards from basic science to population health. Knowledge gaps: Nutrition text books catalogue the properties and functions of the essential and non-essential nutrients but there are still vast gaps in our knowledge especially in relation to the complexities of nutrient-nutrient and nutrient-genome-epigenome interactions. We cannot shy away from these complexities; we must address them head on and this will require an infusion of mathematical and modelling sciences. In this regard the much vaunted 'omics' sciences have failed to make a substantial impact so far, but their day will come. Nutrition needs an infusion of bright young computational scientists. Funding gaps: Scientists complain that there is never enough money to do vital research; funders complain that there is a paucity of novel ideas and that we do not deliver effective solutions to their target diseases. The truth lies somewhere in between. Two challenges stand out. First, such is the desire of funders to find the magic bullet, that they prematurely invest tens of millions in very large 'definitive' trials that usually end in failure. Second, that every scientist believes they can 'do' nutrition and hence our funding options are encroached upon by other disciplines. We must reassert our ownership of nutrition; but this can only be achieved by delivering excellence. Solution gaps: We have had our successes. Observations of low folate status in the mothers of babies born with Neglected tropical diseases (NTDs) was confirmed by randomised controlled trials and has translated into very effective public health interventions. But we have far more failures in which, seemingly strong diet-disease associations fail the test of a randomized controlled trial (RCT). We must develop stronger epidemiological methods that can robustly establish causality before we waste funds on ill-advised trials. Gaps in trust: Many in our field treat the food industry with a level of antagonism that blocks constructive dialogue. If global multinationals are part of the problem they must surely be part of the solution. Gaps in credibility and authority: A substantial segment of the population ignores nutritional advice because they read constantly conflicting messages in the print and electronic media; many others follow highly dubious nutritional fads. Re-establishing public trust in evidence-based advice represents one of the key challenges in our field.

Plenary Lectures:

ZINC TRANSPORTER FUNCTIONS IN HEALTH AND DISEASE

Cousins, Robert J.

Boston Family Professor of Nutrition. Director. Center for Nutritional Sciences. University of Florida. USA.

The supply of zinc needed for cellular functions is influenced by multiple variables. These include dietary composition and genetics. For zinc to carry out its biochemical roles in protein and nucleic acid structure, catalysis and cell regulation, a high degree of coordination is essential. That coordination is provided through the activity of about 24 transporter proteins derived from two gene families: ZIP and ZnT. Some of these genes are regulated via signals from the dietary zinc supply. Other transporter genes are regulated physiologically via hormones and immune mediators. Convincing evidence is accumulating from genetics that mutations in some human transporter genes lead to disease. In addition, molecular studies with gene knockout models with rodents are leading to identification of specific transporter-requiring, zinc signaling pathways that also can contribute to metabolic disorders in humans. These conditions include neurodegenerative diseases, arthritis, cancer, endotoxemia, diabetes and metabolic syndrome. One hallmark of zinc transporter activity is the cell-specificity of expression of the Zip and ZnT genes. ZnT2, highly expressed in secretory cells of the exocrine pancreas and mammary gland and ZnT8, in pancreatic β cells, are but two examples. Cellular localization and transporter trafficking to specific sites is a second hallmark of zinc transporter activity. This provides the opportunity for the targeting of zinc ions sites necessary for activation or inhibition of specific pathways. In this presentation, I will give examples of targeted zinc transporter activity by summarizing research on ZIP14, a zinc transporter that is regulated by proinflammatory conditions including IL6. I will describe roles for ZIP14 in diverse processes including hepatic ER stress, impaired intestinal barrier function and defense, adipocyte NF-κB activity control, endosomal insulin receptor activity in hepatocytes, bone homeostasis with aging and prevention of neurodegeneration. Research discussed was supported by the National Institutes of Health.

HUMANS VS OBESITY: WHO WILL WIN?

Caballero, Benjamin.

Bloomberg School of Public Health. Johns Hopkins University. Maryland. USA.

Efforts to stop the global obesity epidemic have been ongoing for at least 3 decades. While there is no single global coordinated program, many programs are based on similar premises, e.g., reducing dietary energy intake with low nutritional value, promoting physical activity, etc. The WHO and other organizations have defined frameworks to assist in the development of obesity prevention programs in different geographic and cultural contexts.

And yet, the rise in obesity prevalence continues almost in all countries. The situation calls for a pause and reflection on a few conceptual issues related to our understanding of the epidemic. First, there are well recognized questions about our key indicators, particularly BMI. This parameter evolved from a screeening tool to a diagnostic/predictive indicator for NCD, diabetes, early mortality, etc. Second, we have never really defined our endpoint. What would constitute a "victory" over the obesity epidemic? To have no more than 5% of the population with a BMI above 25? If so, the gap with the current situation in many countries would be enormous, and that goal is unlikely to be reached in many generations, if ever. Another question is whether the continuing increase in BMI in the world is a combination of an epidemic and a historic secular trend in body size, since human body size has been increasing continuously for at least 300 years. If there is a fraction of the continuing rise in obesity prevalence that is due to a "natural" secular trend, that fraction might be less responsive to prevention programs having BMI as an outcome indicator.

IUNS LIFETIME AWARD LECTURE: FROM TREATING CHILDHOOD MALNUTRITION TO PUBLIC HEALTH NUTRITION

T. James, W. Philip.

CBE, FRSE, MD, DSc Hon. Prof. Nutrition. London School of Hygiene and Tropical Medicine. London. United Kingdom.

My first understanding of nutritional issues started on landing in the Tropical Metabolism Research Unit in Jamaica as a young doctor with some paediatric experience. The task was to understand and effectively treat children with marasmus and kwashiorkor. Albumin levels were a key marker but we soon found its limited utility because of albumin's unrecognised extra-cellular adaptations. Mortality rates, however, were high with diarrhoea a major problem. So a new biopsy and 5 lumen perfusion techniques for assessing gut morphology, motility, digestive and absorptive capacity were developed. There was a marked inability to digest and therefore absorb disaccharides, especially lactose, and compensatory dietary fluid composition was critical. Whereas the gut digestive capacity recovered we found that insulin secretory capacity seemed permanently impaired. Only recently have we linked this to our more recent findings of excess diabetes on adult weight gain in Asians, Mexicans, Africans e.g.in the Caribbean and now Middle East nationals. Jamaican children with gastroenteritis also had marked jejunal secretion only overcome by careful repeated small glucose/saline feeding. The NIH Bangladesh cholera group then linked these data with their own research findings and then introduced glucose/saline treatment solutions for childhood diarrhoea and cholera thereby saving annually millions of lives. Shortly thereafter, when assessing schoolchildren's nutritional state in Montserrat, it was shown that stunting rather than crude "weight for age" was the key, dominant issue when assessing global childhood malnutrition.

Returning to the UK I established the criteria for the normal mortality related BMI and for obesity and later for adult underweight or "chronic energy deficiency". Assessing energy balance with new whole body calorimeters, however, led to the re-evaluation for WHO/FAO/UNU of individual, national and global basic food needs with new criteria for FAO analyses based on our predicted basal metabolic rates and physical activity levels (PALs). The emphasis on low BMIs and height transformed policy analyses and showed that dietary surveys supposedly showing very low "adaptive" energy intakes in poor countries were misleading.

This led to new dietary validation analyses with biomarkers and the lithium tracking of dietary salt sources thereby revealing striking differences between dietary salt sources in pre and post industrialised societies, essential for understanding the approach to salt reduction to prevent strokes in lower income countries.

I was privileged to chair many WHO consultations and the SCN's Millennium report where we discovered that stunting also related to the prevalence of low birth weight so maternal nutritional health was crucial and we needed a new life – course approach to nutrition while recognising the potential importance of epigenetic programming of children's future well-being and the trans-generational amplification of nutritional risk. We then showed that lower income countries now have epidemic obesity and probably nutritionally programmed exaggerated diabetes rates. Our International Obesity Task Force focused on poorer societies and income groups for WHO with our new analyses highlighting the need for integrated multi-sector policies. Recently our revised analyses on sugar intakes and dental caries helped WHO to emphasise the importance of very low (max 5%) sugar intakes for overall public health nutritional prevention.

Keywords: Childhood Malnutrition Public Health

BUILDING AND IMPLEMENTING EVIDENCE – BASED NUTRITION POLICY

Rivera Dommarco, Juan Ángel.

Managing Director. National Institute of Public Health. Mexico.

Malnutrition and poor diets are the largest risk factors responsible for the global burden of disease. Therefore, ending all forms of malnutrition by 2030 is an international priority.

Essential to achieving this goal is to design and implement nutrition policy based on the best available scientific evidence. The demand for evidence-based nutrition policy may originate directly from policy makers or through social actors. In both cases, the role of research institutions is to generate relevant evidence for public policy. The design of sound policy to tackle malnutrition

in all its forms requires that research institutions develop strategic research agendas.

The two key objects of analysis for the design of effective policy are the magnitude, distribution and trends of malnutrition in all its forms in the population (nutrition conditions) and the policies and programs available, including the identification of platforms and competences required by human resources, for the provision of products and services (social response).

In addition, systematic literature reviews about the risk factors of malnutrition as well as the efficacy and effectiveness of an array of promising policy actions lead to evidence based policy recommendations. For some topics, international evidence based recommendations developed by expert panels with clear criteria for identifying and classifying the evidence are already available (WHO/PAHO, WCRF, Lancet Series and commissions, etc.). Given the multifactorial nature of malnutrition, the drivers and risk factors operate in several systems (food, health, education, and social) and may be immediate, underlying or basic causes. This multilevel complexity should be considered when developing recommendations.

Evidence-based recommendations should be then adapted to the local conditions in the country, using the locally generated evidence about the nutrition conditions and the known risk factors in the population. This exercise will produce locally adapted evidence based recommendations, which ideally should be tested in small-scale interventions for feasibility and efficacy before implementing at scale. In some instances, when immediate action is required, locally adapted recommendations are implemented without small-scale testing. In those cases policies or large-scale programs should be evaluated, so that the body of evidence about effective policy actions is produced.

The last exercise required is the evaluation to provide feedback to policy makers. This exercise should include assessing the design, implementation, results and effectiveness. Design evaluation is inexpensive and not time demanding, making it a cost-effective tool to avoid implementation of flawed policy or programs. For a policy or program to be effective, correct implementation is critical; thus, implementation evaluation is essential for the success of a well-designed policy and provides timely feedback for improvement. Effectiveness evaluation assess the results of programs and policy on behaviors (i.e. food purchases, healthy eating, physical activity) and nutrition outcomes (i.e. nutritional status). The results of the evaluation often guide decisions about keeping or modifying policies or lead to recommendations for improving their design or implementation. They may also generate new research questions that feed the research-to-policy cycle. Finally, the whole process for the generation and evaluation of policies should include provisions for avoiding conflicts of interests.

Keywords: evidence-based nutrition policy

Closing Lecture:

OUR QUEST FOR HEALTHY DIETS: THE ROLE OF NUTRITION SCIENTISTS

Lartey, Anna.

President of the International Union of Nutritional Sciences (IUNS). Director of Nutrition at the Food and Agriculture Organization of the United Nations (FAO). Rome. Italy.

The current food system is not delivering on the healthy diets needed for optimal health and nutrition. The nutrition situation and the rising prevalence of diet-related non-communicable diseases have become a global concern. About 30 years ago, our major preoccupation was with hunger. We have been able to reduce undernourishment by about 45% from over 1 billion in 1990/1992. Despite progress on this front, we still have about 795 million people being hungry in 2014-2016 (FAO, 2016). About two billion people worldwide are micronutrient deficient, with more than half a million women of reproductive age suffering from iron deficiency anaemia. Among children under 5 years, 156 million are stunted, 50 million are wasted. Nearly two billion people are overweight or obese. Obesity is one of the drivers for the increase in non-communicable diseases. Children have not been spared; over 40 million children are overweight or obese. Altogether, malnutrition in all forms is estimated to affect 1 in 3 persons globally. Underlying the current nutrition situation are unhealthy diets. The Global Burden of Disease identified dietary risk factors as contributing the highest to early deaths among adults. Our diets are changing: although more varied, less healthy, comprising over processed foods, high is sugar, fat and salt, and less consumption of fruits, and vegetables. The food systems determine the quantity, quality, diversity and nutritional content of the foods available to consumers. Thus a faulty food system affects the food environment, from which the consumer selects food and ultimately access to healthy diets. The current global attention given to nutrition provides the opportunity to put in place the policies and programs to turn the food systems around for the better. At the 2nd International Conference on Nutrition organized by FAO and WHO in November 2014, countries committed to enhance food systems by developing coherent public policies from productions to consumption and across sectors to promote safe and diversified diets. The 2030 Agenda of the Sustainable Development Goals has Goal 2, with improved nutrition as a key outcome of food security and sustainable agriculture. In April 2016, the UN General Assembly declared the period 2016-2025 the Decade of Action on Nutrition. It is time for all stakeholders and sectors to step up efforts to eliminate malnutrition in all its forms. Improved nutrition starts with healthy diets. Nutrition scientists we have a role to play in the quest for healthy diets. There are gaps around healthy diets for which the world is looking for answers: What are the essential elements of foods that contribute to a healthy diet? Studies are needed that relate the long term impact of diets from different geographic regions of the world to health outcomes. What food systems policies will contribute to healthy diets? What is impact of globalization on healthy diets? The evidence-base for food systems for healthy diets is still murky. The space is large for nutrition scientists to step in.

Keywords: Healthy diets, food systems, improved nutrition

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Track 1: Advances in Nutrition Research

KL_144/3565

IMMUNONUTRITION AND DETERMINANTS OF LIFESTYLE

Marcos, Ascensión.

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Lifestyle habits have suffered enormous changes in the last 30 years, mainly as a consequence of a stressful life and the abuse of new technologies and communications. Obviously, these new behaviours attack all ages, from childhood to adulthood passing through the risky period of adolescence. As an example, the sedentary jobs have been duplicated to the detriment of physically jobs. A growing proportion of computer-user workers are in professional positions, using their computers for more than half their working day. Irregular working schedules and an elevated number of long hours spent on computer devices induce stressful effects on mental performance and also lead to a high risk to suffer from different diseases, most of them, related to inflammatory processes, even musculoskeletal injuries. Overweight and obesity are clear consequences of a stressful type of life that appear more and more frequently early in life, developing a high impact on morbidity and mortality in the mid adulthood, leading to chronic diseases such as type 2 diabetes, cardiovascular and neurological disorders, a high incidence of certain tumours, as well as an increased and undesirable symptomatology of allergies and more severe infections. Nowadays, stress is being confirmed to be related to mental disorders that are acquiring high dimensions in the general population, leading to attention deficit hyperactivity disorder (ADHD), among others. This disorder involves an inflammation process associated with immune dysregulation together with a high oxidative stress, increased toxic metal burden and intestinal dysbiosis. Moreover, food consumption has also suffered the impact of the globalization with a detriment of the intake of healthy diets, such as the Mediterranean diet. Nowadays, the assessment of the adherence to the Mediterranean has been used to evaluate the nutritional status of different groups of population. The study of Immunonutrition includes the knowledge of the interactions between the immune system and nutrition status. Therefore, Immunonutrition has a main role in the evaluation of nutritional situations, including not only food intake, but also eating behaviours, physical activity and sedentary habits, sleep profile and stress situations. Thus, the assessment of immunological and metabolism biomarkers acquires a great interest facing out the big concern about the changes of lifestyle in the last three decades in order to detect risks of disease and to prevent the high incidence of chronic metabolism and inflammation-related illnesses that nowadays is an important burden for public health policies.

Keywords: Lifestyle determinants, Immunonutrition, chronic diseases, management

KL_144/3374

MICROBIOTA AND OBESITY

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Metagenomics concerns the study of a complete genome from an environmental sample. The conception and application of culture-independent methods has extended the understanding about the diversity and features concerning gastrointestinal tract microbial populations. Two main methods have been implemented concerning characterization of the microbiome that are not based on pure culture, such as sequencing technologies to define the lineages existing in a sample and metagenomics studies based on the whole metagenome shotgun sequencing. In some cases, the first approach is also termed as a "metagenomic" study because they analyse a heterogeneous sample of community DNA. The involvement of the gut microbiota in the onset and development of a wide variety of diseases, including obesity, is being nowadays thoroughly examined. Actually, disruptions on gut microbiota content and composition may be important causal factors in some pathological conditions, although mechanisms are so far not well characterized. Indeed, the ratio between firmicutes and bacteriodetes, as well as the phyla biodiversity, have been found to be altered in various animal models and in obese subjects as compared to lean individuals. Therefore, promotion of specific gut bacterial communities to improve/benefit the expansion of "healthy" bacterial groups and reduce detrimental bacteria might be a complementary therapeutic approach for the management of excessive body weight and other chronic diseases. In this framework, fiber, carbohydrates, proteins, polyphenols and other food components occurring in plant sources, such as flavonoids (i.e. quercetin) and

non-flavonoids (i.e. trans-resveratrol), or from animal sources, may elicit health protective properties. A parallel interplay between some food compounds and the gastrointestinal microbiota arising at intestinal plane has been hypothesized to be responsible, to some extent, for some wellbeing beneficial outcomes. Moreover, polyphenols and other compounds such as betaine might drive to the formation of other metabolites or bacterial-derived co-metabolites with additional biological activities. Therefore, scientific evidences about the impact of pure natural compounds on gut microbiota and, in turn, host metabolism are important in order to further understand the health benefits derived from the intake of diverse food components taking advantage of new technologies, namely next-generation sequencing and untargeted metabolomics. Noteworthy, the consumption of a high-fat/high-sucrose diet impacts on gut microbiota distribution putatively altering the bacterial balance towards an obesity-associated gut microbial profile. The prescription of some dietary patterns, such as a Mediterranean-based food diet, or the administration of bioactive compounds could counteract the accompanying disturbances on the gastrointestinal microbiota by promoting the growth of some beneficial bacteria while reducing some pathogenic and obesity-associated microbes. Finally, metagenomic analyses also may enable to discriminate people in different groups based on the dietary intake or the dietary prescription they might need. In this context, gut microbiota composition might be used as a predictive biomarker of the metabolic response to different dietary interventions, being one of the main pillars in the development of precision nutrition in obesity and associated clinical complicactions.

Goni L, et al. Future perspectives of personalized weight loss interventions based on nutrigenetic, epigenetic and metagenomic data. J Nutr 2016;146:905-912S.

Keywords: Metagenomics, Metabolomics, Polyphenols, Fiber, Prebiotics

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KL_144/3222

HOW TO MAKE THE MOST OF HIGH – DENSITY GENETIC DATA FOR HUMAN NUTRITION RESEARCH

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The impact of most nutrition exposures depends to some extent on inherited disposition. In many instances the differences in response between genetically distinct individuals are so large that they cannot be ignored. Therefore, common genetic variation always needs due consideration for the design, implementation and evaluation of nutrition endeavors. High-density genetic analyses are rapidly gaining ever wider use, facilitated by the ease, speed and affordability of new generation technologies. This includes the use of common microarrays, analysis of targeted genes as well as whole-genome sequencing. The main challenge in respect to genetic analyses is now shifting from consideration of their inclusion to bewilderment by the information overload. Practical examples will showcase for the non-specialist nutrition scientist some approaches and strategies to extract novel and useful knowledge from available high-density genetic data.

It is often illuminating to use publicly available genome browsers to investigate the architecture of target loci even before engaging with any study data. Repositories of genome data are continuously expanding and are starting to be more representative for non-Caucasian populations. This makes the use of genetic data more predictable for nutrition scientists around the world. Careful study of relevant regions helps them to plan for likely diversity and ensure adequate group sizes. Every beginner should make it a priority to learn how to handle their favorite genome browser and use it often.

Genome-wide genetic data include a wealth of information describing each sample donor. Verifying gender is best practice to detect erroneous sample assignments. Other generic uses may include the detection of duplicates, controlling for population stratification and taking into account major known genetic determinants. Strand-specific sequences (haplotypes) across gene segments, or even extended regions, and the resulting diplotypes (defined by the two haplotypes present in an individual) can greatly simplify resolving the genetic diversity resulting from dozens of polymorphisms in a typical gene. Individual diplotypes are often common enough to single-locus genotypes. Allele counting algorithms can bring together the impacts of multiple influencers in the many instances where several variants are likely to contribute to the same outcome. Modeling functional differences of multiple constituents in metabolic or regulatory networks can be another effective way to explore complex genetic data.

With some relatively simple tools, often available as open source versions, most nutrition scientists can try their hand on exploratory analyses of their study data. While the collaboration with genetics experts is invaluable, research progress and scientific understanding will be greatly facilitated with more active engagement by non-expert nutrition scientists. Unlike many other advanced science approaches, exploration of high-density genetic information is relatively inexpensive, does not pose the risk of breaking expensive instruments and is easy to get started with using available training data sets.

Keywords: Nutrigenetics, nutrient gene interaction, haplotypes, genome browsers, nutritionist training

Track 2: Nutrition Through Life Course

KL_144/2919

IMPACT OF EARLY LIFE NUTRITION ON THE GUT MICROBIOME AND HOST – MICROBE INTERACTIONS IN THE HUMAN INFANT

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Nutrition in early life is critically important for short and long-term health outcomes. Epidemiological data show that breast-fed infants have lower incidences of infections in early life and gastrointestinal diseases, reduced risk of childhood obesity and improved cognitive development than formula-fed infants. The perinatal period is also the principal time for acquisition of the gut microbiome and the microbiome has been shown to influence the development of same systems that differ between breast and formula-fed infants (e.g. gastrointestinal, metabolic, immune, and cognitive). However, defining how nutrition influences gut development and host-microbe interactions has been limited by ethical constraints surrounding invasive sampling of infants. To overcome this limitation, we have developed a non-invasive method to assess intestinal epithelial gene expression using exfoliated epithelial cells and host-microbe interactions. Using these approaches, identified key gene networks that were differentially expressed in breast- and formula-fed infants. In addition, virulence genes in the infant fecal metagenome were associated with the expression of immunity and defense genes in exfoliated cells, demonstrating for the first time the potential for the microbiota to influence the host transcriptome in the human infant.

Keywords: microbiota, breastmilk, formula, immune

KL_144/3464

HETEROGENEITY IN RESPONSE TO NUTRITION INTERVENTIONS DURING THE FIRST 1000 DAYS: EVIDENCE FROM RANDOMIZED CONTROLLED TRIALS USING LIPID-BASED NUTRIENT SUPPLEMENTS FOR MOTHERS AND INFANTS

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Meeting the high nutrient needs of pregnant and lactating women and young children in low-income countries is challenging because diets are dominated by staple foods with low nutrient density and bioavailability. Strategies to meet nutrient needs during the first 1000 days include increased intake of nutrient-rich foods, improved complementary feeding practices, micronutrient supplements, and fortified products designed for these target groups. In the latter category, small-quantity lipid-based nutrient supplements (SQ-LNS, ~20 g/d, ~120 kcal/d) have been developed and evaluated for prevention of malnutrition among infants and young children, and pregnant and lactating women. Several SQ-LNS trials have been conducted. This lecture will summarize results from the International Lipid-based Nutrient Supplements (iLiNS) Project and from the Rang-Din Nutrition Study (RDNS) in Bangladesh. The iLiNS Project included 4 randomized controlled efficacy trials in 3 countries in Africa: Ghana, Malawi and Burkina Faso. Two trials began in pregnancy (the iLiNS-DYAD trials in Ghana and Malawi) and included maternal supplementation (pregnancy and 6 months postpartum) plus infant supplementation from 6 to 18 months of age. Two trials began in infancy, the iLiNS-DOSE trial in Malawi (from 6 to 18 months) and the iLiNS-ZINC trial in Burkina Faso (from 9 to 18 months). Of the 4 iLiNS Project trials, increased linear growth in response to SQ-LNS was seen in Burkina Faso (25% reduction in stunting) and Ghana (40% reduction in stunting), but not in Malawi. The lack of response in Malawi is likely linked to high rates of maternal and child inflammation and infection, and short maternal stature. The RDNS was a cluster-randomized effectiveness trial (n=4011) to compare 4 interventions in rural Bangladesh: a) combined maternal and child SQ-LNS; b) child-only SQ-LNS; c) child-only micronutrient powders (MNP); and d) control. Prenatal SQ-LNS reduced newborn stunting and small head size; the impact was greatest in younger mothers and those with household food insecurity. By 24 months, maternal and child SQ-LNS, but not MNP, improved child linear growth and head size. All three RDNS intervention groups experienced improved child motor and language development. Taken as a whole, the evidence suggests that SQ-LNS supplementation can promote fetal and child growth and development, but there is heterogeneity in these effects both within and across study populations. Heterogeneity may be explained by differences in: a) potential to benefit (baseline nutritional status and dietary adequacy; evidence of developmental delay or inadequate child stimulation), and b) potential to respond (other factors that constrain the ability to improve growth or development). Further research is needed to examine the role of infection and inflammation, the microbiome, environmental contaminants, maternal mental health and caregiver behaviors, and the long-term effects of prenatal nutrition and epigenetic influences on growth and development. Nutrition interventions may have a greater impact if they are delivered as part of a comprehensive strategy that addresses the multiple causes of stunting and poor development, including control of pre- and postnatal infection, care for women and children, and stimulation of early child development.

Keywords: Lipid-based nutrient supplements; infants; pregnant women; malnutrition; child growth

KL_144/3644

INTERFACING FOOD SCIENCE AND FOOD TECHNOLOGY & ENGINEERING FOR BETTER NUTRITION REACH OUT–FARM TO FOLK

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The role of agricultural practices in a region, harvesting practices, transport facilities, primary processing, saving carbon foot print back to the soil, value addition at different steps with co- and by-products have all a role to play in making available tons and tons of nutrients to the Folks from the Farm. This has principally to address the chain and correct with appropriate and adaptable Food Science and Technologies to reach the nutrients with a holistic approach of nutrition on a food based approach. This should also be of course, a well proved science based approach delivering large amount of benefits of the food in that region based on culture, traditional wisdom, sustainable agricultural practices, sustained varieties of agri-materials for varying weather and climate changes and with no fatigue to the soil through eco-practices. All this must result in healthy food to the population, of course, with food safety imbibed in it. The growth of a healthy society all around has to be differentiated from the normal nutrition programs which surpasses subsidized food for combating malnutrition, undernutrition of the mother and child and micronutrient deficient families irrespective of the economic strata. We find the NCDs are increasing year on year in spite of many programmes. The role that food with different forms of cooking and combination of foods, the sequence of food that is eaten, the fresh and the stored food, the potential of the parenteral nutrition and the first 1000 days of the child and mother from conception to delivery and after delivery with all the nutritional programmes falling under one umbrella of food and nutrition for Translational Nutrition appears to be very crucial. How will we manage these makes a huge difference in our approach to the problems of its Translational Nutrition and challenges, solutions and sustainable approach that will make the difference using appropriate, relevant and adaptable Food Science and Technology with Engineering inputs for scale up. The Value addition of Nutrition to a Food is more valuable than just value addition. It is this challenge that the Food Scientists, Technologists and Engineers must join hands with Nutritionists together and more forward to address the Nutritional Challenges.

"If Translational Nutrition matters to us on Food based approach, we shall matter more to it through Reach out of Nutrition on a Sustainable Approach through appropriate Food Science and Technology and Engineering!"

Track 3: Public Health Nutrition and Environment

KL_144/2883

THE NUTRITION TRANSITION AND FOOD SYSTEM DYNAMICS: THE ACCELERATING SPEED OF CHANGE

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The nutrition transition, conceptualized as changes in the patterns of eating, drinking and moving and all the underlying technological and environmental causes, is understood at a basic level. The biological mismatches between our biology of taste and movement and our modern food system and movement-related technology have seen rapid gains in knowledge. While rapid shifts in all low and middle income countries (LMICs) physical activity domains are a major causal factor, increased activity is not the major solution. Improving our global diets are challenged by new rapidly changing shifts in the global food system in LMICs in the last several decades. After laying out our food systems earlier history, we examine the recent remarkable rapid changes in LMICs. The challenges posed for nutrition-related noncommunicable disease, including obesity prevention, are great. We have new actors increasingly controlling LMIC food production (agribusinesses, global and local food and beverage producers, food service companies, and food retailers) and subsequently our food purchases. Understanding the history of the food system changes and the way this has been linked with dietary changes and more recent acceleration of these dietary shifts is important. At the same time we are seeing important changes in our body composition which we have yet to fully understand. These body composition changes, of course, relate not only to diet shift but to increasing shifts in physical activity in all domains. Food policy changes are seen as the major option for prevention but they will not be adequate without shifting our culture of eating.

Keywords: Nutrition transition, global, food system, obesity prevention, food policy

KL_144/2913

WHAT THE WORLD CAN LEARN FROM MEXICO'S BATTLE AGAINST OBESITY: VULNERABLE GROUPS, INTERNATIONAL COLLABORATION, EVIDENCE-BASED POLICIES AND MANAGEMENT OF CONFLICTS OF INTEREST

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Mexico has learned a number of lessons that could contribute to other countries' national obesity prevention efforts. In 2002, we documented an alarming rise in diabetes mortality. The finding was received with skepticism at a time when the main perceived health challenge was undernutrition and obesity was only considered a disease of affluence. In November 2016, the government declared a national epidemiological alert due to the diabetes considerable rise. For the past years, we have developed efforts to understand the potential determinants involved in this transition and international collaborations to evaluate policy options. Among these, a soda tax initiative, front-of-pack food labeling and food marketing regulations. The government has adopted some recommendations, but in many cases evidence-based policies have faced intense lobbying and opposition campaigns, mostly led by transnational food and beverage companies [1].

In 2013, a fiscal reform including a soda tax initiative was implemented in response to international reductions in oil prices and increasing inflation rates. Diverse evaluations have demonstrated a decrease in consumption [2] and we have modeled its potential health and economic benefits in the next 10-y [3].

Many developing countries are experiencing transitions with a number of similarities such as increasing participation from transnational companies, increasing availability of ultra-processed foods, lack of adequate regulation of commercial practices, poor nutrition literacy among the population and public health efforts focused mainly in overcoming undernutrition [4]. In this context, five lessons from our experience that should be considered are: a) obesity affects mostly vulnerable groups; however society as a whole pays the costs; b) international collaboration is necessary to modify the obesigenic environment; local efforts to develop evidence and policies have limitations, but there is a supporting international group of academia, civil society and funding agencies with solid expertise, c) obesity prevention requires interdisciplinary teams with experts in the fields of economics, social marketing, good lobbying, etc. Public health alone has a limited chance to achieve the desired outcomes; d) academia needs to develop evidence and provide it when a window of opportunity to support policies rises; and e) preventing and managing conflict of interests could be one of the most important steps to curve the NCDs global epidemic. Unhealthy food and beverage companies' actions that negatively influence and undermine public health efforts must be documented and widely disseminated to make transparency and accountability a social norm.

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Keywords: Obesity, Prevention, Policy, Soda Tax, Conflicts of Interest, Nutrition Transition

KL_144/3368

ENABLING AND DISABLING HEALTH SYSTEMS THROUGH FOOD SYSTEMS

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Health is more dependent on the prevailing food system than acknowledged. This is for several reasons. First, it may or may not be available Second, it may not be safe. Third, it may not be acceptable. Fourth, it may not be affordable. Fifth, food itself is much more complicated than nutrient composition would suggest or aberrant nutrient intake might contribute to pathophysiology (Wahlqvist Food & Function 2016). Sixth, food plays a sociological as well as physiological role. Seventh, it is eaten at the end of an intricate system of production, transport, processing, packaging, storage and marketing any one of which may have health effects downstream. Eighth, it has effects on every body organ and system, not just the cardiovascular, gastrointestinal, musculoskeletal or immune system, for example. Ninth, it alters gene expression (epigenetics), and heretofore we have over-stated what is genetic inheritance and underestimated the intra-and inter-generational effects of food. Tenth, the growing understanding of our microbiomes provides for explanatory models of food-health associations previously arcane. Finally, we are ecological creatures and not separate from our environment whether through biorhythms, sensory inputs, energy regulation, microbiomic pathways, endocrine-phytonutrient linkages, locomotor activity, eco-immunology, and more (Wahlqvist ML ,Ann Nutr Metab 2016).

The recognition of these food system inputs into human biology offers potentially greater cost-effectiveness in health care systems. We now know that a greater emphasis on plant-derived foods and food biodiversity reduces the prevailing burden of disease and its costs (Lo et al Amer J Managed Care 2013). In addition, the availability of public open space (POS) and gardens is associated with better mental health, longer lives and less so-called chronic disease (Mitchell and Popham, Lancet 2014). Better health outcomes are possible even in the face of risk factors like cognitive impairment, hypertension and obesity with a biodiverse diet, physical activi-

ty and POS (Wahlqvist APJCN, 2014). A deeper understanding of food and health would be represented by an ecosystem health disorder nomenclature (EHD) (Wahlqvist, APJCN, 2014). It has been suggested that we increasingly suffer what might be termed 'nature deficit disorders'. Given that modest exercise is necessary to access nature, and is associated with healthier and longer lives (Wen CP et al Lancet, 2011), the combination of a biodiverse diet, the social role of food and walking among nature and gardens has the prospects of health and economic advantage.

Yet new health risks and costs loom as ecosystems are lost and food systems compromised. One of the most pressing is that of oceanic contamination with microplastics, much of it derived from food and beverage packaging. They are now found in deep sea and coastal seafood whose health risk and benefit must therefore come under review.

An innovative food and health workforce with systems awareness could take a more socio-ecological approach to mitigate the challenges of climate change. Axiomatic will be that we need to appreciate how little we need and not seek how much we can get, in the interests of our ecological selves and a habitable planet.

Keywords: Ecosytem health disorders, nutritional economics

KL_144/3343

IMPACT EVALUATION READINESS IN POPULA-TION-BASED NUTRITION PROGRAMS: THE EX-AMPLE OF FOOD FORTIFICATION

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Food fortification, or the addition of essential vitamins and/or minerals to a food, is a cost-effective intervention designed to increase micronutrient intakes. Recent evidence confirms that food fortification programs in low- and middle-income countries improve a range of micronutrient deficiency-related outcomes in different population groups when there is high quality and consumption of fortified foods. Programs that did not show impact in the expected health outcomes tended to have low intake of the food, poor compliance with fortification and/or poor bioavailability of the selected fortificant.

High coverage is a prerequisite for impact of any intervention or program and many factors including availability, accessibility and acceptability of products/services may affect program coverage. Measuring coverage across the service delivery process and the factors that limit or facilitate it can be used to directly assess the potential of programs for impact and to identify solutions to improving potential. Considering a typical program impact pathway for food fortification, quality, coverage and utilization, are intermediate outcomes that should be assessed as part of on-going monitoring activities during the implementation phase of a program. Only when there is high enough coverage and utilization of adequately fortified foods for impact on nutritional status to be plausible should biochemical or functional outcomes be assessed.

Currently, such information on coverage and utilization is rarely available in nutrition programs due to gaps in program monitoring and/or process evaluation activities yet impact evaluations are still frequently undertaken, often at substantial expense.

Without measuring and understanding patterns of coverage and utilization, impact evaluations may have limited potential to capture the true contribution of food fortification in a population and subpopulation groups that may be at risk of inadequate micronutrient intake, and also to provide potential explanations if impacts are not observed. Impact evaluation readiness of all nutrition programs must be considered from the outset of program design. Program monitoring and evaluation activities should systematically include coverage assessments with clear criteria for minimum coverage levels to guide evaluators on when it is feasible to undertake impact evaluations.

As part of this short conference, we will present data from recent coverage assessments of food fortification programs (including wheat and maize flour, oil among other vehicles) in 10 countries and discuss implications for potential for biological impact across countries and among different sub-groups within countries. We will also use conclusions from this body of work to discuss implications for improving impact evaluation methodologies for population based programs.

Keywords: fortification, coverage, evaluation, multi-country, impact

KL_144/3066

DECLINING CONSUMPTION OF ADDED SUGARS AND SUGAR-SWEETENED BEVERAGES IN AUSTRALIA: A CHALLENGE FOR OBESITY PREVENTION

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Background: Reducing intake of added sugars and sugar-sweetened beverages (SSB) has been the main focus of efforts to stall obesity. According to a global analysis, Australia and New Zealand experienced the single largest absolute increase in adult obesity since 1980 and the single largest increase in adult female obesity. More than 68% of Australian men and 56% of women are overweight or obese. While obesity has risen steeply, some evidence suggests that added sugars and SSB intake declined in Australia over the same timeframe.

Objective: To investigate recent trends in availability of sugars and sweeteners, and changes in dietary intake of total sugars, added sugars and SSB in Australia using multiple, independent data sources.

Methods: A comparison of relevant data published by the Food and Agriculture Organization of the United Nations (FAOSTAT), Australian government, academia and industry.

Results: FAOSTAT food balance sheets for Australia show per capita availability of added/refined sugars and sweeteners fell 16%

from 152 g/capita/day in 1980 to 127 g/capita/day in 2011 (P for trend = 0.001). In national dietary surveys in 1995 and 2011-12, added sugars intake declined markedly in adult men (from 72 to 59 g/day, -18%) but not women (44 to 42 g/day, NS). As a proportion of total energy, added sugars fell by 10% in adult males but non-significantly in adult females. Between 1995 and 2011-12, the proportion of energy from SSB (including 100% juice) declined by 10% in adult males and 21% in females. More marked changes were observed in children 2-18 y. National grocery sales data indicated that added sugars derived from carbonated soft drinks fell 26% between 1997 and 2011 (from 23 g/capita/day to 17 g/capita/day) with similar trends in non-carbonated beverages.

Conclusions: In Australia, 4 independent datasets confirm shorter and longer term declines in the availability and intake of added sugars, including those contributed by SSB. The findings challenge the widespread belief that energy from added sugars and sugars in solution are uniquely linked to prevalence of obesity.

Funding: University of Sydney

Keywords: Added sugars, sugar-sweetened beverages, food availability, obesity

Conflict of Interest disclosure: JBM is President of not-for-profit Glycemic Index Foundation, director of a GI testing service at the University of Sydney, and co-author of books about the GI.

KL_144/3409

INVOKING THE BASE OF THE ICEBERG: ORIGINS AND CONSEQUENCES OF ENDEMIC SHORT-STATURE (ERRONEOUSLY TERMED "CHRONIC UNDERNUTRITION")

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Protein-calorie (-energy) malnutrition (PEM) was once the monarch of human nutrition paradigms. Born in 1933, in observations by Ceciley Williams in West Africa, it came into relief as the focus of public health nutrition in the mid-1940s after the founding of the UN and its agencies: WHO and FAO. Attention would remain on clinical syndromes –kwashiorkor and marasmus– for the next three decades, until height/length came into play. This emerged from a classical article by John Waterlow entitled: "Classification and Definition of Protein-Calorie Malnutrition" (1972). This was linked to a concept that the clinical forms were the tip of an iceberg, with preclinical PEM manifested by altered anthropometry; this in turn related to the supply and consumption of macronutrients in the diet. Waterlow termed the process of height decline as linear "retardation" and the extreme status as "stunting", expressed as height-for-age. These were ascribed to the duration of nutritional deprivation, and "chronic malnutrition" became a synonym.

Militating against pure dietary origins of stunting, up to 40% arises in fetal life, with the most accelerated phase of retardation occurring during exclusive/ predominant breast-feeding. Supple-

mentation of neither protein nor micronutrients (individually or in combination) reverses the condition. Observations by Bogin & Varela-Silva and Penny (and confirmed at CeSSIAM) show that short-stature is driven by deficits in the length of the lower extremities, with the torso-length and head-circumference remaining relatively conserved.

Notably, also in the early 1970s, more nuanced nutritional concepts emerged, as one enunciated by Doris Howes Calloway "people eat foods, not nutrients", and another by Victor Herbert that, beyond the ingestion of nutrients, their absorption, retention and utilization were further determinants of nutritional status. These were brought to this present explanation of stunting's origins. Most likely, all of the amino acids, calcium and phosphorus for hydroxyapatite are available within the body from any diet with human (or bovine) milk. A parsimonious theory for the mechanistic origins of retardation and stunting is failure of the utilization of nutrients essential for long-bone elongation due to impairment in the signally in the hormonal cascade regulating the epiphyseal growth-plates. The signallying pathway can be interrupted by inflammatory and stress hormones. The stress-inducing elements common to deprived settings include microbial saturation, ecto- and endoparasite infestation, recurrent infections, mycotoxins, poultry fecal toxins and adverse maternal psychosocial conditions, along with a potential role of malabsorption and systemic inflammation arising from environmental enteric dysfunction (EED), may constitute the constellation of mediators to disrupt long-bone elongation.

The epidemiological variation of stunting across continents, as well as within continents across nations and across areas within nations, suggest the possibility of genetic factors in resistance to or susceptibility for the antitrophic effects of the environmental factors.

So, 45 years after Waterlow's postulation of linear retardation and stunting as part of the preclinical manifestations of the PEM continuum somewhere in the base of the iceberg, their true origins remain submerged in uncertainty. Without a firm dietary explanation, however, "chronic malnutrition" is an unsuitable and outmoded descriptor worthy to be retired.

Keywords: height-for-age, stunting, protein-energy malnutrition, stress, bone growth

Conflict of Interest disclosure: Travel financed by Nestlé Research Center. Lausanne

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KL_144/2874

STUNTING: CHALLENGES IN ESTIMATING PREVALENCE AND POTENTIAL SOLUTIONS

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Stunting is a leading indicator used in policy formulation, social sector investment and program evaluation. For example, the World Health Assembly (WHA) established the goal of reducing the prevalence of stunting in 2010 by 40%, or to 100 million

stunted children, by the year 2025. Stunting is declining but too slowly to meet this goal; by 2025, the decline will have been only 26% relative to 2010 and 171 million children are expected to be stunted. Measurement error inflates the variance of height for age Z-scores and overestimate the prevalence of stunting and there is considerable noise in the country-level data. In addition, program evaluation is compromised when measurement is poor and may even make a successful program appear to be a failure. The purpose of this lecture is to discuss options for improving data quality. There are several diagnostics to identify the quality of measurement. Proper training and supervision are effective in improving the quality of measurement and several groups are working on strengthening training manuals. Another potential solution is to develop new technology to replace anthropometry. One such example is being developed by Body Surface Technology (BST) and Emory University. The system uses three -dimensional imaging (3DI) taken with off the shelf gadgets (Video game technology – Kinect- connected to an iPad) and an app written by engineers to create a three dimensional articulated model of the child from which measurements such as length and head circumference can be taken. The system is light and portable. We are comparing measures taken with 3DI with those obtained from anthropometry in 500 preschool children in Atlanta, with Gates Foundation funds. The idea is that if 3DI is as good (similar accuracy and no bias) as standardized anthropometry and assuming that 3DI requires less training and time to provide accurate and valid length and other measures, that it could substitute for anthropometry eventually in surveys, with improvement in the estimation of stunting. Joel Cockle is leading the data collection and analysis of the 3DI project for his doctoral dissertation at Emory. A next step would be to try 3DI in a developing country setting.

Keywords: Anthropometry, stunting, measurement error, 3-dimensional-imaging

KL_144/1449

A PARTICIPATORY COMMUNITY-BASED APPROACH TO EFFECTIVE IMPLEMENTATION OF THE BABY FRIENDLY COMMUNITY INITIATIVE IN RURAL KENYA

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Background and objectives: The child survival and development strategy in Kenya aims at improving child health and reduction in child mortality through the acceleration and scale-up of evidence-based high-impact interventions. Promotion of optimal maternal infant and young child delivery of such high impact interventions is marred by lack of clear evidence on what works, how it works and why. The Baby Friendly Community Initiative (BFCI) project conducted a formative qualitative study whose specific objectives were to determine the local contexts and cultural factors that influence breastfeeding and other maternal, infant and young child feeding practices in order to tailor the intervention package to the communities and to determine the enablers and barriers associated with the implementation of Baby Friendly Community Initiative and how to address them

Methods: The formative study employed a cluster randomized trial which used a participatory action research design for qualitative data collection. A total of 205 participants were interviewed in the study which covered 13 community units which were used as sampling units for the main project. A total of 52 interviews were done, 16 Focus Group Discussions, 14 In-depth Interviews and 22 Key Informant Interviews. The key informants included chiefs, village elders, religious leaders, women leaders, CBO leaders, Traditional Birth Attendants and health professionals at sub county and health facilities. In-depth interviews included pregnant women, breastfeeding women, HIV positive women and Health professionals. Focus group discussions were done with fathers, old and young mothers, grandmothers and Community Health Volunteers.

Results: Results revealed that cultural factors and traditions had great influence on maternal and child feeding practices. Mothers' decisions were also highly influenced by the health workers, community and family members, religious leaders and Traditional birth attendants. This information was used to develop

appropriate and targeted intervention strategies for effective BFCI implementation.

Conclusions: End line qualitative data showed a great improvement in addressing some of the key barriers and enhancement of the existing enablers. There were significant positive outcomes for key indicators; the number of antenatal visits, health facility deliveries, exclusive breastfeeding, growth monitoring, motivation and capacity building of community health volunteers and functional mothers support groups.

Keywords: Baby Friendly Community Initiative, Enablers/Barriers

Conflict of Interest disclosure: The authors of this abstract declare that this is an original 3 year intervention research and this presentation is based on findings, there is therefore no conflict of interest.

Further collaborators:

Koibatek Sub County Health management Team

Track 4: Nutrition and Management of Diseases

KL_144/3382

NEW INSIGHTS INTO OBESITY PREVENTION IN CHILDREN AND ADOLESCENTS

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Obesity in children and adolescents has been increasing in the last decades, reaching unacceptable prevalence rates. Public health actions seem to start to be effective in some developing countries. However, more efforts are necessary to achieve the WHO goal of ending with the childhood obesity epidemic. Available evidence concludes the different types on interventions already implemented, have moderate effect in body composition indices, i.e. the body mass index (BMI). Interventions use to be effective in relation with the targeted behaviours, especially fruits intake and sedentary behaviours. Interventions combining different nutrition and physical activity related behaviours are more effective than those targeting isolated behaviours. Ideally, interventions should focus not only in children, but also in the families, the school and the community. The school is an appropriate setting in this population group, as children spend a significant part of their time taking lessons and participating in other school-related activities. Community activities seem to add to what is achieved with the other intervention components.

The main limitation of the studies on childhood obesity prevention is the lack of proper assessment of the process of the intervention and its relationship with the obtained efficacy. Different aspects related with the intervention context should be considered, such as contextual factors that shape theories of how the intervention works, contextual factors that affect implementation, intervention mechanisms and outcomes and causal mechanisms present within the context which act to sustain the status quo, or potentiate effects. The implementation process as how delivery is achieved, training, resources etc. should be considered as well as what is delivered, specifically its fidelity, dose, adaptations and reach. Mechanisms of impact such as participant responses to and interactions with the intervention, mediators and potential unexpected pathways and consequences should be also considered.

Innovative strategies are also promising for future intervention programs. They include social marketing approaches, the use of social networks in order to disseminate health related messages and to take profit of the peers influence, and the use of active games. Future studies should incorporate these promising approaches in order to develop the most effective strategies to tackle the childhood obesity epidemic.

Keywords: Obesity, prevention, child, epidemiology

KL_144/3037

CHALLENGES IN THE CARE OF CHILDREN AND ADOLESCENTS WITH TYPE 1 DIABETES

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The Diabetes Control and Complications Trial (DCCT) showed that improved metabolic control reduces the risk of long term complications in both adult and adolescent patients with type 1 diabetes (T1D).

The Epidemiology of Diabetes Interventions and Complications (EDIC) study further proved that good glycemic control had persistent beneficial effects on long term complications. Based on these results it was recommended to optimize glycemic control as early and close to normal as possible in all patients in order to prevent complications. Despite modern approaches to physiologic insulin replacement, insulin analogs and insulin pumps, most children and adolescents fail to achieve optimal metabolic control and do not achieve the recommended Hb A1 c target.

There is a need to identify current barriers and opportunities in diabetes care.

TEENs study of young people with diabetes provides a global approach to explore factors related to glycemic control & quality of life of T1D youths by age class (8–12, 13–18, 19–25 y/o) through multifaceted insights (health-care providers, T1D patients, families) 5960 participants from 20 countries of 5 continents and over 200 centers were included. TEENs study also explores the challenges of transition of care from pediatric to adult in the understudied young adult population. Results show that more than 70% of young people with T1D do not achieve glycemic control targets.

Factors associated with A1c target attainment included treatment approaches (frequent Blood Glucose Monitoring (BGM), carb counting, exercise, avoiding ketoacidosis, and glucagon availability) and family factors (avoiding diabetes-specific family conflict)

In agreement with the TEENs, the type 1 Diabetes Exchange register clinic network from the USA which compared adolescents with excellent vs poor control, showed that both groups differed substantially in diabetes management with excellent control group using insulin pumps, performing more blood glucose monitoring, missing fewer boluses and using meal -specific insulin: carbohydrate ratios than those in poor control.

With another perspective, Huidöre study registers 26 centers from Europe, USA, Japan and Australia evaluated between 1998 and 2009 and summarized in the paper Lessons from the Huidöre International Study Group on Childhood, from 2013. It shows the relevance of modality in applying therapeutic strategies and focusing on communication and visits regularity as predictors of Hb A1c levels

While the patients' expectations are a cure, minimally invasive treatments, and not having any limitations, HPC's goals are control to prevent complications for which we indicate intensive treatments, multiple insulin doses, frequent BGM and pumps.

Finding common goals, incorporating motivational techniques with patient-centered treatments, working as a multidisciplinary team to implement interventions that target modifiable factors may help optimize A1c levels; and providing added support and education to youth with non modifiable factors (at risk demographic and family factors) may help overcome suboptimal control in youth with T1D.

Keywords: Key words: Type 1 diabetes, pediatrics, glycemic control, Hb A1c.

Conflict of Interest disclosure: Disclosures: Member of steering committee of TEENs Study: Advisor SANOFI; Advisor LILLY

KL_144/2876

NUTRITION FOR INFLAMMATION: PUT OUT THE FIRE!

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Inflammation is a major factor for the progression of diabetes, cardiovascular diseases, eye disorders, arthritis, obesity, autoimmune diseases, and inflammatory bowel disease. Pathological inflammation associated with autoimmune diseases is controlled by networked immune system genes. The nuclear factor kappa-B protein family, as well as signal transducers and activators of transcription 3 (STAT3,) activate over 500 gene products affiliated with inflammation, cell transformation, angiogenesis, and metastasis. Most chemo-preventive blockers act by inhibition of NF-κB and STAT3 pathways. These blockers have numerous side effects whereas plant-derived polyphenols do not. An anti-inflammatory Mediterranean diet supports lifelong health and a reduction in chronic inflammation.

Keywords: Inflammation, Plant polyphenols, Mediterranean diet

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KL_144/3642

BIOCHEMICAL PROFILE IN PATIENTS SUFFERING DIFFERENT TYPES OF CANCER AND AIDS

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The aim of this lecture is to show the most important results obtained in our laboratory, related to the nutritional status evaluated through the use of biochemical parameters. Patients suffering from a) head and neck cancer (HNC, n=17), b) colorectal, esophagus or stomach cancer (GG, n=32) and c) HIV+/AIDS (n = 43), were included.

HNC were looked after at the Service of Gastroenterology (Carlos G. Durand Hospital), GG at the Angel Roffo Institute of Oncology and HIV+/AIDS at the Hellios Salud Centre. The study was approved by the University of Buenos Aires Ethics Committee, and all participants agreed to sign the written consent before recruitment.

Blood samples were collected from fasting patients. Specific plasma protein fractions Albumin, Transthyretin (TTR), Transferrin (Tr), C3 and C4 complement fractions (C3c, C4c). Ceru-

loplas¬min (Cp), Haptoglobin (Hp), Fibrinogen and C-reactive protein (CRP) were measured by single radial immunodiffusion technique on agar gel layers (Binding Site, UK; Diffu-Plate, Biocientífica SA, Argentina).

IL-4 concentration and total antioxidant status (TAS) was determined by Elisa and by Randox Kit (UK), respectively in the HNC group. In addition, the fatty acid profile was analyzed on 58% of these patients.

The results (expressed as X±SD) were compared against reference values performed in a group of healthy subjects.

HNN group

Data showed lower TTR, C3c, Tr and IL-4 levels together with higher Cp and Hp plasma concentrations than those from the reference values. These results pointed out to a depressed nutritional status and an inflammation process. Moreover, a decreased total antioxidant status and changes in essential fatty acids pattern were observed. These findings showed the importance of an early and periodical nutritional evaluation that could help to perform an adequate nutritional support concomitant to the specific treatment.

GG group

Statistically significant decreases were shown in Tr, ApoB, C4c and TTR plasma concentrations together with concomitant increased albumin levels when data were compared with reference values. This behaviour suggests nutritional disorders associated with an hemoconcentration status in this group of patients. It is important to highlight that nutritional differences depend on diverse stages of the disease.

HIV+/AIDS group

HIV+/AIDS patients showed changes in biochemical parameters, particularly an increase in Fibrinogen and ApoB together with a tendency to diminished TTR levels. These data could lead to a compromised nutritional status with an altered lipid profile.

The global analysis of the biochemical profile of individuals suffering from these different pathologies emphasize the importance of including the periodic evaluation of functional biochemical parameters in these patients, since the diagnosis of the pathology. This outcome would allow an early assessment to achieve an appropriate nutritional support, implemented along with the specific therapy, leading to the delay of the progression of the disease, and improving survival and quality of life outlook.

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Keywords: head and neck cancer, gastroenterology cancer, HIV+/AIDS, biochemical plasma profile, specific plasma proteins.

Track 5: Nutrients and Nutritional Assessment

KL_144/2901

BENEFICIAL EFFECT OF PROBIOTICS CONSUMPTION ON THE IMMUNE SYSTEM

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The gastrointestinal tract is one of the most active microbiologically ecosystems that play a crucial role for the functioning of the Mucosal Immune System (MIS). In this ecosystem, probiotic microorganisms, that enter orally can stimulate the Immune System and induce a network of signals, mediated for the whole bacteria or their cell wall structure (originated by the effect of antimicrobial substances from the Paneth cells): 1) to the intestinal epithelial cells or the immune cells associated, to the lamina propria; 2) the interactions induce the production of different cytokines or chemokine as MCP1 (macrophage chemoattractant) from the IEC, that in turn will send signals to the immune cells, which contribute to the MIS activation. We demonstrate: a) probiotic strains stimulate the mucosal immunity increasing the number of IgA +cells in the intestine, the activity of T cells, and induce inmunomodulation by IL-10 release. We determined the importance of the probiotic viability b) that in the interaction with the epithelial cell and macrophages, Tol like receptors (TLRs), mainly TLR2 are involved, and also the mannose receptor, 3) probiotics favor the innate immune response, where macrophages and DCs play an important role, without inducing an inflammatory immune response, they only produce a slight increase in the cellularity of the lamina propria. We demonstrate the effectiveness of probiotics in Salmonella infection by an increase in the microbicidal activity of peritoneal and spleen macrophages. In malnutrition models with an improvement in the histology of intestine and thymus in both: undernutrition and obesity with an improvements in Immune System functionality. We determine in a respiratory allergy model, that a PFM diminished the levels of IgE by induction of Th1 balance, that favor the production of IgG instead of IgE. These biological mechanisms observed mediated by probiotic stimulation, open the door for the study of anti-inflammatory mechanisms. We demonstrated the anti-inflammatory effect of yogurt in IBD model, where we observed a decrease in the inflammatory cytokine IL-17. We conclude that probiotic strains, PFM and yogurt have an important role in the functionality of the MIS and in the immune surveillance, through the mechanisms of immunoregulation

Keywords: Probiotics, Functional foods, Intestinal Immune System, Immunomodulation.

KL_144/3501

MEAL PATTERN ANALYSIS: NEW INSIGHT INTO DIETARY PATTERN AND THEIR HEALTH CONSEQUENCES

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It is still a debate whether public health aspects of diet should be addressed preferentially as single dietary component or as dietary pattern. The pattern approach has gained prominence during the past decade and the scientific community can find many scientific publications on this topic. Of particular interest had been statistical approaches that identify dietary patterns in a specific study population from empirical data and relate these patterns to disease risk.

The motivation to investigate dietary patterns instead of single components comes mainly from the observation that many of the components of dietary intake correlate with each other. This observation usually makes it difficult to interpret the health impact of a single component properly in view of the many alternatives. However, it is still not widely discussed how exploratively identified dietary pattern can be interpreted and why they exist in a study population. The interpretation of dietary pattern is getting even more complex when habitual dietary intakes had been used as prime data source. This is the case of nearly all studies conducted so far on dietary pattern.

Information on the course of food intake at the different eating occasions over a day is nowadays widely available due to the increased use of 24-h-recalls. The investigation of food intake at meal occasion is in line with the idea of foods eaten together as well as with the idea that a specific food consumption at a particular time during the day is meeting with a metabolism that is following a circadian rhythm. Thus, the analysis of meals regarding food intake and their patterns could help understanding the formation of food pattern on the habitual level but also understanding their immediate metabolic impact. In this way meal and meal pattern analysis open up a new promising research area.

In our group we recently analyzed with different statistical approaches (PCA and network analysis) how meal pattern relate to habitual pattern. We found that - in the German context - breakfast is the most stable meal but has less impact on the formation of habitual pattern than other meals particular if variation reduction methods are used to identify dietary pattern. Dinner is the meal with the highest impact on the formation of dietary pattern on habitual level. We also found that only part of the pattern identified in habitual data originate from foods eaten together at meals. Currently we are searching on how otherwise foods are combined at habitual level into a food pattern.

A statistically more comprehensive approach to investigate meals with a particular focus on foods being eaten and its health implication is multi-level analysis. This statistical approach is trying to trace the origin of variance at the different levels and also could relate this variance to covariates. The covariates can also include metabolic and health parameters measured at the individual level. First results from this investigation will also been presented in this lecture.

Keywords: Meal, meal pattern, dietary pattern, multilevel analysis

KL_144/2877

FROM TASTE TO WEIGHT

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Obesity is a chronic intoxication with calories. Eating causes a pleasure sensation that starts with the sense of taste in the gustative receptors of the papillae in the tongue, mouth and pharynx.

There are specific receptors in the papillae for sweet, bitter, umami, salty and rancid.

In the last couple of years another set of receptors for fatty substances was discovered.

Foods with sweets and fatty components are the most stimulating.

This information is transmitted first to the Nucleus of the Tractus Solitarius, from there to the hypothalamus and higher centers in the brain, recently started to be discovered with fMRI research.

Similar receptors are also found in the intestine with sensations transmitted to the Central Nervous System mostly by ascending fibers of the Vagus nerve.

The overall sensation transmitted to the brain is one of gratification and reward.

The neurotransmitters in charge of these pleasurable sensations seem to be mostly dopaminergic, although serotonin, GABA and norepinephrine are also present in some of these pathways.

The hypothesis to be presented is that the pleasure sensation of eating is the main reason that makes obesity so common and resistant to treatments in a world of excessive calories offered by the food industry.

Keywords: Obesity, Taste, Gustatory Receptors, Pleasure sensation.

Track 6: Functional Foods and Bioactive Compounds

KL_144/3384

MOLECULAR MECHANISMS OF ACTION OF PROBIOTICS

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Probiotics are living microorganisms that confer a health benefit on the host when administered in adequate amounts, although dead bacteria and their components can also show probiotic properties. Bifidobacterium and Lactobacillus strains are the most widely used bacteria exhibiting probiotic properties and are included in many functional foods and dietary supplements. Beneficial effects of probiotics in allergy, intestinal-related diseases (IRD), chronic liver disease, urinary tract infections and respiratory infections have been reported, among others.

The current scientific evidence regarding to overweight and obese patients that received some probiotics and synbiotics shows a significant reduction in the abdominal adiposity and BMI; and also, probiotic supplementation produced an improvement in the metabolism of carbohydrates, as well as a reduction in the metabolic stress in patients with type 2 diabetes (T2D) and IRS. Moreover, an improved serum lipid profile was observed in patients with T2D after the consumption of synbiotics. The effects of probiotics in patients with non-alcoholic fatty liver disease (NAFLD) were primarily an improvement in the liver function and metabolic parameters, although there is some controversy on the effects of probiotics on those chronic diseases, which might be related to inappropriate design such as diversity, the use of several strains, and the small number of individuals receiving some interventions. Undeniably, further studies to evaluate the best dose-response effect of probiotics and synbiotics are needed, including following up with patients after the probiotic intervention to evaluate the persistence of their potential beneficial effects in obesity, IRS, T2D, and NAFLD.

Major mechanisms underlying the effects of probiotics include improvement of the gut barrier function, increased competitive adherence to the mucosa and epithelium, gut microbiota modification, and regulation of the gut associated lymphoid immune system. In this regard, probiotics communicate with the host through intestinal cell pattern recognition receptors, such as Toll-like receptors and nucleotide-binding oligomerization domain-containing protein-like receptors, which modulate important key signalling pathways, such as nuclear factor-κB (NF-κB) and mitogen-activated protein kinase (MAPK), to enhance or suppress activation and influence downstream pathways. Some authors have also described the modulation of intestinal gene expression mediated by probiotics. In this regard, our group has recently shown that L. paracasei CNCM I-4034, B. breve CNCM I-4035 and L.

rhamnosus CNCM I-4036 are able to inhibit the expression of both Adamdec1, a gene involved in dendritic cell maturation, and Ednrb, a gene that codifies for endothelin B receptor involved in vasoconstriction/vasodilation and cell proliferation in the intestinal mucosa of the Zucker rats. Beyond understanding the molecular mechanisms of action for probiotics, further studies to evaluate the best dose-response-effect of probiotics, including following up with patients after the probiotic intervention and persistence of beneficial effects, are clearly needed.

Keywords: Lacobacilli. Bifidobacteria. Microbiome. Probiotics. Gene expression.

KL_144/3517

FEEDING THE IMMUNE SYSTEM: THE DANONE INTERNATIONAL PRIZE FOR NUTRITION 2016

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A well-functioning immune system is key to providing good defence against pathogenic organisms and to providing tolerance to non-threatening organisms, to food components and to self. The immune system works by providing an exclusion barrier, by identifying and eliminating pathogens and by identifying and tolerating non-threatening sources of antigens, and by maintaining a memory of immunological encounters. A breakdown in host defence increases susceptibility to infection while a breakdown in tolerance results in immune-mediated diseases like food allergy or autoimmunity. The immune system is complex involving many different cell types distributed throughout the body and many different chemical mediators some of which are involved directly in defence while others have a regulatory role. Babies are born with an immature immune system that fully develops in the first few years of life. Maturation factors in breast milk, acquisition of an "appropriate" microbiota, and exposure to environmental antigens for example from microorganisms and from are all important in early life immune maturation. Immune competence can decline with ageing. The sub-optimal immune competence that occurs early and late in life increases susceptibility to infection. Undernutrition decreases immune defences, making an individual more susceptible to infection. However, the immune response to an infection can itself impair nutritional status and alter body composition. Practically all forms of immunity are affected by protein–energy malnutrition, but non-specific defences and cell-mediated immunity are most severely affected. Micronutrient deficiencies impair immune function. The gut-associated lymphoid tissue (GALT) is especially important in health and well-being because of its close proximity to a large and diverse population of organisms in the gastrointestinal tract and its exposure to food constituents. There are strong interactions between the gut microbiota and the host GALT and it is considered that an altered gut microbiota can affect host immune responses. Strategies to modify the gut microbiota include prebiotics and probiotics and through such modifications host immune defence may be improved.

Keywords: Nutrition, immunity, life course, microbiota

OLIVE POLYPHENOLS – IMPORTANT MEDIATORS OF HEALTH BENEFITS OF THE MEDITERRANEAN DIET ?

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There is extensive evidence that the Mediterranean diet is associated with health benefits for cardiovascular disease, cancer and type-2 diabetes. Extra virgin olive oil is often highlighted as an important component of the diet's health promoting effects and recent evidence suggests that the polyphenols present, including oleuropein and hydroxytyrosol, may be the main factors involved.

We have been studying olive polyphenol extracts derived from olive oil or olive leaves to evaluate their influence on cardiovascular health and on aspects of cancer development. Such polyphenol extracts improved vascular function and certain inflammatory markers in an acute intervention study. In a longer term (6 weeks) double blind, placebo controlled intervention, olive leaf polyphenols lowered blood pressure and decreased total and LDL-cholesterol and plasma triglycerides. Using a similar olive leaf extract, others have reported beneficial effects on insulin resistance and plasma glucose profile in oral glucose tolerance tests.

In vitro, olive polyphenols were also shown to inhibit DNA damage in colon cells and to inhibit tumour cell invasion. In a SCID Balb/c mouse model of metastasis, olive polyphenols markedly inhibited the rate of growth and metastasis of an invasive colon tumour cell xenograft

Keywords: Mediterranean diet, olive oil, olive polyphenols, cardiovascular disease,

Conflict of Interest disclosure: Research support: Comvita New Zealand Ltd

Scientific advisory boards: Herbalife Nutrition Institute, McCormick Science Institute, European Natural Soybean Association, Alpro Foundation

ILSI Europe working group

MEMBRANE LIPID PEROXIDATION IN HUMAN NUTRITION AND AGING

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Phospholipids are of critical importance in mammalian cell biology, both through providing a permeability barrier and acting as substrates for synthesis of lipid mediators. Such membrane phospholipid peroxidation receives attention in connection to evaluate nutritional states and also to aging. For measuring phosphatidylcholine hydroperoxide (PCOOH) as a primary oxidation product of membrane lipids, liquid chromatography combined with chemiluminescence (LC-CL) detection and/or with tandem mass spectrometry (LC-MS/MS) is employed with using synthetized authentic standards. Nowadays it becomes possible to determine total PCOOH, positional isomer, and stereo isomers of PCOOH in human plasma, red blood cells (RBC), tissue organs and cultured cells. High PCOOH concentration is confirmed in atherosclerotic plasma with angiographically significant stenosis in which PCOOH accelerates monocyte adhesion to ICAM-1. In Alzheimer patients, aged RBC rich in PCOOH is found in peripheral blood, and such PCOOH-rich RBC lacks CO_2/O_2 exchange function that contributes to develop the senile dementia. The data further indicate that radical and/or enzymatic oxidation, rather than singlet oxygen oxidation, is recognized to cause oxidation of membrane PC in our body. Age-dependent accumulation of PCOOH is also confirmed in cultured human diploid cells, the microsomal and plasma membrane of the rat hepatocytes, and the brain and liver of the rat, and intensely in a mouse model for hepatitis C virus associated hepatocarcinogenesis. Food nutrients generally influence these membrane lipid oxidations, and moderate intake of dietary antioxidants (vitamin E, C, carotenoid, polyphenols and so on) would be recommendable.

Keywords: Lipid peroxidation, Oxidative stress, Aging, Senescence, Alzheimer disease

Track 7: Food Culture Practices and Nutritional Education

KL_144/3572

WEIGHT LOSS USING A HEALTHY DIET AND EXERCISE PROMOTION TO PREVENT CARDIOVASCULAR DISEASE: THE PREDIMED-PLUS TRIAL

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Since there are no clinical trials demonstrating that sustained weight loss over >2 years with diet and changes in lifestyle reduce the risk of cardiovascular disease, we have designed the PREDIMED-PLUS Study, an intervention trial on primary prevention of cardiovascular disease in patients with metabolic syndrome and overweight or obesity.

The PREDIMED-PLUS Study is a parallel group, multi-centre, randomised, primary prevention trial (PREDIMED-PLUS) on men aged 55-75 years and women 60-75 years, with a body mass index ≥ 27 to <40 kg/m^2 and meeting at least 3 criteria for the metabolic syndrome. The objective of the present research is to compare the cardiovascular effect of two interventions: a) intensive weight-loss intervention on lifestyle program with hypocaloric Mediterranean diet, physical activity and behavioural therapy, b) non intensive care with recommendations on Mediterranean diet following the usual care of medical physicians. The principal end-points are: 1) a composite of major hard clinical cardiovascular events, and 2) weight loss and weight maintenance at long term. Other secondary end-points include the incidence of several chronic conditions or diseases secondary to obesity and metabolic syndrome.

Recruitment of participants began in September 2013, and finish in November 2016, with 6,874 participants randomized to the trial. The final results will be available from 2020.

We hypothesize that an intensive weight-loss lifestyle intervention, including physical activity, based on the traditional Mediterranean food pattern is a sustainable long-term approach for weight reduction among overweight/obese adults and that the achieved lifestyle changes will exert beneficial effects on cardiovascular disease incidence, according to our experience and to research by other investigators. The rationale for the proposed investigation is that it can provide a new, affordable, and sustainable approach to reduce excess cardiovascular morbidity and mortality among overweight/obese adults, beyond what was already observed in the PREDIMED I trial.

At the IUNS Congress, we will present the results of the PREDIMED-PLUS pilot study in the first 600 participants randomized to the trial.

Keywords: Weight loss, diet, exercise, cardiovascular disease.

KL_144/3572

SUSTAINABLE DIET FOR A SUSTAINABLE WEIGHT

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To achieve and maintain a sustainable body weight is a challenge, especially in the westernized world. Overweight and obesity have reached epidemic levels with ensuing increases in type-2 diabetes and cardiovascular diseases. An abundance of energy-rich, easily available foods and lack of physical activity are major reasons for these effects. A high protein intake has been shown to increase weight loss and improve weight maintenance compared to a low protein intake (1). A high-carbohydrate diet has also been shown to induce weight loss, although not to the same extent (2).

In recent years, increasing attention has been put on the environmental impact of different foods, and when comparing eg CO_2 emission for legumes with meat, the CO_2 equivalent (in kg) is 30 times increased (3). Therefore, a replacement of protein from animal sources such as beef and pork with protein from vegetable sources, such as legumes, would be an environmental-friendly approach. This could also lead to an increased intake of dietary fiber, which in most countries is not yet at the recommended level. We examined if a meal based on vegetable sources (legumes) was comparable to a meal based on natural animal sources (pork and veal) regarding satiety and energy intake. The conclusion was that vegetable-based meals (beans/peas) influenced appetite sensations favorably compared to animal-based meals (pork/veal). Interestingly, a vegetable-based meal with lower protein content

was as satiating and palatable as an animal-based meal with higher protein content (4). A recent meta-analyses including 21 studies also supports that dietary pulses can be a beneficial weight-loss strategy (5).

Potatoes are a predominant staple in most diets of the Western world and the primary non-grain food item produced globally. Potatoes have a high glycemic index, but compared with other carbohydrate sources, they have a low energy density and consequently a low glycemic load. Furthermore, potatoes provide potassium, vitamin C, phosphorus, magnesium, folate, dietary fiber, and polyphenols. Evidence from meal test studies has suggested that intake of boiled potatoes increases satiety compared with intake of other preparations of potatoes or carbohydrates such as rice, bread, and pasta on an energy-equivalent basis. How these short-term effects translate into long-term effects is, however, not yet clear. We conducted a systematic review to evaluate the association of intake of potatoes and risk of obesity, T2D, and CVD in healthy adults. We found only observational studies and the 13 identified studies did not provide any convincing evidence to suggest such associations (6). Still, there is a need for well-designed long-term, randomized controlled trials in this field.

In conclusion, it is worth considering that an increased proportion of vegetable sources could be a possible way to achieve a sustainable diet for a sustainable weight.

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Keywords: Animal and vegetable protein, potatoes, obesity, type-2 diabetes.

KL_144/2889
BUILDING CAPABILITY AND CAPACITY IN NUTRITION: CANCER AS A MODEL

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The appropriate detection, diagnosis and management of nutritional problems in public health and clinical care is impeded by the lack of an adequately resourced workforce who are appropriately trained in nutrition. In addition, necessary infrastructure for addressing nutritional problems is often lacking. The link between nutrition and cancer offers an example both of the problems and of potential solutions.

There is abundant evidence that nutritional factors are central to the causation and prevention of several cancers, and mounting evidence that they also predict and possibly influence outcome of cancer once diagnosed. Most of the evidence supporting these conclusions comes from higher income countries, and while is expected to increase more in low income settings over the coming decades, little resource is directed to building the infrastructures necessary to explore the specific aspects of nutrition and cancer prevention and care in these settings.

National and international agencies for nutrition and for cancer exist to prosecute agendas relating to professional, research, care and policy aspects, but there is little structured coordination between them. Developing structured collaborations between nutrition and cancer activities offers the possibility of improved prevention and care, saving lives and money. Establishment of cancer registries with basic nutritional information, and of a core nutritional status assessment as routine in cancer care, would be simple initial projects.

A new collaboration between IUNS, UICC, IARC and IAEA will be described as a model for how progress might be made.

Keywords: Cancer, capacity building, international collaboration.

KL_144/3390
GASTRONOMY AT THE INTERSECTION OF NUTRITION AND EDUCATION

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In March 2014, the European Parliament approved the Resolution on the European gastronomic heritage: cultural and educational aspects, that was impulsed by the Spanish Nutrition Foundation (FEN) cojointly with the Royal Academy of Gastronomy mainly based on the following principles: developments in recent years have highlighted that diet, in its broadest sense, is extraordinarily important in modern society; it is essential to incorporate learning about diet and nutrition, taste workshops and a knowledge and culture of food and gastronomy into the various national education systems; It is also evident that gastronomy and cooking have become an increasingly important form of artistic and cultural expression, that food and good cooking are one of the fundamental pillars of family and social relationships and that satisfaction at meal times is of course essential in sensory and psychical terms, as it is a substantial element of psychological and emotional balance, education in nutrition and gastronomy, including respect for nature and the environment, should include the participation of families, teachers, the educational community, information channels and all education professionals; and finally, that it is not only possible but necessary to combine healthy eating with gastronomy. Therefore, the aim of this lecture is not only to explain and debate the development, approval of this Resolution at European level, but also to share and discuss the recent achievements in this field in Spain to be extrapolated to the rest of Europe and worldwide.

Keywords: Gastronomy; Education in Nutrition; Healthy Gastronomy; Culinary Skills

Track 8: Agriculture, Food Science and Safety

KL_144/3391

NUTRITION-SENSITIVE AGRICULTURE – WHAT DOES IT MEAN AND WHICH IMPACT IT CAN HAVE IN ADDRESSING ACTUAL MALNUTRITION PROBLEMS

Charrondiere, U. Ruth; Rahmanian, Maryam; Unver, Olcay; Hemrich, Guenter; Toppe, Jogeir; Muir, Giulia; Dahdouh, Sergio; Rolle, Rosa; Mottet, Anne; Scherf, Beate.

FAO.

Food production is immensely important but undervalued in the food system approach aiming to improve malnutrition. Nutrients that are not produced through agriculture, cannot be conserved or consumed. They would have to come from fortification or supplementation, or would remain in insufficient amounts leading to micronutrient deficiencies or undernutrition, or if available in excess will lead to overweight/obesity and waste of resources.

Agriculture includes large-scale monoculture with high productivities and market access, and small-scale farming or pastoralism, where most of the biodiversity is conserved but having lower productivity, market access and income. Important challenges are climate change; environmental degradation; loss of biodiversity; lack of agricultural research for non-stables and minor species; water scarcity; and urbanization. Most agriculture is geared more towards quantity, income and industrial requirements than towards nutritional quality or consumers' preferences (including taste and strive towards agro-ecological products). Previously, it was thought that if energy needs are covered the micronutrient needs will be fulfilled; or that economic/agricultural growth will automatically lead to improved nutrition – we know today that these are wrong.

Ways forward to meet nutritional requirements while producing foods sustainably could be to simultaneously increase diversification; higher production/use of species, varieties and breeds rich in micronutrients; use resources efficiently; integrate value chains; and reduce food loss and waste. They all aim to produce more diverse and nutritious foods and sell them at decent prices, hopefully resulting in the consumption of sustainable diets. A multi-sectorial approach is most efficient (following the principle 1+1=3) because change is most likely to be efficient if all elements of the food system are moving into the same direction, i.e. production is linked with consumer and environmental demands, enhanced by appropriate value chains, progammes and policies (e.g. agriculture, trade, health, nutrition, education) and nutrition education. FBDG are central here and can inform consumers and policies.

Examples are integrated systems coupled with improved water management: aquaponics (integrated fish-poultry-vegetables system); rotation or intercropping (e.g. pulses and cereals); valuing wild foods often coming from the forest; home-based animal husbandry; crop-livestock-fish integration for improved use of manure and crop residues; or promoting insect consumption. Efficiency will be enhanced by producing foods and varieties rich in micronutrients and ensuring high overall productivity and income. Key elements are mainstreaming biodiversity and the use of FAO's new tool Nutrient Productivity Scale combining yield, food composition and human nutrient requirements. These, together with agro-ecological approaches could achieve efficient resource use. An increased production without taking into account value chain and transportation leads to high losses in income, foods and inputs. Therefore improving value chains is essential, e.g. cold chains for fruits, vegetables and animal-based foods. Another possibility is the use of micronutrient-rich fish by-products for human nutrition.

For all these steps, food composition data are needed at food and variety level for raw, cooked and processed foods – but in 99% of cases they are absent. Investments in their generation could be highly beneficial.

Once agriculture is more nutrition-sensitive, many of the global malnutrition problems can be solved.

Keywords: nutrition-sensitive agriculture, food system, malnutrition, food composition

KL_144/3307

WHY EXPERIENCING FOOD INSECURITY HAS BAD CONSEQUENCES FOR CHILDREN AND HOW WE CAN PREVENT THEM

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Children experience food insecurity when households are food-insecure. Children's experiences of food insecurity differ from those of adults. Children are cognitively, emotionally, and physically aware of food insecurity, and take responsibility for managing food resources through participation in parental strategies, initiation of their own strategies, and generation of resources to provide food for the family. Even when household food insecurity is mild or moderate, these experiences are associated with many negative consequences for children, including behavior problems, poor health, disrupted social interactions, delayed development, shame, poor school performance and absenteeism, lower physical activity, altered daily activities, and poor or less healthy diets. The paths through which these consequences occur are both nutritional and non-nutritional. Non-nutritional paths may involve psychological and social effects of and responses to the stress that food insecurity places on families. The traditional lens for child food insecurity concentrates attention on food, hunger, and malnutrition, but, to guide effective intervention, we should also attend to other interconnected domains of children's daily lives, including food-related challenges within the psycho-social, family, educational, and community domains in which child development unfolds. Understanding why experiencing food insecurity has bad

consequences for children and knowledge about these mechanisms can guide effective and beneficial actions to prevent them.

Keywords: Children, food insecurity, interventions, development, stress.

KL_144/3479

HOW TO MAKE FOOD SYSTEMS MORE NUTRITION-SENSITIVE

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Poor quality diets affect more than 1 in 3 people worldwide. Diets are imbalanced in terms of the quantity and sources of calories consumed and in the excess consumption of certain components such as added sugar, salt and some forms of fats. So it is no surprise that diet related factors account for 6 of the top 11 risks behind the global burden of disease. Income growth and urbanization are not going to make it any easier to purchase healthy diets in the future. Increased income allows the increased consumption of foods that are health promoting as well as foods that are not. Urbanisation puts a premium on convenience and this can lead to the excess consumption of highly processed foods. Global and national food systems are part of the problem and part of the solution. What we produce, how we store, process, market and retail food affects its availability, affordability and desirability—and hence its consumption. The quality of consumption of food by key groups – infants and women for example-- is well below the minimum standards required. The food system commands large resource flows which can be guided towards advancing nutrition, through a combination of positive and negative incentives, at all stages of the food system. At the moment low and middle income countries are on course to follow the damaging pathway that the high income countries have taken. This presentation stresses that policymakers have choices to make, outlines the options available to them, urges them to take decisive action to make their food systems become more nutrition sensitive, and outlines the consequences of not changing course.

Keywords: Diet, food systems.

KL_144/3357

INVESTING IN NUTRITION: WHAT WILL IT BUY?

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Ensuring optimum nutrition—particularly during the 1,000-day period from pregnancy to a child's second birthday—can alter an individual's development trajectory and maximize her or his productive potential. Chronic malnutrition has important lifelong consequences for health and cognitive development. Being stunted (low height-for-age) in early childhood is associated with a delayed start at school, reduced schooling attainment and substantially decreased adult incomes at both the individual and country level. These consequences add up to overall gross domestic product (GDP) losses of 4 to 11 percent in Africa and Asia. Importantly, chronic undernutrition can be transmitted through an inter-generational cycle, where malnourished mothers are more likely to have stunted children. There is a strong body of evidence that shows high economic returns to investing in nutrition. Scaling up these proven nutrition-specific interventions can ensure that mothers are healthy and well-nourished and that they can provide optimal nutrition to their children, that children realize their full physical and cognitive development potential, and that women's productivity is not hampered by illness, especially anemia. Furthermore, investments in nutrition are highly cost-effective and among the best value-for-money development actions. In 2016, the World Bank, Results for Development Institute, and 1,000 Days, with support from Bill & Melinda Gates Foundation (BMGF) and the Children's Investment Fund Foundation (CIFF) released innovative, in-depth economic analyses and developed a global investment framework for achieving four of the six global nutrition targets (for stunting, wasting, anemia, and exclusive breastfeeding). To scale up the package of key nutrition-specific interventions to reach the global nutrition targets, an investment of about $70 billion is needed over the next 10 years, in addition to what low and middle income countries currently spend on nutrition. Combined with improvements in underlying determinants of malnutrition, over the next decade, investing in these nutrition-specific interventions would reduce the number of stunted children in low and middle income countries in 2025 by 40%, compared to the 2015 baseline. In addition, the scale up of this package of interventions would allow to prevent over 3.7 million child deaths and 265 million of cases of anemia in women of reproductive age. It would also allow to treat 91 million additional cases of severe acute malnutrition in children and result in 105 million additional babies being exclusively breastfed. Finally, the investment framework also showed very high returns on every dollar invested in nutrition: from $4 in returns for treating acute malnutrition (wasting) to $11 for preventing stunting, $12 for the treatment and prevention of anemia, and $35 for increasing the prevalence of exclusive breastfeeding. Not only do investments in nutrition produce substantial economic benefits, but they also lay the groundwork for the success of investments in other sectors.

Keywords: Nutrition, Stunting, Benefit-cost, Economic benefits, Cost-effective

Track 1: Advances in Nutrition Research

PS_144/26
THE BIOLOGY OF THE FIRST 1,000 DAYS OF LIFE

EPIGENETICS, NUTRITION AND INFANT HEALTH

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The field of epigenetics is currently garnering a great deal of interest, exploring how our very molecular make-up in the form of modifications to the genome can be altered by factors as diverse as ageing, disease, nutrition, stress, alcohol and exposure to pollutants. Epigenetic changes have previously been implicated in the aetiology of a variety of diseases, notably in the development of certain cancers and inherited growth disorder syndromes, but the exploration of its role in fetal programming is still in its infancy. This review focuses on how nutritional exposures during pregnancy may affect the infant epigenome, and the impact that such modifications may have on the long-term health of the child. We start by describing some keys concepts in epigenetics and discuss windows of epigenetic plasticity in the context of the Developmental Origins of Health and Disease (DOHaD) hypothesis. We then review some of the key mechanisms by which nutrition can affect the epigenome, with a particular focus on the role of one-carbon metabolism. We finish by outlining some of the child health outcomes that have been linked to epigenetic dysregulation and discuss possible next steps that need to be realised if insights into the basic science of epigenetics are to be translated into tangible public health benefits.

Keywords: Epigenetics; maternal nutrition; methyl donors; developmental programming; DNA methylation

Conflict of Interest disclosure: The authors declare no conflicts of interest.

BEFORE AND BEYOND THE 1,000 DAYS: A ROLE FOR PRECONCEPTION NUTRITION

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A woman's health, nutritional status, and lifestyle prior to pregnancy, referred to as preconception health, influence pregnancy outcomes for both mother and baby. Preconception interventions should begin early and continue through the reproductive years because many maternal risk factors are rooted in childhood and adolescence.

The supply and availability of nutrients to the developing fetus are based on maternal nutritional status, physiological requirements and her ability to build and maintain nutrient stores. The mother's nutritional status can also influence gene expression (namely, related to reproductive organs, eggs, and sperm) by disrupting highly regulated processes through which specific genes are turned on and off at certain time intervals during fetal development. Energy and both macro and micronutrients, particularly folic acid, iron, iodine, zinc, vitamin A, and vitamin B12; play essential roles in organ growth and development, and are critical to the development of the fetal brain and nervous system.

Nutrition interventions during the preconception period focus largely on micronutrients and include supplementation, dietary modification, fortification of staple foods and condiments, point-of-use fortification, and biofortification. Complementary public health actions include interventions and strategies to reduce the incidence of infectious diseases, reduce alcohol consumption and smoking, delay the age of the first pregnancy, support optimal inter-pregnancy intervals, improve the nutrition and health of male sexual partners, and decrease male partners' unhealthful habits. This presentation focuses predominantly on the role of preconception weight and micronutrient nutrition on pregnancy outcomes, reviewing relevant biological factors, and recommended interventions to address dietary gaps.

Keywords: Preconception; Nutrition; Birth weight; Epigenetics

NUTRITIONAL REGULATION OF THE GROWTH PLATE

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Abstract Elongation of the long bones is what primarily makes children grow taller, and it is driven by a process called endochondral ossification that takes place at a cartilaginous structure found near the ends of long bones called the growth plate. A thorough understanding of the normal physiology of the growth plate, and how various endocrine, paracrine, and intracellular mechanisms collectively regulate growth plate function is important for deciphering the causes of childhood growth failure and designing new therapeutics.

Malnutrition remains as one of the leading causes of childhood growth attenuation globally. Nutritional status serves as a physiological permissive signal to partially shut off childhood growth under suboptimal conditions. Interestingly, when nutritional status improves, body growth often occurs at a rate greater than normal for the chronological age of the malnourished child, a phenomenon also known as catch-up growth. Catch-up growth helps bring the child closer to his/her original growth trajectory. However, in many cases, catch-up growth is incomplete, leading to a permanent growth deficit. Our recent studies on growth plate senescence, or how growth plate function declines with age, have improved our understanding of the mechanism of catch-up growth, and might provide new insights into developing better nutritional and therapeutic regimens for more complete catch-up growth in children with malnutrition and growth disorders.

Keywords: Growth plate, cartilage, catch-up growth, malnutrition, hormone

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PS_144/93

ADDRESSING CHILD MALNUTRITION: NEWER MEASURES TO ADVANCE PREVENTION AND TREATMENT OUTCOMES

PROTEIN QUALITY, AMINO ACIDS AND GROWTH: HISTORICAL CONTEXT, NEW TECHNIQUES AND MEASURES

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The recent re-evaluation of human indispensable amino acid (IAA) requirements by the WHO/FAO/UNU in 2007, showed that the daily requirement of important and potentially limiting IAA such as lysine was higher than earlier thought. This has had an impact on protein quality in terms of the amino acid score, where cereal proteins, which are the mainstay of the daily protein intake in many low and middle income countries (LMIC), now would have a lower quality, due to their lower lysine content. In turn, protein quality impacts human health, as it is important for linear growth and the prevention of stunting in children, and possibly also to mental development. Protein quality is an important factor in healthy diets. With the use of nationally representative household protein consumption data in India, the percentage of the population at risk of quality protein deficiency was found to vary between 4% and 26% among different age groups and between the urban or rural sector. Mitigating these risks requires a greater intake of high quality proteins, such as pulses and milk, and that food subsidy policies move beyond cereals and become more quality conscious.

The measurement of protein quality is based on an assessment of the indispensable amino acid content in relation to the pattern of their requirement, along with a term for the intestinal digestibility of protein into its constituent amino acids, and their subsequent absorption. This was measured by the oro-fecal balance of the fed protein. However, the digestion and absorption of protein occurs in the small intestine, while colonic (large intestinal) bacteria confound the oro-fecal balance. Therefore, protein digestibility should ideally be measured by measuring the oro-ileal balance of the fed protein. In addition, oro-ileal digestibility varies by IAA and should therefore be defined for each IAA. It has been proposed that protein quality should be measured for each IAA from each digestible IAA content (using specific IAA oro-ileal digestibility) in relation to the requirement pattern, in what is called the Digestible Indispensable Amino Acid Score, or DIAAS.

The measurement of the oro-ileal balance of IAA is difficult in human subjects, and usually impossible without intubation or intestinal fistulation. However, it can be performed in a relatively non-invasive manner, by a dual tracer technique, in which an intrinsically isotope-labelled test protein is simultaneously fed with a different isotope-labelled 'reference' protein, whose digestibility is known. This relatively non-invasive method offers a way to measure digestibility in vulnerable groups, and will be more relevant in settings where environmental enteric dysfunction (EED) already affects nutrient absorption. Current research into measuring plant protein digestibility in children in relation to EED and growth, is ongoing.

Keywords: Protein quality, digestibility, growth, IAA

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PS_144/1004
GUT MICROBIOTA TARGETS IN NUTRITION

FUNCTIONS AND DYSFUNCTION OF THE GUT MICROBIOTA

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The human intestinal tract harbours a complex microbial ecosystem which plays a key role in nutrition and health. Interactions

between food constituents, microbes and the host organism derive from a long co-evolution that resulted in a mutualistic association.

Recognized functions of the dominant gut microbiota relate to a contribution to nutrition via provision of key vitamins such as B12 and K and short chain fatty acids as well as a major implication in the breakdown of fibers and the bioconversion of plant-born phenolics. It also contributes to trophic functions of the gut, modulation tissue renewal and mucus production in quantity and composition. Finally, it regulates the vigilance of the immune system.

Current investigations into the human faecal metagenome are delivering an extensive gene repertoire representative of functional potentials of the human intestinal microbiota. The most redundant genomic traits of the human intestinal microbiota are identified and thereby its functional contribution. These observations show a unique segregation of the human population into individuals with low versus high gene-counts or microbiota richness. It significantly expands our ability to look for dysfunctions and specificities of the microbiota associated with human diseases and to ultimately validate microbial signatures of prognostic and diagnostic value in immune mediated diseases.

As an example, the microbiota is a key player in the development of obesity. the overall phenotypic characteristics are worse in individuals with low gene counts (LGC) microbiota, which represent 25% of overweight to moderately obese subjects and up to 75% of extreme obese (candidates for bypass surgery). LGC patients present a low grade inflammatory context also associated with insulin-resistance, and the worst response to a dietary intervention in terms of weight loss or improvement of biological and inflammatory characteristics. Conversely, a calorie restricted diet, with low fat, high protein and especially high-diverse fiber content, was able to correct the low gene count microbiota, raising by more than 25% the gene count during a 6 weeks intervention. Gastric bypass surgery rapidly corrects average gene richness and restores higher proportions of symbionts that appear deprived in extreme obesity. The effects seem durable over a 12 months follow up.

The human intestinal microbiota should hence be regarded as a true organ, amenable to rationally designed modulation for human health. Dysbiosis and dysfunctions appear in essence as alterations of man-microbes symbiosis which trigger interest in the application of functional metagenomics to better understand the crosstalk between intestinal symbionts and food constituents on the one hand, and human cells and tissues on the other hand.

Keywords: Microbiota; functions; metagenome; obesity; dysbiosis

Conflict of Interest disclosure: Worked on the topic with Danone, Cargill, Novo Nordisk, Enterome BioScience, MaaT Pharma

DYSBIOSIS IN FUNCTIONAL BOWEL DISORDERS

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Functional bowel disorders (FBD) resemble a group of diseases of the gastrointestinal tract (esophagus to anus - swallowing problems to defecation disorders) that are without a clear pathogenesis, that are quite frequent, and bothersome for the individual; best know is probably the "irritable bowel syndrome" (IBS). Because many FBD symptoms are associated with eating and elimination, is has very early been assumed that food eaten on the one hand, and bacteria involved in its processing may play a key role in FBD origin and/or its clinical picture. But only recently we have been able to explore the role of the gut microbiota in FGD, due to progress in microbiological analytic techniques.

The term "dysbiosis" implies that the microbiota - the community of microorganisms living in an environment, e.g. in the human gastrointestinal tract - is unbalanced, that the composition of the different bacterial genera living there regularly (called: commensal bacteria, to distinguish them from pathogen bacteria) is disturbed, that some or many bacteria are missing and others may become more prevalent or dominant. While we have learned of many new bacterial species and their role in health and disease, unfortunately the proper "balance" of the several hundred different bacterial species (and the total of trillions of bacteria) is unknown, as is the role of single bacterial species and their metabolic functions for a healthy gut.

There are different ways to explore the role of the gut microbiota and its balance or unbalance (dysbiosis) is FGD. For one, we can compare the microbial composition in a group of patients with FGD, e.g. with IBS to a group of healthy volunteers, but in such a study extreme care has to be taken that the "controls" are not only of similar age and gender, but also of the same cultural background and nutritional habit, since these factors affect the microbial composition and diversity. Studies have shown that the microbiota in FGD is different from that of healthy controls, but the recorded differences are not necessarily specific for FGD, they may also occur in other diseases.

Another approach to explore the role of the gut microbiota in FGD is to challenge the existing "flora" with novel bacteria (probiotics) or with nutritional substrates that stimulate bacterial growth (called prebiotics), especially in randomized clinical trials (RCT) where only a fraction of patients receive the true challenger, while the other receive a placebo. This has been done excessively in FGD, especially in IBS, with more than 60 trials including several thousand patients. These studies have produced mixed outcome: some probiotics appear to be better than others, and some appear to work only for a part of the IBS symptoms and not for all. An extreme of this approach is the transfer of an entire microbiota from one healthy person to another, called fecal microbiota transplantation (FMt). This has rarely been tested in FGD, but is not without risk in benign disorders.

More experimentally designed approaches will be presented, but are currently not yet approved for clinical purposes.

Keywords: Dysbiosis; functional bowel disorders; IBS

THE GUT MICROBIOTA IN OBESITY, METABOLIC SYNDROME AND T2D

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We are not alone. Recent findings have demonstrated that the gut microbiome complements our human genome with at least 100-fold more genes. In contrast to our Homo sapiens-derived genes, the microbiome is much more plastic, and its composition changes with age and diet, among other factors. An altered gut microbiota has been associated with several diseases, including obesity and diabetes, but the mechanisms involved remain elusive. In order to understand the impact of gut microbes on human health and well-being we have described the Illumina-based metagenomic sequencing assembly and characterisation of 3.3 million non-redundant microbial genes from faecal samples of 124 European individuals. Nearly 10 million genes are now described in a recent updated gene catalogue. The extensive gene catalogue has enabled us to perform studies of association of the microbial genes with human metabolic phenotypes.

Several studies have suggested that altered gut microbiota composition and function are associated with overt type 2 diabetes, obesity and atherosclerosis. However, in a recent study we questioned previously reported associations between gut microbiota and type 2 diabetes by demonstrating that metformin, the first-line of choice for treatment of hyperglycaemia in type 2 diabetes, confounds this relationship. Accordingly, although gut microbial signatures can be used with high accuracy to distinguish metformin-treated patients with type 2 diabetes from healthy controls, this is not the case when attempted in metformin-naïve patients indicating that drug treatment is an important factor to take into account when evaluating associations of microbiome composition to disease. New data in treatment naïve individuals indicate that gut microbial signatures are altered in individuals with impaired glucose regulation and that low bacterial diversity is associated with elevated levels of biomarkers of poor metabolic health, including markers of glucose regulation, insulin resistance, inflammation, obesity, and dyslipidaemia.

Keywords: Gut microbiota; obesity; metabolic syndrome, T2D

MODULATION OF THE GUT MICROBIOTA, CURRENT APPROACHES AND PATHOPHYSIOLOGICAL SIGNIFICANCE

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The gastrointestinal tract represents an enormous interface with the environment. It has its own unique immune system that accounts for over one third of the body's immunological cells. The number of autochthonous bacteria (1014) living on mucosal surfaces exceeds the number of cells forming the human body. Indeed, the size of the genome of the intestinal microbiota exceeds the human genome by 2-3 orders of magnitude. It is evident from studies on germ-free animals that the human genome is insufficient to maintain efficient bodily function. For example, germ-free mice have a rudimentary mucosal immune system because of the absence of stimulation by enteric bacteria. Germ-free mice also consume 30% more calories than conventionalized mice, as they are inefficient in harnessing all energy sources in the diet. It is also evident that the behavior of germ-free mice differs from that of conventionalized mice, and becomes normalized following bacterial colonization. Thus, there is an axis of communication between dietary constituents, commensal bacteria, mucosal immune activity, gut physiology and brain function. In this context, it is easy to envisage how altered interactions between diet and bacteria could produce dysregulated inflammation and disease. There is general consensus that genetic susceptibility is insufficient to cause chronic inflammatory disorders such as IBD, and that environmental factors, such as alterations in composition or metabolic function of the colonic microbiota, play a role in driving and maintaining inflammation. Even in celiac disease, a condition with a clear dietary trigger, gluten, and a known HLA association, alterations of the small intestinal microbiome have been recently implicated as modulators of disease risk. A microbiota associated with disease has been referred to as "dysbiotic". However, a specific disease-microbiota signature has been difficult to define and, how specific dysbiosis contributes to inflammation is unknown. Despite this, therapies targeted at modulating the microbiota with the objective to prevent or treat gastrointestinal inflammation have emerged. These include probiotic supplementation, fecal matter transplantation or modification of specific dietary-microbiota interactions. The potential and limitations, as well as gaps in knowledge, regarding these approaches will be discussed.

Keywords: Intestinal microbiome, inflammation, probiotics, FMT, dysbiosis

NEW TECHNOLOGIES TO DETECT AND STUDY ADVERSE LIFESTYLES IN CARDIOMETABOLIC DISEASES

APPLICATION OF GEOSPATIAL TECHNOLOGIES FOR ANALYSIS OF CARDIOMETABOLIC DISEASES RELATED TO FOOD AND NUTRITION

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In last decades, the rapid changes in levels and composition of dietary and activity/inactivity patterns in transitional societies are related to a number of socioeconomic and demographic changes. To solve this situation it is necessary to study this epidemiological behavior from different approaches. In this context, geospatial technologies -understood as a set of tools used to obtain, process, store, analyze and represent data centered in a geographical, temporal and spatial context- have provided a new analytical approach.

The aim of this conference is to present the results obtained in an exploratory study through different geospatial tools to analyze the distribution of overweight and obesity in Córdoba city, Argentina.

Epidemiological data (prevalence of obesity and overweight in 2013) were obtain from 79 Primary Health Care centers in the city. A surrounding area with radius of 1000 m around each point was considered as its zone of influence, and used to explore the environmental conditions around it.

For this study we used a multispectral SPOT 5 image. This commercial high-resolution optical imaging Earth observation satellite provides a 10 meters resolution image with four spectral band on: green ($0.50 – 0.59$ μm), red ($0.61 – 0.68$ μm), nearest infrared ($0.78 – 0.89$ μm) and middle infrared ($1.58 – 1.75$ μm). All images used were supplied by National Commission on Space Activities (CONAE), and the SPOT image was acquired in January 2013.

As a first step, we focus our attention on exploring the possibility to describe social strata used to describe the social dimension and economic access to food.

To evaluate the environmental parameters in this area, a land cover map is required, and it was decided to exploit the SPOT 5 image using spectral and spatial features for classification. Specifically, textural features based on the Grey-Level Co-Occurrence Matric (GLC).

By using land cover maps as well as statistical and spatial information, the existence of statistically significant relationships between the prevalence of obesity and overweight according to the data from the health centers, and the geophysical variables obtained from the satellite image was explored. Specifically, in addition to the environmental variables such as the above mentioned NDVI, the Normalized Soil Index (NSI), and the distance from water bodies and crops were included. For this analysis, different tools were used -like machine learning technique called Maximum Entropy Modeling (MaxEnt)- and the free software SatScan that analyzes spatial, temporal and space-time data using the spatial, temporal, or space-time scan statistics.

Keywords: Geospatial technologies, spatial analysis, nutritional epidemiology

Further collaborators:
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PROSPECTIVE ANALYSIS: ELIMINATING ARTIFICIAL TRANS FATTY ACIDS IN ARGENTINA AND ESTIMATED EFFECTS ON THE BURDEN OF CORONARY HEART DISEASE

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Consumption of TFAs alters the plasma lipid profile in such a way that it increases the risk of coronary heart disease (CHD). A 2% increase in energy intake from TFAs may increase the risk for a coronary event by up to 23%. Other potential adverse effects of TFAs include systemic inflammation, endothelial dysfunction, insulin resistance and arrhythmias. Based on these adverse effects, several countries have implemented policies to reduce industrial TFA consumption.

In Argentina, before 2004, artificial TFAs were present in most sweet or salty solid snack foods, such as biscuits. Be¬tween 2004 and 2014, Argentina implemented several policies to reduce artificial TFAs. After 2004, the industry voluntarily reformulated foods by replacing approximately 40% of TFAs from partially hydrogenated vegetable oils. Regulations enforcing mandatory labelling of artificial TFAs in food were introduced in 2006 and the country's food code was amended, such that, by the end of 2014, industrially-produced TFAs in food should not exceed 2% of total fats in vegetable oils and margarines and 5% of total fats in other foods.

To estimate potential reductions in annual CHD events, disability-adjusted life years (DALYs) and associated health-care costs attributable to reductions in artificial TFAs we used a model.

We built a policy model including baseline intake of TFA, the oils and fats used to replace artificial TFAs, the clinical effect of reducing artificial TFAs and the costs and DALYs saved due to averted CHD events.

To calculate the percentage of reduction of CHD, we calculated CHD risks on a population-based sample before and after implementation. The effect of the policies was modeled in three ways, based on projected changes: (a) in plasma lipid profiles; (b) in lipid and inflammatory biomarkers; and (c) the results of prospective cohort studies. We also estimated the present economic value of DALYs and associated health-care costs of coronary heart disease averted.

We estimated that projected changes in lipid profile would avert 301 deaths, 1066 acute CHD events, 5237 DALYs and 17 million United States dollars (US$) in health-care costs annually. Based on

the adverse effects of TFA intake reported in prospective cohort studies, more deaths and CHD events would be averted annually.

In conclusion, even under the most conservative scenario, reduction of TFA intake must have had a substantial effect on public health.

Keywords: Trans fat, model, health outcomes, costs, Argentina

COMPUTER TOOLS FOR FOOD INTAKE DETERMINATION IN NUTRITIONAL EPIDEMIOLOGY OF CARDIOMETABOLIC DISEASES

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The relationship between diet and disease has been studied for more than a century and diet has been shown to play an important role in the development of chronic diseases of high prevalence, such as cardiometabolic diseases. In this sense, nutritional softwares have been emerged for different research needs in food intake studies.

According each technological development, the software selection includes several aspects such as alimentary questionnaire format, accessibility, adaptability, intuitive system, support contact, information about food databases and result reports. In response of Argentina food research needs, a software called Interfood v.1.3 was development. The program is based on three fundamental components: first, a food frequency questionnaire (FFQ) to obtain the food intake profile about 242 foods more frequent in the country; second, a food composition table database (FCD) based on food composition tables of Latinfoods-Argenfoods, the Food and Agriculture Organization and the USDA Food Composition Databases. The reporting includes 131 compounds (macro/micronutrients and phytochemicals) per 100 g of food. The third component is a relational database, which through the interaction between FFQ and FCD calculates the amount of each of the foods, nutrients and phytochemicals consumed by day, week and month. The information is obtained on a Microsoft Excel format basis applicable to its subsequent analysis in other programs.

One strength of Interfood is its focus in fatty acids and bioactive compounds, nutrients related in prevention and pathogenesis of cardiometabolic diseases. Also, like other softwares developed by researchers of the region, prioritizes the use of local food databases. Nutritional softwares allow easy management of food and nutritional information and can be used in epidemiological studies in different geographic areas, socioeconomic levels and age groups. In conclusion, technological advances in computer sciences can be incorporate into the methodological tools in nutritional epidemiology of cardiometabolic diseases and other pathologies related to diet.

Keywords: Nutritional softwares, dietary assessment, nutritional epidemiology

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SOUTH AMERICAN YOUTH/CHILD CARDIOVASCULAR AND ENVIRONMENT STUDY (ACRONYM: SAYCARE STUDY)

DESIGN AND OBJECTIVES OF THE SOUTH AMERICAN YOUTH/CHILD CARDIOVASCULAR AND ENVIRONMENTAL (SAYCARE) STUDY

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The South American Youth/Child cARdiovascular and Environmental Study (acronym: SAYCARE Study) is an observational multicenter feasibility study was carried out in seven South American cities: Buenos Aires (Argentina), Lima (Peru), Medellin (Colombia), Montevideo (Uruguay), Santiago (Chile), Sao Paulo and Teresina (Brazil). The study children and adolescents (3 to 18 years). In this feasibility phase we performed quality controls, develop valid and reliable measurement methods to obtain information from: social and environmental factors, family environment, food intake, preference and food choices, physical activity and sedentary behaviors body composition, oral health, lipids and cardiovascular health biomarkers. After the developing we measured the reliability and a validity coefficient of these methods by several analyzes: kappa coefficients for categorical variables and intraclass correlation coefficients for quantitative variables, which were complemented by the development of Bland-Altman. The correlations were calculated by Spearman and Pearson correlation coefficients for nonparametric and parametric variables respectively. Our total sample is composed with 237 children (preschool and school children) and 258 adolescents, provided data during 1stphase

measurements. The results of the SAYCARE study are expected to provide higher accuracy of the assessment of cardiovascular disease risk factors (eating behaviors, body composition, physical activity, sedentary behaviors, lipid profile and cardiovascular health biomarkers, oral health, social conditions, environmental factors and home environment) and of their determinants in children and adolescents aged 3-18, from seven South American cities.

Keywords: Reliability, validity, children, cardiovascular diseases, risk factors.

ASSESSING DIETARY INTAKE IN CHILDREN AND ADOLESCENTS: DEVELOPMENT OF A FOOD FREQUENCY QUESTIONNAIRE

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Global epidemic levels have been reach by non-communicable diseases (including obesity) in children and adolescents. South American children under 5 years have an estimated prevalence of overweight of about 7%; in school age children, overweight and obesity prevalence ranged from 15% to 36.9%, and among adolescents from 16.6% to 38%.

Food Frequency Questionnaires (FFQs) are often used in epidemiological studies to evaluate long-term food consumption. They should be created and validated in the specific population in which they will be used.

The aim of this study is to describe the process of development of a FFQ, to assess dietary intake to be used in children and ado-

lescents from six countries of South America and to assess their feasibility in the target population.

Methods: A semi-quantitative FFQ was designed to be self-administered and to assess the dietary intake over the past three months among children and adolescents aged 3 to 17 years from seven cities of six South American countries: Buenos Aires (Argentina); Lima (Peru); Medelin (Colombia); Montevideo (Uruguay); Santiago (Chile) and Sao Paulo and Teresina (Brazil). In order to compile the food list, multiple approaches were considered. Eleven food groups were included (cereals, tubers, vegetables, fruits, oils, meat and derivate, fish and eggs, milk and dairy products, legumes, beverages, sugar products and miscellanea). To determine the frequency categories of the questionnaire, Willet´s proposal of a nine response category, was adopted. A food photo booklet was produced.

Results: In order to develop the FFQ, national food consumption surveys and several local studies were considered. Experts from all the cities involved in the SAYCARE study completed the food lists for every country. A preliminary common core food list was developed that included food items that represent at least 30% of the children/adolescent's total food intake and appear in at least two of the six countries involved. Countries´ food items were included to the common core. At the end, Medelin had 55 food items, 58 for Santiago, 60 for Montevideo, 63 for Lima and Buenos Aires, 67 for Sao Paulo and 68 for Teresina. It was developed in Spanish and translated to Portuguese.

345 children and 357 adolescents were considered for analysis. Food consumption (in grams per day) for male children consumption of crackers, sweet cookies, filled sweet cookies, pork, milk, yoghurt and fruit juices was lower in the older one than in the younger one. Female children consumption of sweet cookies and yoghurt was lower and packed juice was higher in the older one, compared with the younger children. In male adolescents soft drinks consumption was lower in the younger one, compared with the older one. In female adolescents cookies, filled cookies, fried potatoes, pork and canned fish consumption was lower in the older one, compared with the younger one.

Conclusion: A culturally appropriate, semi quantitative FFQ, was developed in order to assess dietary intake in children and adolescents of the SAYCARE Study.

Keywords: Food intake, children and adolescents, food frequency questionnaire, development

VALIDITY OF A FOOD FREQUENCY QUESTIONNAIRE DESIGNED FOR SOUTH AMERICAN CHILDREN AND ADOLESCENTS BY THE HEALTHY DIET SCORE

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Background: The Healthy Diet Score was developed by the American Heart Association as one component of cardiovascular health to assess adherence to dietary guideline recommendations. Objective: To validate the SAYCARE food frequency questionnaire (FFQ) to assess the Healthy Diet Score. Methods: A sample of 409 (50.93% female) children and 270 (53.58% female) adolescents (aged 3-18 years) from the SAYCARE study were included in this validation analyses. The children's parents/guardians or the adolescent themselves answered the FFQ and three 24-hour-dietary-recalls. Children and adolescents were given one point when they ate ≥ 400mg of fruits & vegetables, and drunk < 70 kcal of sugar-sweetened beverages per day. If they did not meet these recommendations no point was scored. Therefore, these eating components were summed up and classified according to the Healthy Diet Score, adapted into poor (zero points), intermediate (one point), and ideal (two points). To estimate the validity of the FFQ the weighted cohen's kappa, and the sensitivity and specificity analyses were applied, using the 24-hour-dietary-recall as a reference method. Results: The proportions of the Healthy Diet Score were 41.56% poor, 50.86% intermediate, and 7.58% ideal for children; and were 42.96% poor, 50.37% intermediate, and 6.67% ideal for adolescents. The FFQ validity coefficients were: k=0.110 (73.59% of agreement) and k=0.165 (76.48% of agreement), and sensitivity of 70.53%; 69.23% and specificity of 19.58%; 41.43% for children and adolescents, respectively. Conclusions: The SAYCARE food frequency questionnaire presents fair agreement and validity for two components of the Healthy Diet Score (fruits & vegetables and sugar-sweetened-beverages).

ASSESSING THE DETERMINANTS OF DIET IN THE SAYCARE STUDY: REPEATABILITY AND RELIABILITY OF A BODY IMAGE SCALE

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Background and objective: In children and adolescents, overweight and obesity are associated with body image dissatisfaction. Low body image may trigger unhealthy behaviors, such as, following a very low energy diet, and doing extreme exercise routines. Given the high prevalence of overweight and obesity in South American youth, this study aimed to evaluate validity and reliability of a body image scale in children and adolescents from the SAYCARE Study.

Materials and methods: 228 children (3 to 10 years old) and 142 adolescents (11 to 17 years old) answered the SAYCARE- questionnaire twice, two weeks interval. Children and adolescents body weight and height were measured following standard procedures. Children parents/guardians answered the questions: "Do you think that your son is: Lean, little bit lean, healthy weight, little bit overweight, overweight?". "Choose the figure (13-body image scale developed by Gardner) that best represents your child's physical appearance". Adolescents answered these questions themselves. Repeatability was evaluated between the first and the second response of every child or adolescent. Validity was assessed comparing the answers against the body mass index classification developed by the World Health Organization. Kendall's tau-c coefficient and weighted Kappa statistics were calculated and interpreted according to Landis and Koch.

Results: In children, the repeatability to the question "Do you think that your son is? was acceptable (K=0.337) but showed poor validity (k=0.176). For the Gardner scale the repeatability was deficient (K=0.124) with poor validity (K=-0.018). In adolescents, the repeatability to the question "Do you think that your son is? was notable (K=0.709) with acceptable validity (K=0.268). For the Gardner scale the repeatability was notable (K=0.599) but the validity was poor (K=0.023).

Conclusions: The questionnaire answered by parents or guardians showed acceptable repeatability but failed to assess child's body weight adequacy. The adolescents questionnaire showed good repeatability and validity to assess physical appearance by using direct questions, but not through the Gardner body image scale.

Keywords: Body image rating scale, body mass index, body image perception, South American

PA ASSESSMENT IN CHILDREN AND ADOLESCENTS FROM SOUTH AMERICA: METHODOLOGICAL ASPECTS

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Physical activity (PA) is one of the most important determinants of obesity and cardiovascular risk factors in children and adolescents. In the majority of the countries, and especially in urban areas, children and adolescents have low levels of PA and the proportion of children complying with PA recommendations (60 minutes per day of moderate-vigorous PA) is also very low, especially in girls. There are several methods to assess PA in children and adolescents. The most widely used are the questionnaires. The reference method for free-living PA assessment is the doubly labelled water method. There are also some objective methods providing a good compromise between accuracy and feasibility; they are movement sensors (accelerometers) and heart rate monitoring. In the SAYCARE feasibility study, two methods were used: questionnaires and accelerometers. Questionnaires are self-reported and they measure the routine activities of the last week in three different PA domains (PA at school, PA at leisure time and active

commuting). The perceived intensity is measured in three levels: light, moderate and vigorous. Accelerometers provide objective measures of total PA and the time spent in the different intensities. For both methods, the optimal accuracy and reliability should be achieved. The main goals of this study is to provide methodological aspects related with the use of a questionnaire adapted to be used in children and adolescents in seven centres in six countries and to compare the results with those obtained with accelerometers in four centres in three countries in South America.

For reliability assessment 161 children (49.8 % females) and 177 adolescents (58.3 % females) were studied. Questionnaires were completed by the parents or caregivers in the case of the children's sample and by the adolescents themselves. They filled in the questionnaire twice, two weeks apart. In children, the questionnaire showed good reliability for moderate-vigorous PA ($rho = 0.56$), and very good for vigorous PA ($rho = 0.89$); however, reliability for moderate PA was moderate ($rho = 0.37$). In adolescents, the questionnaire showed good reliability for moderate-vigorous PA ($rho = 0.60$), and very good for vigorous PA ($rho = 0.93$); however, reliability for moderate PA was also moderate ($rho = 0.36$). Results obtained with the questionnaire were compared with those measured with accelerometers in 82 children (54.4 % females) and 60 adolescents (55.7 % females). In children, correlation between moderate-vigorous PA assessed both with the questionnaires and the accelerometers was moderate ($rho = 0.44$) and it was good for moderate PA ($rho = 0.61$). In adolescents, correlation between moderate-vigorous PA assessed both with the questionnaires and the accelerometers was very good ($rho = 0.88$) and the same apply for vigorous PA ($rho = 0.65$).

In conclusion, measurement of PA using both questionnaires and accelerometers is feasible in children and adolescents in urban areas of six countries in South America, with a good reliability, especially when considering vigorous PA.

Keywords: Physical activity, child, adolescents, cardiovascular risk factors

BLOOD SAMPLE COLLECTION AND PRE-ANALYT-ICAL SAMPLE PROCESSING

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Overweight and obesity are independent risk factors for cardiovascular diseases, associated with other risk factors such us hyperlipidemia, hyperinsulinemia and insulin resistance. In clinical epidemiological multicenter studies, the managing of the correct selection of biomarkers that will ensure the identification of these risk factors is required and it is considered the "pre pre analytical stage". Moreover, the concentration of these biomarkers in blood samples depends on several factors, including those inherent to the individual, such as age and gender, ethnic and cultural diversity, sociological, psychological, environmental factors and others referred to pre analytical conditions. Besides, the quality assurance and harmonization of all procedures in the pre analytical stage, the drafting of the informed consent and the standardization of patient preparation is very important in order to reduce error comparison between different laboratories. The SAYCARE Study was held in children and adolescents (3 to 17 years) from seven South American cities: Sao Paulo and Teresina (Brazil), Buenos Aires (Argentina), Santiago (Chile), Montevideo (Uruguay), Lima (Peru) and Medellin (Colombia). The aim of SAYCARE was to develop methods to collect reliable, comparable and validated data about cardiovascular health biomarkers, lifestyles and environmental, social and familial factors. Regarding blood samples collection, investigators from each participating center were involved in the planning and development of the protocol, which included the study design, the impact of pre analytical conditions on different blood biomarkers and the stability of these biomarkers according to time and frozen storage of the samples and transport at reference laboratory in Sao Paulo for it biochemical evaluation. Different blood biomarkers were evaluated in 474 fresh samples of serum, in different country centers: glucose, total-cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, iron, and hs-CRP. We also evaluated the stability of different biomarkers according to time and frozen storage within this pilot study across the concordance of the results obtained from the 49 blood samples measured in two different centers. An excellent concordance and correlation between different centers were observed, in most of the evaluated parameters. This concordance is a consequence of the strict compliment of the pre analytical conditions previously established in the SAYCARE study.

Keywords: SAYCARE, blood sample collection, pre-analytical blood sample procesing, blood biomarkers,

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REDUCTION OF SALT CONSUMPTION IN DIETS FOR COMBATING NCDS FOR BETTER HEALTH AND WELLNESS

POLICY AND TECHNICAL ISSUES OF SODIUM REDUCTION – CHALLENGES AND GLOBAL PERSPECTIVES

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The intake of Salt has been a matter of many discussions both from the Nutritionists point of view and the Clinicians point of view and from the point of combating NCDs on diet based approach. The consumption pattern of salt and its relation to the over all health status of the individual is a well established fact with most consumers. In this connection over the last eight years plus IUNS has been able to address this globally in several regions with workshops on Salt Reduction. A few publications have also emerged as a result of this and has captured the attention of Regulators and Academia. This is basically restricted to added salt to the food while cooking and also on the table largely keeping the figure of 5 gms. per day recommended by WHO. However this does not take into consideration the invisible salt in food as well as the climatic conditions and the Regional lifestyles. This is only a generic recommendation rather than customizing for a region based on life style. Regulators in many countries have recently come in with measures such as high tax, banning high consumption of salt by either pegging the level of salt in the processed foods or discouraging their purchase thus bringing about large awareness amongst the public for low consumption of salt in the interest of health and wellness.

Having said this the final solution may not be in the immediate horizon but will take a long way and thus one must bring in awareness of the problems of high salt consumptions at a very young age in schools to ensure at least the next generation if it can peg salt consumption to not more than 2 to 3 gms. a day it would be wonderful. Perhaps at that time we can take the agenda back to WHO to refix the recommended daily salt intake minimum to a lower level. The focus also is to manage the electrolyte balance in order that the entire concept of consumption of salt is holistically seen for the body. Regulations alone may not change the mind set but working together of Regulators, Industries, manufacturers of Processed Foods, Consumers and NGO's and media has a very large

role to play by networking and working in synergy in the Global Salt Reduction Programme from the bottom of the Pyramid approach and Top down approach in this agenda.

Keywords: Low Salt,WHO,Awareness,Processed Foods,NCDs

REDUCING SALT INTAKE IN WEST AFRICAN COUNTRIES: CONTROVERSIES AND CHALLENGES

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In recent times West African countries just like other countries across the globe are experiencing an alarming increase in non-communicable diseases including hypertension. Apart from overweight/obesity, high dietary salt intake has been recognized to be one of the major contributory factors to the high prevalence of NCDs in the sub-region. This evidence was the consensus at the salt reduction forum held by the West African Health Organization (WAHO) on Salt Reduction in West Africa, July 17 2013 in Bobo-Dioulasso, Burkina Faso. Generally the average salt intake exceeds the WHO recommendation of <2 g/day sodium (5 g/day salt). The increasing trend of hypertension in West Africa as documented by various epidemiological studies is therefore not surprising. The population is also in a dilemma since high salt intake are influenced by traditional food systems, social, environmental, economic and industry practices as well as globalization of market systems. This presentation therefore discusses the controversies and challenges surrounding salt intake reduction in the West African Sub-region and calls for nutrition and public health interventions that consider multi-sectorial and multi-disciplinary approaches backed by government efforts.

Keywords: Salt, intake, west-Africa, hypertension, challenges

DIET COMPOSITION AND SODIUM INTAKES-A LOOK AT CHINA'S DATA

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The latest National Chroinc Diseases and Nutrition Survey data released by National Health and Family Planning Commission (NHFPC) China , Sodium intake shows that overall the population is still consuming too much salt and not enough fruit, milk. population-based blood pressure levels and prevalence of hypertension are increased rapidly in the past decades in China . Meanwhile, sodium intake, is a major risk factor for hypertension. The studies is conducted to collect information on sodium intake, the reason of analysis and the national strategy making .

The study is an once every two years survey designed to assess the food composition , food consumption of a China representative sample living in private households. Salt content in food measured, Salt and condiment intake information of aged 18 years upwards was collected by the 3-condecutive days-24-hour dietary recall and food weighting method, the sudium content the average salt intake was calculated based on energy percentage of family members. And Industry Salt Reduction strategy design by trend analysis.

The report development the food sodium content data for the nutrition survey. The development work involved food analyses and recipe calculation. And presents the results combined and supersedes the previous report published by China CDC 2012 which covered the salt intake during 2010-2012. The average salt intake for aged 18 years and above was 10.5g /day from national survey in 2010- 2012. Compared to 30 years of data, it can be found that it continues to decline. The average salt intake was 12.0g /d in 2002, and 13.9g /d in the year 1992 respectively. But the salt intake of Chinese all redidents was still in higher level than 6g/d, which is the salt intake goal from national dietary guideline.

For diet towards the 6g a day goal. A slat reduction plan including set the 10% reduction target in the year 2018 , And a target for food industry by the 2020-2030 to encourage companies to reformulate recipes, including to use FOP and guide people choose lower salt options – through promotional and other activities; Push the catering and takeaway sector by setting new maximum targets for the most popular dishes and chips.

The daily average salt intake among Chinese adult was still in high level, and salt reduction plan should be gradually by consumer education and public policy.

Keywords: Salt content, intake,targets

ADDRESSING CONSUMER CHALLENGES IN REDUCING SODIUM INTAKES

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Globally, average dietary salt intake is much higher than the recommended World Health Organization level of less than 5 grams of salt per day. As part of its Sustainable Living Plan, Unilever set itself the challenging target of helping consumers to cut their salt intake to this recommended level of 5 grams a day. The challenge here is to achieve further reductions in the salt content of our foods, while maintaining good taste, stability and texture to ensure consumers will like (or even prefer) these reformulated products. Moreover, a change in consumer behaviour is also required. Reducing salt in products is often perceived to negatively influence the taste, making it hard to encourage consumers to use these products without adding salt back at the table. In order to increase the effectiveness and health impact of efforts in this area, an approach is required that is directed at both manufactured foods as well as consumer behaviour. The presentation will address aspects that are relevant from a consumer perspective, such as communication, taste perception, acquired preferences and salt usage. These are crucial insights to consider in developing effective salt reduction strategies and/or policies.

Keywords: Consumer, sodium reduction, salt

Conflict of Interest disclosure: Both authors are employees of Unilever, a manufacturer of Food and Beverages products.

CURRENT INTAKE OF SALT AND ITS REGULATIONS IN INDONESIA

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Indonesia, a tropical developing country in the South East Asian Region, is now facing a double burden of malnutrition and increasing incidence of non-communicable diseases. Cardiovascular diseases, especially stroke and coronary heart diseases are the main cause of death in Indonesia. Epidemiological and clinical studies showed that high intake of salt, sugar and fat are part of risk factors for cardiovascular diseases. One of the strategies by WHO to reduce incidence of non-communicable diseases is to limit the intake of sugar, salt and fat. In line with the strategy, the Indonesia government through Ministry of Health formulated the new dietary guidelines for Indonesians, in which messages include to limit intake of sugar, salt and fat. The MH also issued a regulation number 30/2013 on Sugar, Salt and Fat Information for Labeled Packed Foods and Fast Food, that will be implemented from 2019. Ten years ago (2007), the mean intake of salt among Indonesian was 5.6 g/cap/d, which is now increased to 6.3 g/cap/d from both visible and invisible sodium. Based on Total Diet Survey by MH, 52.7% of Indonesian population had sodium intake exceed the limit sodium intake recommended by the MH. Regarding age groups, the highest prevalence of high sodium intake was among teenagers, and the lowest among children under-five years. In Indonesian diets, the salt intake predominantly from the non-label packed foods, especially from family foods and food away from home such as salted dried fish, salted soybean sauce, chilly sauce, meat ball soup, fried rice, porridge, fried foods, snacks and spices. The data on salt or sodium intake in Indonesia may suffered from estimation bias, since the data derived from the food consumption survey. The salt data are from visible and non visible salts, which is more likely under-estimated . The weaknesses of the salt intake data are inherent in the weakness of food data collection using one-day and seven-day food recall, there is no standard recipe on the utilization of salts of Indonesian foods, there is no data on sodium content of Indonesian foods, not all packed food provide information on sodium content. It is difficult and facing a great challenge from the stakeholders while the regulation is in placed without strong or adequate evidence about where we are now, what is the specific targets and how to achieved the targets. This implies that more detail data on sodium content of Indonesian foods and sodium education efforts need to be done before the implementation of the salt regulation.

Keywords: Indonesia, salt intake, sodium intake, related regulation

LATIN AMERICAN SURVEY OF NUTRITION AND HEALTH (ELANS): MAIN RESULTS ON INTAKE, PHYSICAL ACTIVITY AND SEDENTARISM IN EIGHT COUNTRIES

INTRODUCTION TO ELANS: NUTRITION AND HEALTH SURVEY IN URBAN POPULATION FROM EIGHT LATIN AMERICAN COUNTRIES

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The ongoing epidemiological transition is leading to increased burden of obesity-associated chronic diseases worldwide, including the Latin American region. These disease conditions are determined by inadequate lifestyle involving unhealthy food intake and physical inactivity, which have not been consistently evaluated in Latin American countries. Aim: The purpose of ELANS (Estudio Latinoamericano de Nutrición y Salud) was to obtain high quality data on food intake, physical activity and nutritional status in Latin America. Methods: A multicenter cross-sectional survey was performed between November 2014-July 2015 in nationally representative samples of major urban populations from 15 to 65 years old in eight Latin American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru, and Venezuela). Diet was assessed by two 24-h food recalls using the multiple pass method and the Nutrition Data System for Research (NDS-R) software. Physical activity was analyzed by the long version of IPAQ in the total sample and a subsample was subjected to triaxial accelerometry. Anthropometric measurements included body weight, height as well as neck, waist and hip circumferences. Statistical analyses were applied to total sample data and to each separate country. Findings: ELANS included 9,218 individuals (48% men and 52% women) with validated data. The age distribution of the sample was 13, 38, 28 and 21% for 15-19, 20-34, 35-49 and 50-65 years old, respectively. 42% of the subjects enrolled were from low socioeconomic level (SEL), 43% from medium and 15% from high SEL. 60% of participants had primary school education, whereas 29% attended middle-high school, and 9.5% had college or high-

er education. Mean body mass index (BMI) was 26 kg/m2 with higher values from women (27.5 kg/m2) than men (26.3 kg/m2). Overall, only 37% of the ELANS sample had normal body weight, while 3% exhibited underweight, 34% were overweight and 26% were obese. Conclusions: ELANS provides a unique dataset for Latin America, enabling cross-country comparisons of energy, macro- and micro-nutrient intake and physical activity as well as establishing associations between these lifestyle components and nutritional status within this region. In this symposium, the main results obtained in this study will be reported and discussed.

Keywords: Food intake - physical activity - nutritional status - cross-sectional study - Latin America

RELATIONSHIP BETWEEN DIET QUALITY AND OBESITY RISK: IS IT POSSIBLE TO DEVELOP A LA DIET QUALITY INDEX?

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The Latin American Study of Nutrition and Health/Estudio Latinoamericano de Nutrición y Salud (ELANS), which is randomized cross-sectional multicenter investigation of food intake and physical activity status of adolescents and adults in eight Latin American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru, and Venezuela) was designed and executed simultaneously, using the same protocols to gather information, and provide accurate and updated information on diet, dietary patterns, physical activity and nutritional status of the region. Dietary patterns have been widely used for the assessment of dietary intake and evaluation of diet's association with several health outcomes. To our knowledge, only few studies have assessed diet quality of Latin American population and none has applied the same index in several populations at the same time. Thus, we aim to develop and apply a single and simple index of diet quality index for Latin American adolescents and adults and to evaluate its association with excess weight.

We will model two different dietary patterns: one based on relatively high consumption of ten healthy items (fruits, vegetables, beans and legumes, nuts and seeds, whole grains, milk, total polyunsaturated fatty acids, fish, vitamin D, and dietary fiber); and another based on relatively low consumption of ten unhealthy items (unprocessed red meats, processed meats, sugar-sweetened beverages, added sugar, saturated fat, trans fat, dietary cholesterol, refine grains, sodium and high glycemic index foods). For comparison, we will also model a third overall dietary pattern that incorporated all 20 dietary factors together. A diet quality score will be derived from each pattern; higher scores will be equivalent of healthier diets. Then, diet quality score association with excess weight will be analyzed using logistic regression analysis. Also, Factor Analysis will be performed to identify factor loading of each variable in two dietary patterns, using the average weight consumed (g/d) by each individual of 20 dietary items. Dietary intake will be adjusted for 2000 Kcal, in order to access diet quality independently of the quantity consumed. Preliminary analysis has shown a high prevalence of excess weight among eight countries, and a high intake of certain foods, food groups and nutrients, such as added sugar, sweetened beverages, fats (total, saturated and trans) and sodium, and a low intake of fruits and vegetables, vitamin D and calcium. Following this analysis, it will be possible to develop a diet quality index for Latin American countries, using the same tool that will allow us to compare diet quality by age and sex and country, and will provide information to evaluate and monitor dietary intake. It will also help to better understand the association between diet quality and increased weight in each population in order to contribute to the planning of public health politics to reduce obesity prevalence in the region.

Keywords: Dietary Patters, Diet Quality, Latin American

LATIN AMERICAN POPULATION: MAINLY ACTIVE OR SEDENTARY? IS THERE AN ASSOCIATION BETWEEN LIFESTYLE AND DIET NUTRITIONAL COMPOSITION?

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The enormous increment of the excess weight in humans all over the world in the last 40 years is a new epidemiological situation, not seen in other nutritional problems.

It is very probable that excess weight and obesity is not a one only disease or caused by one only cause. The combination of genetic heritage with external conditions as a modification of food intake (amount or density) and a decrease in energy expenditure, determines a final condition that results in excess weight, an increase in fatty mass and metabolic alterations.

In the last years, modernization and the urban modifications, with sedentary behavior and excess energy intake, have modified the ways human beings are managing energy.

There are no reported papers of evaluating nutritional status and physical activity in Latin American populations, using a standardized methodology and representative surveys for adolescent and adult population, at the same time. ELANS- Estudio Latinoamericano de Nutrición Y Salud- or Latin America Study on Nutrition and Health, has evaluated more than 9000 people in 8 countries (15-65y), in urban settlements, in a randomized domiciliary census.

Anthropometric measurements, nutrition evaluation by means of two 24hs- recall survey and a food frequency questionnaire was performed with physical evaluation by two methodologies-IPAQ (International Physical Activity questionnaire large version) - In person-reported physical activity; leisure-time and transport activity were included; Mexican (Spanish) version of IPAQ (Salvo et al, 2014) was adapted for ELANS. Outcomes: total vigorous, moderate, sedentary time in minutes/week, Transport and Leisure time vigorous, moderate, sedentary time in minutes/week by week and weekend days.

An active evaluation was done by means of accelerometry measurement (model GT3X+, ACTi Graph, Pensacola, FL, USA) in 40% of the whole population, representing more than 3000 people. Accelerometers were fixed by elasticized belt at hip level on the right mid-axillary line, being used for 7 days, and for at least 5 days of valid measurements.

By anthropometric evaluation, 60% of ELANS population presented excess weight, varying from 54%-62%(male-female), with lowest prevalence in Colombia and higher in Chile. Energy intake was lower in Chile, for plausible cases (excluding misreporting).

As for physical evaluation by questionnaires observation (IPAQ), it was seen that 48% of ELANS population were insufficiently active, with 22% in Ecuador and 65% in Venezuela.

When actively observed (accelerometry), the overall sedentary time was higher than 9 hours a day, being higher during weekends and in adolescents. Senior adults have lower physical activity in all measurements in all countries.

As conclusion, we can observe that excess weight epidemic has strongly reached Latin American countries and some observations must be discussed- despite low energy intake, food density must be evaluated. Physical inactivity and sedentary behavior is strongly associated with excess weight, in all countries, and being much important in adults and senior people. Political and educational policies must be implemented for preventing obesity and its morbidities. Implementing changes toward public policies and education interventions must be made for preventing obesity and its co-morbidities.

Keywords: Physical activity, sedentarism, obesity, accelerometry, IPAQ

HABITS & CULTURE: RELATIONSHIP BETWEEN FOOD HABITS AND NUTRITIONAL PROFILE BASED ON MICRONUTRIENTS

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LA countries have been experiencing the nutrition transition during the last 40 years moving from under to overweight but also experiencing nutritional deficiencies. As a result of this transition, alarming rates of overweight and obesity have been described in LA, which coexist with hidden malnutrition especially in developing countries . It has been suggested that the excessive energy intake is also associated with the decreased of food quality and multiple micronutrient deficiencies.

The deep knowledge about LA diet is still a scientific concern. Few studies have investigated the LA diet composition reporting not only the differences across countries but also among the regions within a country. ELANS (Latin American Study of Nutrition and Health) has examined the pattern of habits and micronutrient's food sources in 8 LA, using a single methodology for data collection and analysis. Data were analyzed by country, gender, socioeconomic level (SEL) and group of age.

Micronutrients outcomes of ELANS were Calcium, Vitamin A, D, C and Iron and the estimated average requirements of the Food and Nutrition Board of the Institute of Medicine were the references used for making comparisons. The prevalence of inadequate intake of Vitamin A was 52% (range: 21-80,) no association with socio economical level and/or nutritional status was observed. Intake of Vitamin D was very low for all the countries with little variations between them and higher intake in men was observed (mean: 3.1 mcg/d EAR: 10 mcg/d). On the contrary, Calcium intake showed a wide variation of inadequate intake with lower rates in Argentina (70%) and higher ones in Costa Rica and Peru (95 and 97% respectively). Iron deficiency is higher in Brazil and significantly associated with SEL. Vitamin C inadequate consumption is higher in southern countries (Argentina and Chile) and lower in northern ones, associated with natural juice and fruit consumption. Combined prevalence of inadequate micronutrient intake showed to be higher in vulnerable age groups (adolescents and older adults) and this is a common pattern in all the eight countries. Differences observed in culture and meal habits from one country to another seem to be associated to micronutrient intake and centered in two key aspects: main food sources, and behavior regarding fruit and vegetable consumption

In conclusion, despite the eight Latin American countries show alarming rates of micronutrient deficiencies, cultural differences in meal patterns and food sources explain variations in consumption between the countries. Vulnerable groups are the youngest and oldest of the sample that do not reach to meet intake recommendations and this pattern is shared by all the countries, gender, and social and economic groups within the Latin American region.

Keywords: Epidemiology Macronutrients Nutrition Food patterns ELANS

Further collaborators:
On behalf of the ELANS Study Group

LEARNING FOR RESEARCHERS: A MULTICENTER STUDY SHARING METHODS OF EVALUATION OF PHYSICAL ACTIVITIES AND INTAKE IN EIGHT COUNTRIES

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The interest on developing public health policy interventions to reduce obesity and improve nutrition in last decades has progressively grown as a response to increasing overweight and obesity prevalence. ELANS (Estudio Latinoamericano de Nutrición y Salud) or Latin America Study on Nutrition and Health, is a household-based multi-national cross-sectional survey whose aim is to describe the nutritional status of the Latin-American people, and investigate food and nutrients intake as well as physical activity status of nationally representative samples from urban populations. This study evaluated with an unique methodology, a randomized sample with 9218 people (15-65y) in 8 countries simultaneously (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela).

Many challenges and barriers to conduct this study arose at the very beginning: the complexity of the selection of team members, communications, inclusion of technical scientific advisors. The requirement of having a common protocol with the same set of data collection tools, involved 15 months of collaborative work. In addition, obtaining ethical approval from 8 different boards plus a centralized external Institutional Review Board (IRB) at a similar range of time became an extra challenge. A Contract Research Organization (CRO), was responsible for the recruitment and data collection. To ensure the feasibility, efficiency and adherence to the study protocol and procedures a pilot study was crucial. A simultaneous fieldwork, under standardized and uniformed conditions of application of questionnaires and measurements required a continuous and exhaustive work from the Coordination Center consisted in two chairs, one co-chair and two project managers. A tight collaboration with each academic / research team was performed. During the fieldwork periodical controls of data quality were carried out and a general consistency after completion of data collection was developed. Specifically, the dietary intake consistency was the most complex: technical support and guidance to all research teams were necessary.

From ELANS many lessons were learned regarding the conduction and coordination of a multicenter study: 1- the inclusion of a multidisciplinary team with deep knowledge in specific areas was essential, 2-the key role of a proactive supervision and coordination of an international team allowed the simultaneous developed of the study at every country, 3- designing and following a feasible and realistic protocol required more effort than expected, 4- the value of taking care of local characteristics of each site at the moment of planning and developing the fieldwork allowed to identify and solve local barriers 5- the communication with the CRO and the supervision of its work was critical to ensure data quality. These are a tiny example of many other learnings achieved. The findings of this study will provide scientific information on nutrition and physical activity, and due to strict procedures of data quality control allowing the comparison between the LA countries. It is also a good example of a multi center collaboration study that contributes with learnings and tools for other research teams.

Keywords: Multicenter study, feasibility, learnings, Latin America.

Further collaborators: On behalf of the ELANS Study Group

PS_144/73

50 YEARS OF NUTRITION RESEARCH SUPPORT IN LOW INCOME COUNTRIES: ACHIEVEMENTS AND NEEDS

THE NESTLÉ FOUNDATION 50TH ANNIVERSARY

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Nestlé Foundation, Lausanne, Switzerland.

In 2016 the Nestlé Foundation (NF) celebrated its 50th anniversary. To the best of our knowledge, the NF is one of the oldest foundations exclusively focused on improving child health and

nutrition in low-income countries, through supporting research and capacity building.

During these fifty years the Foundation supported over 300 research projects in more than 55 low / lower-middle income countries, which resulted in nearly 600 publications, many of them in high impact journals. The key criteria for support continue to be the relevance of the research question for improving local nutrition conditions, the potential for implementation in the long term, and the quality and quantity of local capacity building.

During these 5 decades the NF supported many individuals in their research activities and to obtain advanced degrees at internationally-recognized universities. Many of our awardees are currently engaged at local universities, Ministries of Health, public health NGO's or international organizations such as UNICEF and WHO. These alumni of the Foundation carry on our conviction that only the strong involvement of locally-based, well-trained health professionals will lead to a sustainable improvement in health and nutrition in developing countries. During the symposium we will present typical examples of projects from 3 continents, which will give an opportunity to discuss further strategies to improve the health of children in low-income countries by advancing research capacity at the local level.

Keywords: Capacity Building, Nutrition Research, Health research capacity, maternal and child health, sustainability

THE EFFICACY OF PEARL MILLET VERSUS MAIZE IN CHILDREN < 2 Y IN RURAL EASTERN KENYA: A RANDOMIZED COMMUNITY TRIAL

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Twenty six percent of under five children in Kenya are stunted as a result of chronic malnutrition. Stunting in the first 2 years of life leads to irreversible damage, including shorter adult height, lower attained schooling, reduced IQ, reduced adult income and decreased offspring birth weight. Until about 50 years ago pearl millet was a staple crop in Eastern Kenya, but it has now been replaced by maize in most areas.

The objective of this study was to assess the efficacy of a one year supplementation with pearl millet compared to maize in children less than one year of age at baseline on physical growth as measured in stunting rate, attained height, body weight, mid upper arm circumference and head circumference. Hemoglobin levels were also assessed.

The study used a randomized community dietary intervention trial design. It was conducted in Mbooni West Sub County because it has a semi-arid climate and most villages currently grow maize. Four villages, at least 50 km away from each other to avoid contamination, were randomized to a one-year pearl millet or maize intervention. The dietary interventions consisted of food distribution and nutrition education. Mothers were provided a weekly ration (2 Kg) of pearl millet or maize flour for the family. 178 children were enrolled [90 from maize and 88 pearl millet villages]. Anthropometry was measured at baseline, midyear and end year. Data was obtained from 133 children [67 maize and 66 pearl millet] at the end of the study.

Children on the pearl millet supplementation attained higher height (79.2 +3.5) as compared to the maize supplemented (76.4+7.7), p<0.016. More children from the maize supplementation villages were stunted (17.1% stunted, 5% severely stunted) as compared to the pearl millet (stunted 13.6%, severely 1%), p< 0.001. Children on pearl millet supplementation had higher Z-score indices (Height-for-age = -1.42 +2.4) than children on maize (-1.03 +1.0). Hemoglobin levels, mid upper arm circumference and head circumference were not significantly different between the two groups.

Malnutrition in rural Eastern Kenya is still pronounced. However, children supplemented with pearl millet attained slightly better nutritional parameters compared to their maize supplemented counterparts. Results from this study could infer that consumption of pearl millet may better nourish children in arid and semi-arid areas. Further research is needed to assess the impact of pearl millet consumption in a controlled clinical trial.

Keywords: Keywords: Pearl millet; maize, stunting, children, Mbooni west

IMPROVING NUTRITION BY LINEAR PROGRAMMING

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Goal/linear programming (LP) is an optimization method that can be used to identify optimal but realistic, available, and affordable complementary feeding recommendation (CFR) to meet Recommended Nutrient Intakes (RNIs) of energy and nutrients given the food availability, food patterns, food portions, and cost. LP approach can also be used to identify nutrient gap and formulate complementary intervention such as fortification. Several intervention studies where optimized CFRs developed using LP were promoted have been conducted in Indonesia and Myanmar. Findings from 6-month intervention in Lombok Indonesia showed that 12-17mo children whose mothers received nutrition education with optimized CFRs had higher dietary diversity score, consumed the nutrient-dense foods more frequently, and had higher nutrient intakes and nutrient densities for problem nutrients (Fe, Zn, Ca) in their CF diet than children in control group. While difference in growth was not found by the end of the 6mo intervention, a follow-up study conducted two years later on these children (mean age 47±3 months) showed that there was lower prevalence of stunting in CFR than control group (36.6% and 45.8% in CFR and non-CFR, respectively, p=0.05). Six month intervention study on stunted 12-23mo children in Dompu

Indonesia showed that children receiving optimized CFR without fortified food (meeting approximately 65% RNI or close to Estimated Average Requirement) showed better length and length-for-age gain than those who received standard and high nutrient density CF diets which included fortified food. In 6-month intervention trial in Myanmar, optimized CFR for 12-18mo children can minimize the negative effect of iron supplementation (15mg elemental iron in the form of ferric NaEDTA) on zinc status and gut microbiota. The findings suggest the benefit as well as the sustainability of promoting optimized CFR and further study is needed to provide more evidence of its effectiveness at the public health level.

Keywords: Complementary feeding recommendation, Indonesia, linear programming, Myanmar, problem nutrient

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THE NEED FOR EFFECTIVE NUTRITION RESEARCH IN AFRICA

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Africa is the region where improvements in nutritional status has been slow. About 37% of the world's 156 million are stunted children and 28% of the world's 50 million wasted children are in Africa. Malnutrition has a huge cost affecting cognitive development, educational attainment and subsequently affecting adult productivity and economic earnings. Economic losses due to malnutrition are estimated at 11% of the GDP for Africa. Noting this, at the Malabo declaration, Heads of States and Governments of the Africa Union committed to end hunger and improve nutritional status, specifically by reducing child stunting to 10% and underweight to 5% by 2025. These commitments must be translated into actions. Attempts to address malnutrition in Africa would not be effective if efforts are not made to invest in research. The unique nutritional problems in sub-Sahara Africa call for effective research to identify interventions that fit the context. Unfortunately, the current nutrition research environment is not conducive for effective research. A survey among African researchers identified the lack of recognition by policy makers on the relevance of nutrition research, absence of nutrition research priorities, low capacity, poor infrastructure and inadequate funding. As a result, the research agenda is determined by donors not too familiar with the real nutrition problems of the Africans. For example, the food systems in most sub-Saharan countries are fast changing, traditional diets rich in whole grains, legumes, fruits and vegetables are being replaced by highly processed foods. There is little research on-going to explore the use of local food ingredients in improving diets, especially for children. Very few African countries have analysed the nutritional composition of their foods. Until African researchers and governments take and lead the nutrition research agenda, the large research funding chanelled into Africa will not make the expected impact of moving the malnutrition situation in the continent. To move forward, African researchers must position themselves to take advantage of the current opportunities presented by the SDGs to address malnutrition by developing their capacity to source needed funds to carry out the research that really address the nutritional problems of Africa.

Keywords: Research. nutrition. SGD. Africa

Conflict of Interest disclosure: Symposium is organized by Nestle Foundation

THE FUTURE OF YOUNG AFRICAN RESEARCHERS

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Nurturing and empowering young African researchers is important to the success of reducing malnutrition in Africa. The young African researcher is faced with numerous obstacles in his quest to contribute to reducing malnutrition in Africa. The first obstacle is the 'system'; the 'system' rejects the young African researcher simply because he is young and inexperienced irrespective of his qualification. The system fails to realize the young African is well trained and ready to work for mother Africa. The response to this obstacle is, the young African leaves to other countries, commonly to North America or Europe. There are very talented and hardworking young Africans performing and contributing to research in the Americas and Europe who are refusing to return home simply because the 'system' is not welcoming. It is the same 'old' faces who attend conferences, workshops or symposia to discuss solutions to malnutrition in Africa, with no room for the opinion of the young African. Unfortunately, donors and funding agencies contribute to 'embolden' the 'system' by funding proposals, travel grants and fellowships of the 'known' faces, who are mostly the older generation to the neglect of the young African. Another major obstacle facing the young African is the non-availability of opportunities such as localized funding opportunities. Most funding opportunities are from outside the continent with their attached conditionalities which limits the young African to explore in his quest to find solutions to the malnutrition problem. It is high time African leaders, philanthropists and other stakeholders invest substantially in research funding to encourage the young African to explore in terms of research to the benefit of the continent. Given the opportunity and "freedom" to contribute their quota, young Africans are more than willing to contribute meaningfully to the fight against malnutrition. What the young African needs is the exposure, platform and freedom to contribute their part. The African Graduate Nutrition Students Network (AGSNet) seeks to build in its members at their formative stages of their studies and professional careers, the spirit of collaborating and sharing of ideas to solve problems. AGSNet was initiated in 2002 by a group of African students then studying at Cornell University, USA, as a platform for networking and relationship building among mostly African students studying nutrition and related courses, and young professionals. AGSNet aims to build core nutrition competencies, organizational and leadership skills as well as appropriate attitudes and values while fostering the development of strong African nutrition advocates or champions who will keep the fight

against malnutrition in Africa at the forefront of their work. The AGSNet approach is to explore all available platforms, partnerships and opportunities both within and outside the continent to build the capacity of its members. Nestle Foundation prioritizes projects in Africa which leads to sustainable development with a strong emphasis on capacity building. This fits perfectly with the objectives of the AGSNet. Nestle Foundation has thus supported AGSNet over the years to provide capacity building opportunities for its members

Keywords: Africa, Capacity building, Young African Researcher, AGSNet, Nestle Foundation

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PS_ 144/1017
OXYGEN: A NEGLECTED NUTRIENT

HYPOXIA AND ADIPOSE TISSUE DYSFUNCTION IN OBESITY

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Oxygen is rarely considered as a nutrient and this is principally because it is delivered through the lungs rather than by the diet via the gastrointestinal tract. However, oxygen is an essential 'macronutrient' without which oxidative metabolism, particularly oxidative phosphorylation in mitochondria, cannot take place. Once absorbed from the lungs, the delivery of oxygen to cells from the circulation by haemoglobin parallels the carrier mechanisms by which a number of nutrients are transported. At a physiological level the consequences of, and adaptations to, low oxygen tension have been extensively investigated, especially in relation to high altitude. A relative lack of oxygen is apparent in a range of diseases where lung function is impaired, such as pulmonary fibrosis and chronic obstructive pulmonary disease. These conditions impact on the provision of oxygen to the body as a whole, but a reduction in individual tissues can occur even when the total body supply is not compromised; examples include the site of wound healing following tissue damage and in solid tumors. There is growing recognition that low oxygen tension, and indeed overt hypoxia, can also occur in normal tissues with important implications for cellular function. White adipose tissue (WAT), a major endocrine and signalling organ with adipocytes secreting a multiplicity of protein and lipid factors, is one site where hypoxia has been demonstrated. There is substantial evidence from animal studies that hypoxia develops in WAT as the tissue mass expands with obesity, resulting in changes in adipocyte function which may underpin the dysregulation that leads to obesity-associated disorders - including insulin resistance and the metabolic syndrome. In particular, the reduction in oxygen tension is considered to underlie the inflammatory response with the expression and secretion of several inflammation-related adipokines being up-regulated; these include major adipokines such as leptin, IL-6 and VEGF. In contrast, the expression and secretion of the key adipocyte hormone adiponectin is inhibited by low oxygen levels. Adipocytes in culture, both murine and human, exhibit extensive functional adaptations to hypoxia, there being changes in the expression of up to 1,300 genes. A switch from oxidative metabolism to anaerobic glycolysis is evident, glucose utilisation being greatly increased in hypoxic adipocytes with a corresponding elevation in lactate production, both changes involving increased recruitment of the key transporters GLUT1 and MCT1, respectively. Importantly, hypoxia directly induces insulin resistance in fat cells and leads to the development of adipose tissue fibrosis. Exposure to graded levels of oxygen indicate that adipocytes titrate small differences in oxygen tension with alterations in gene expression and glucose utilisation. Other cell types within WAT also respond to hypoxia, with the differentiation of preadipocytes to adipocytes being inhibited and preadipocytes transformed into leptin-secreting endocrine cells. Overall, hypoxia has pervasive effects on the function of white adipocytes and appears to be a key factor in adipose tissue dysfunction in obesity. Finally, oxygen should be recognised as a critical nutrient and part of the landscape of nutritional science.

Keywords: Adipocytes; Hypoxia; Obesity ; Oxygen tension; White adipose tissue

OXYGEN DEPRIVATION IN TUMOURS

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Intratumoral hypoxia has been identified in a majority of solid tumors and has been associated with an increased risk of metastasis and cancer patient relapse. Hypoxia within a solid tumor arises from an increase in oxygen utilization by rapidly proliferating cancer cells, which ultimately results in a decrease in oxygen availability. The abnormal blood vessels formed within tumors further limit the diffusion of oxygen. Cancer cells adapt to the hypoxic microenvironment by increasing the activity of the hypoxia-inducible factors, HIF-1 and HIF-2. In breast cancer, regardless of lymph node status, patient survival is significantly decreased in patients with the highest HIF-1α levels in their diagnostic breast cancer biopsies. This is consistent with studies showing HIF-1α overexpression within metastatic lesions arising from breast tumors. A growing body of data from preclinical and clinical studies has shown that hypoxia can induce and/or select for cells with altered characteristics, including (a) maintenance of replicative potential, (b) maintenance of stem cell properties, (c) genetic instability, (d) angiogenesis, (e) metabolic reprogramming, (f) autocrine growth factor signaling, (g) invasion, (h) metastasis, and (i) resistance to radiation and chemotherapy. We will discuss how cells alter their metabolism to support continuous growth and proliferation in challenging hypoxic environments. Furthermore, we will discuss how hypoxia forces changes in cell behavior and the associated extracellular matrix to increase their migratory and metastatic behavior.

Keywords: Oxygen, hypoxia, tumour, HIF, cancer

SCIENCE UPDATE OF PHYTONUTRIENTS IN AGING SOCIETIES AND PUBLIC HEALTH

SCIENCE UPDATE OF PHYTONUTRIENTS

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Attention to the benefits of phytonutrients has been increased recently. Our vision is to make phytonutrients as the first value of people's health for consumers and scientists, as a part of daily life based upon scientific evidence. Objective of Global Phytonutrient Society (GPS) is to promote usefulness of phytonutrients based on advanced scientific evidence from the world; to utilize promising phytonutrients applying to super-aging society; to link to global leading experts and societies for use in supplements/health foods and as essential choice to achieve optimal health; to collaborate with governmental scientific organizations in major legions; and to establish global subsidiaries in the future. Our goal is that botanicals, especially sources phytonutrients, are universally accepted by policy makers, regulators, academia and consumers for use in supplements/health foods and as essential choice to achieve optimal health.

For example, phospholipids are of critical importance in mammalian cell biology, both through providing a permeability barrier and acting as substrates for synthesis of lipid mediators. Such membrane lipid peroxidation receives attention to evaluate nutritional states and also to cellular aging. For measuring phosphatidylcholine hydroperoxide (PCOOH) as a primary oxidation product of membrane lipids, CL-HPLC and/or with LC-MS/MS is employed. High PCOOH concentration as a biomarker of membrane lipid peroxidation is confirmed in atherosclerotic plasma with angiographically significant stenosis. In Alzheimer patients, aged RBC rich in PCOOH is found significantly in peripheral blood, and such PCOOH-rich RBC lacks CO_2/O_2 exchange function that contributes to develop the senile dementia. The data further indicate that radical and/or enzymatic oxidation is recognized to cause oxidation of membrane lipids in our body. Age-dependent accumulation of PCOOH is confirmed in cultured human diploid cells, the microsomal and plasma membrane of the rat hepatocytes, and the brain and liver of the rat, and intensely in a mouse model for hepatitis C virus associated hepatocarcinogenesis.

Phytonutrients (vitamin E, C, carotenoid, polyphenols and so on) prevent the membrane lipid oxidations, and intake of phytonutrients as dietary antioxidants would be recommendable for public health.

Keywords: Aging, Phytonutrients, Botanicals, Lipid Peroxidation, Antioxidants

PHYTONUTRIENTS IN AGING SOCIETIES: A PRACTICAL APPROACH

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Phytonutrients include flavonoids, phenolic acids, sulfur-containing compounds, isoflavones and other secondary metabolites which are found in plant-based food and beverages, and are consumed as part of the diet. According to epidemiological and intervention studies, diets rich in these compounds protect against developing the chronic diseases of aging, such as cancer, type 2 diabetes and cardiovascular disease [1-4]. Studies on human cells in vitro have indicated mechanisms by which this protection might occur, and these have been complemented by experimental animal models and by studies in healthy and at risk human volunteers. Taken together, this huge effort has provided part of the scientific platform for government recommendations on consumption of diets high in fruit and vegetables, to maintain health and slow down aging processes. Many mechanisms of action have been suggested, but the most viable effects are those which take into account the bioavailability of phytonutrients. Pathways of absorption and metabolism for the major classes have been studied extensively and are in general well understood [5]. It is clear that the beneficial effects of phytonutrients are on specific cellular targets and are not due to direct chemical antioxidant action [6]. Taken together, the current data in the literature indicate a robust and widely applicable protective effects of phytonutrient-rich foods against chronic diseases of aging. However, the doses required and to what extent the phytonutrients can be supplied as supplements both remain issues of debate, and probably depend on formulation, processing, combination with other ingredients, time and frequency of consumption.

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Keywords: Flavonoid; diabetes; cancer; cardiovascular; supplements

with multiple industrial partners in EU projects and industrial support from multiple companies in the DRINC programme.

MEDITERRANEAN DIET AND PHYTONUTRIENTS FOUND IN SUCH DIET CAN HELP TO SUPPORT IN PREVENTING AND REDUCING AGE-RELATED DISEASES

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Benefits of Mediterranean diet type have been known for well over half a century. In the last decade, an increasing amount of scientific evidence has supported its beneficial effects in human health confirming how this diet could be useful in preventing and reducing cardiovascular disorders, in diabetes type II, metabolic syndrome and fatty liver, and the cognitive decline of neurodegenerative diseases. A number of plant constituents naturally occurring in foods, particularly polyphenols, terpenoids, glucosinolates have a dramatic role in the modulation of cellular signaling pathways and nutritional genomic is a developing research field to study the effects of foods and food constituents on gene expression, focusing on identifying and understanding molecular-level interaction between nutrients and other dietary bioactives with the genome. Olive oil is the main source of fat and health-promoting component of the Mediterranean diet. Solid evidence was obtained on the homeostatic control of genes having a role in lipid metabolism, immune-inflammatory pathways, vessel protection and blood pressure control, metabolic regulation and detoxification of reactive species. Oleurepein, hydroxytyrosol and oleocanthal are the principal constituents responsible for such natural functional food. Citrus fruits such as oranges, bergamots, lemons and grapefruit contain special classes of flavonoids (polymethoxylated flavone and flavanones), are emerging for their considerable nutraceutical value. Juices from fruits or single flavonoids constituents can reduce the incidence of cardiovascular disease risk, pre-clinical investigations highlight cellular and subcellular targets that are responsible for these beneficial effects. Typically, plants from Brassicaceae family represent a large botanical family comprising many edible species. The organosulfur compounds of these species, denominated isothiocyanate derivatives (deriving from a myrosinase-mediated transformation of glucosinolates) have an important preventive effect in many human diseases, particularly prevention of neurodegenerative processes and cardiovascular diseases. Similarly, species belonging to Allium genus such as garlic, contain sulfur derivatives. S-allyl cysteine (SAC) is the active and main component of aged garlic extract with anti-inflammatory, neuroprotective, and nootropic potential.

Keywords: Mediterranean diet ; prevention and reduction aged-related diseases; polyphenols; terpenoids; glucosinolates

THE CURRENT STATE OF COMPUTER SUPPORT FOR GENOTYPE-BASED NUTRITION AND LIFE-STYLE GUIDANCE

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The responses to many foods, nutrients and bioactives differ greatly between individuals. In many instances known gene variants are the underlying cause for such distinct differences in effects and outcomes. A typical example is the persistence of intestinal lactase expression in carriers of variants located in enhancer regions of the LCT gene. These variant carriers usually tolerate the consumption of significant lactose amounts while non-carriers respond with bloating, abdominal cramps and other discomfort to such intake. In light of the rising number of such well-documented examples of actionable genetic information, the call for genotype-based nutrition guidance is getting stronger.

Current-generation nutrition information tools should meet several key requirements: (1) Estimate individual dietary targets by flexibly integrating genetic data with variable layers of personal information such as age, gender, body size, activity level, intolerances and dietary preferences; (2) Shield raw genetic information both from the user to avoid distress and from third parties to avoid abuse; and (3) Generate individually actionable information such as personal nutrition suggestions, life-style tips, and tailored meal plans.

The tailoring of meal plans to individual nutritional needs and personal preferences is a major challenge because of the large number of factors that have to be taken into account. The macronutrients, sugar, saturated fat, sodium, minerals, a few vitamins, a few trace elements, fruits, vegetables, vegetarian, vegan, gluten-free, low-lactose and pork-free already add up to more than twenty targets and conditions.

Fully configured food databases are essential for generating individually tailored meal plans. Building such a database is a tall order because it can only include items with all the data used by the search criteria. To be suitable for a gluten-free meal plan, the absence of gluten in every single meal component has to be know. Foods with even one missing data item missing are useless. The lack of comprehensive nutrition information for most commercially available foods is the major limiting factor.

So far, PONG (Personal Online Nutrition Guidance) appears to be the only computer-supported nutrition information tool that meets these minimal requirements. It is a comprehensive platform that can integrate all types of personal information for generating nutrition target estimates. To the extent that evidence-supported rules are available, an unlimited number of genetic variants and other factors can be used to estimate individual nutrition targets. Another set of rules dependent on the acquired information and estimated targets provides a personalized narrative of major di-

etary and life-style goals, tips for practical implementation, and hints for daily success. Most importantly, the tool offers individualized meal plans that fully meet the user's personal needs. The tool lists the nutrient composition of suggested meal plans next to the intended target amounts. Plans that are reasonably close to what the user wants can be further modified to personal preferences and food availability. Colors and other visual aids signal the suitability of combinations.

Head-to-head comparisons with other available nutrition information tools should assess how well they meet these advanced criteria for safe, effective and user-friendly translation of genetic information into daily nutrition and life-style choices.

Keywords: Nutrigenetic, responders, meal plans, gluten-free, meal planning

GENOMICS OF EATING BEHAVIOR IN RELATION TO OBESITY

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The prevalence of obesity (Body Mass Index BMI> 30 kg/m2) has increased in the last decades via "obesogenic" environments characterized by easy access to high energy-density foods and a reduction in physical activity levels. In Chile, a middle-income country, childhood obesity prevalence has tripled over the last decades and continues to rise. The evaluation of the change in the population distribution of BMI over time indicates that the increase in body weight is not uniform in the population, implying that there are groups of subjects that are resistant to the development of obesity, while other groups are especially susceptible. Among the multi-level factors that are related to obesity, increased energy intake is likely to play a dominant role. In this context, eating behaviour is acquired in early childhood, and changes over time according to personal subjective experiences and family influences, which ultimately determines food consumption patterns. Despite the decisive influence of the environment on the obesity epidemic, twin studies have reported that both BMI and eating behaviour scores are traits with important genetic basis. Genetic variation in taste receptors (for example, TAS2R38 among others) and components of neuroendocrine systems (FGF21, MC4R, among others) have has been linked with variation in food responsiveness, food selection and hunger. Additionally, genome-wide association studies have identified more than 200 loci related to BMI that can be used to create genetic risk scores for obesity. Appetitive traits have been proposed to mediate the relation between genetics and obesity, in accordance to the "behavioural susceptibility theory" (Llewelyn and Fildes. Curr Obes Rep 2017; 6: 38-45) that states that individual differences in eating behaviour scores are the mediators of the relation between genetic susceptibility and the development of obesity. In relation to rare monogenic syndromes characterized by obesity and hyperphagia, most cases diagnosed with genetic obesity are caused by disruption of genes belonging to the leptin-melanocortin pathway such as LEP (encoding leptin), LEPR (leptin receptor), MC4R (melanocortin-4 receptor), POMC (proopiomelanocortin) and PCSK1 (proprotein convertase subtilisin/kexin type 1), among others. It was reported that subcutaneous leptin administration to obese patients with genetic leptin deficiency reduced dramatically their energy intake and body weight. Recently, new therapeutic strategies based on MC4R agonism have led to the modification of eating behaviour and body weight in patients with POMC deficiency, (a rare obesity syndrome with hyperphagia). In conclusion, the study of monogenic forms of obesity and hyperphagia has led to new biological knowledge and therapeutic strategies to manage eating behaviour and increased body weight. On the other hand, intricate relations of obesity-related variables have led to the concept of eating behaviour as a mediator connecting genetics and the development of obesity in the context of a modern obesogenic food environment.

Keywords: Obesity, eating, behaviour, melanocortin, taste

NUTRITION AND GENETICS: THE MISSING LINK

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The aims of this presentation will be to provide a deeper appreciation of the role of nutrition in genetics. Differences between the stable human genome and the ever-changing microbiome have led to discoveries of the single nucleotide variants and dietary changes that affect human health. The Human Variome Project documents specific genes and their relationship with diseases. Recent studies show that epigenetic programming during the developmental years and alterations during aging have important implications in disease management. Key nutrients affecting gene expression include folic acid, Vitamins B-12 and Vitamin D. Tumorigenesis and several age-related diseases are linked to DNA methylation-dependent activities. Thus, dietitians should understand the significance and be ready to create new employment opportunities in the emerging fields of Nutrigenomics and Nutritional Genetics. Competencies, knowledge and desirable professional traits have been identified and adopted for interpretation of genetic and genomic information and personalized nutrition therapy.

Keywords: Nutrigenomics, Nutritional Genetics

PRECISION NUTRITION BASED ON OMICS KNOWLEDGE

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Chronic diseases, including obesity, diabetes, and cardiovascular events, are related to important clinical complications and lower longevity. Nutrition and dietary patterns, as well as other lifestyle factors, are crucial elements with potential interactions on genes impacting on health outcomes. Personalized nutrition relies on knowing the genotype of the individual, which influence the response to foods and also on the principle that nutrients regulate gene expression. Thus, precision nutrition depends on the genetic make-up (i.e., DNA sequence and epigenetic markers), on clinical and physiological issues (i.e., phenotypical traits, perinatal nutrition, diseases history and drug prescriptions, allergies,...) and on social/cultural differences (i.e., lifestyle, physical activity, food habits and preferences, mating, religion and food accessibility, likes and dislikes, etc...)…

Precision nutrition is evolving as an important part of disease management accounting the individual's genetic and epigenetic information, together with subject´s personal aspects (previous or current diseases, endocrine disruptions, fat distribution, sex, age) and environmental influences (including diet). Indeed, omic advances are generating a better knowledge about the involvement of genetic variants/SNPs and epigenetic marks as well as gene expression patterns or metabolites/microbiome changes depending on nutrition and their interactions with the development/treatment of acute and chronic diseases.

The convenience of modern omic technologies, the discovery of new biomarkers based on genomic and metabolic data together with a wider understanding of gene and lifestyle interactions are becoming important endeavors in precision nutrition areas. Also, metabolomics and metagenomics (microbiota) studies are contributing, together with progress in dietary assessment and biochemical/genetic tests, to better interpreting every person individuality through blood, urinary, and fecal differentiating features.

Investigations to unravel omic markers in groups with different genetic and epigenetic backgrounds (i.e., GWAS and EWAS strategies), together with advances in NGS or Omic tools and bioinformatics are enabling to deduce new relationships among genes and dietary factors. These findings are disentangling the genetic predisposition to complex metabolic diseases and providing suitable recommendations for precision nutrition.

The "Nutrient-gene interactions: Knowledge to action" IUNS Task Force has been since 2005 specifically devoted to these tasks. Indeed, the number of publications related to nutritional genomics and associated omics branches, such as Nutrigenetics, Nutrigenomics, Metabolomics and Metagenomics, are continuously evolving (more than 1.000 documents with more than 12.000 citations since 2001), which is paving the way to provide an efficient precision nutrition for a healthy life.

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Keywords: Obesity, Metagenomics, Metabolomics, Nutrigenomics, Nutrigenetics

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PS_144/142
HYDRATION AND WORK

HYDRATION IN THE WORK ENVIRONMENT

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The human organism is composed of approximately 60% water. The function of water is essential for the maintenance of health, acting in the development of different physiological processes, all essential for life. Therefore, it is evident the need for a person to be adequately hydrated, both to maintain health, and to properly perform their tasks.

Different causes can make a worker quickly lose body water, become dehydrated and suffer complications both in their work capacity and in their own health. In industrial work, among these causes we can mention:

1. Use of encapsulated protective clothing that can raise sweat rates by 2.25 liters per hour.

2. Intense physical work, for example, construction workers.

3. Work in hot environments, for example, mining.

4. Air conditioning in offices, shops, gyms, hospitals, even in vehicles that are used in long journeys, which can accelerate losses by skin or respiratory tract.

5. Difficulties in access to water, for example, in long distance driving, work in controlled environments, construction sites, hospitals and also in educational institutions.

Different researchers have shown that body water losses around 2% of body weight, regulate changes in mood, can cause fatigue and reduce the level of alertness, conditioning the individual's work capacity.

Institutions and companies should ensure that workers have adequate availability of drinking water. In addition, accessibility should be ensured, i.e. there should be water in strategic locations, visibly marked and with the necessary utensils (glasses, etc.) to drink it.

There are no specific recommendations on water consumption for the worker, considering environmental factors such as protective clothing, high temperature, work in heated or outdoor environments, work intensity, etc.

The Institute of Medicine (IOM) of the National Academy of Sciences of the United States of America recommends adequate fluid consumption for adults 2.7 to 3.7 liters / day. The worker should consume at least the maximum recommendation cited and increase this consumption until reaching 5 or 6 liters daily, according to work intensity and environmental conditions. The American Occupational Safety and Health Administration recommends replenishing liquids by drinking a 250cc glass of water every 20 to 30 minutes.

Finally, we can conclude that a correct hydration at work is oriented to avoid diseases, reduce absenteeism at work and increase productivity.

Keywords: Hydration, Work.

HYDRATION AND PHYSICAL ACTIVITY

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A well-hydrated athlete always functions at a higher physiologic and performance level than a dehydrated one

Prolonged exercise leads to progressive water and electrolyte loss from the body as sweat is secreted to promote heat loss. The rate of sweating depends on many factors and is increased in proportion to the work rate and the environmental temperature and humidity. Sweat rate is highly variable between individuals and can exceed 2, 5 l h for prolonged periods.

Since it is established that the dehydration will impair exercise capacity and can pose a risk to health, the intake of fluid during exercise to offset sweat loss is important.

Fluid intake is also aimed at providing a source of substrate, usually in the form of carbohydrate. The availability of ingested fluids may be limited by gastric emptying or by intestinal absorption. Gastric emptying of liquids is slowed by the addition of carbohydrates in proportion to the carbohydrate concentration and osmolality of the solution.

Water absorption in the small intestine is a passive process and is stimulated by the active absorption of glucose and sodium.

The optimum fluid for rehydration during exercise depends on many factors, particularly the intensity and duration of the exercise, the environmental conditions and the individual physiology of the athlete. The composition of fluids to be used will depend on the relative needs to replace water and to provide substrate.

Where rehydration is a priority the solution should contain some glucose or polymers and sodium and should not exceed isotonicity.

Dehydration refers to an imbalance in fluid dynamics when fluid intake does not replenish water loss. A moderate exercise workout generally produces a 0,5 to 1,5 liters sweat loss over a 1 hour period. Significant water loss occurs during several hours of heavy exercise in a hot environment.

Intracellular and extracellular compartments contribute to the fluid deficit (dehydration) which can rapidly reach levels that impede heat dissipation, reduce hot tolerance and severely compromise cardiovascular function and exercise capacity.

Because sweat is hypotonic with other body fluids, the hypovolemia caused by sweating correspondingly increases blood plasma osmolality

Just about any degree dehydration impairs physiologic function and thermoregulation. Adequate fluid replacement sustains the exceptional potential for evaporative cooling of acclimatized humans.

Changes in body composition indicate the extent of water loss during exercise and the adequacy of rehydration during and after exercise or athletic competition. Voiding small volumes of dark yellow urine with a strong odor also provides a qualitative indication of inadequate hydration. Well hydrated individuals tipically paroduce urine in large volumes, light in color, and without a strong smell.

Prepubescent children have a lower sweating rate and exhibit a higher core temperature during heat stress than adolescents and adults, despite their larger number of heat-activated sweat glands per unit skin area. For a practical standpoint, children exposed to heat stress should exercise at reduce intensity and receive additional time to acclimatize compared to more mature competitors.

Keywords: Well hydrated, Health,Sweat

PS_144/96

ADVANCES IN FEEDING BEHAVIOR RESEARCH AND ITS RELATION TO NUTRITION

THE WHY? AND FOR WHAT? OF FEEDING BEHAVIOR RESEARCH AND ITS RELATION TO NUTRITION

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The why? and for what? of feeding behavior research and its relation to nutrition

The development of a perspective that links knowledge related to how, what with, where, whom with, when, what for and why we feed, and its effects on well-being, life quality and health, has a particular dimension. Its importance lays in the fact that the development of such a perspective is a crucial element to understand the current world food situation, and therefore is also the best possibility to prevent and control feeding related pathologies among

others. In this sense, it is possible to indicate that such scientific perspective is the study and research of feeding behavior. One of the major challenges of this young area of science has been to place behavior and conduct as central elements of study. This task has not been easy, given the historical bias towards biologically based explanations. In general, there is a great ignorance of issues as basic as identifying what a behavior is, and not to mention the techniques and theories that explain their relationships and function. However, resistance and ignorance have not only been of the biological area, psychology in particular and radical behaviorism especially, disdain to establish cooperation links with other scientific perspectives. The same is true of anthropological, social, political or economic perspectives. It would seem, then, that we are hopelessly seeking to understand, predict, and control phenomena, blindly, with partial visions, which might be described as petty. Therefore, it is necessary to question ourselves, why is it pertinent to establish behavior and conduct as central elements to explain the feeding phenomenon? For this, it is necessary to consider the preponderant role of behavior as a mean and regulatory mechanism in biological, psychological and social processes. A second point is that behavior is a distinctive element of organisms, product of the evolutionary process. Finally, the last point to consider is the perception that organisms have of the behavior of their conspecifics or other organisms, that is, what is perceived in the first instance in a moment of interaction, is necessarily the behavior of the persons or other organisms with whom we interact. In this sense, the behavior of the demonstrator subject acts as stimulus and modifies the behavior of the observer. These three points are necessary and sufficient conditions to point to behavior as an integrating element of other scientific perspectives knowledge around on food. Thus, the study and investigation of feeding behavior is characterized as the conjunction of knowledge and understanding related to everything that organisms do to feed. Therefore, this particular perspective integrates the basic, applied, theoretical, experimental and non-experimental knowledge, as well as the conjectures, predictions, and the analysis of the different disciplines and scientific perspectives that are linked in one way or another to the act of feeding.

Keywords: Feeding behavior, research, nutrition

relationship among physiological, environmental and behavioral factors with respect to an essential act for the survival of organism: feed. Since the proposal of Homeostasis Theory by Walter Cannon in 1929 whose origin is precisely based on evidence generated from experimentation, the considerations of John B. Watson in 1924 with regard to the physiological functionality of organism is observable through of the behavior and the incorporation of the behavior as a fundamental part in the homeostatic regulation of organism by Curt Richter in 1947, are only some findings that have consolidated the base of feeding behavior studies. Feeding behavior was defined as: Everything that an organism does to feed itself (López-Espinoza & Martínez Moreno, 2012). If feed is studied as a process in which the actions connected with the intake as: eating, drinking, smell, taste, look for food, buy it, select it, cook it, produce it etc. A fruitful space is generated for the realization of experimental studies to characterize: what?, how?, when?, how much?, with whom? and for what? Eat. In this process, the learning is a key element in understanding the responses of human and animal organisms in the presence and absence of food. The research about preferences, aversions, hungry, appetite, satiety, selection, choice, intake, energy expenditure, sensation, perception, social interaction etc., are phenomena that have been observed, measured, evaluated and explained through experimentation demonstrating the versatility but also the complexity of the study of food behavior and above all in order to understand the relationship between organisms and the process of feeding themselves. In this way is explained for example: a) How the food deprivation and the experience with palatable food increase the intake; b) The neophobia (refuse) to eat different foods; c) Determine how post-ingestive effects encourage or reduce the probability of intake food; d) Explain how eating behavior can occur even when there is no physiological stimulus of hunger and c) As well as identifying the fundamental role of women in convincing other to accept and consume novel foods "The Eva Effect" (López Espinoza, et al. 2011). In this way, it proves that experimentation in humans and animals models helps to characterize the phenomena and identify the variables that lead to these and accordingly to plan different strategies of intervention in the process of feeding in people of all ages in conditions of health and disease.

Keywords: Fedding behavior, experimentation, applications.

EXPERIMENTAL APPLICATIONS OF FEEDING BEHAVIOR RESEARCH

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Experimentation has been established as a fundamental part in the generation of knowledge in all the sciences. At the study of feeding behavior is not an exception. The empirical evidence generated from experimentation in animal and human models it has allowed the application of theories and models that explain the

CLINICAL APPLICATIONS OF FEEDING BEHAVIOR RESEARCH

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Eating is often seeming as a simple process. But that is an illusion. Eating behavior is an extraordinary complex process that can be challenging for many individuals. Human eating behavior is defined as an individual´s fed actions that have one or more dimensions that can be observed and recorded. Feeding and eating behaviors have an impact on the physical and social environment.

For this reason, feeding behavior research can provide to nutrition professionals a comprehensive set of postulates from Applied Behavior Analysis (ABA) to modify some feeding problematic behaviors. It distinguished by types of clinical problems addressed, the mode of therapeutic intervention, and settings in which therapy is typically conducted. Within clinical contexts, ABA is used extensively in a variety of circumstances and it has proven its efficacy in many areas including: developmental disabilities, mental illness, education and special education, rehabilitation, community psychology, clinical psychology, business, industry, and human services; self-management, child behavior management, prevention sports performance, health-related behaviors; and lately, educational settings above feeding behavior. One of the biggest challenges is helping our people to be a good eaters and no to be a problem or a resistant eater. We all want our kids, patients and all people to eat nutritious foods from a wide variety of sources in the proper portion sizes. But eating the right foods is not easy. Behavior modification procedures can help to resolve eating difficulties. Besides of a medical, nutritional and sensorial evaluation we need a behavioral evaluation. Just as you need to identify any medical, physical, and sensory issues that may be contributing to your feeding problems before starting to food chain, you need to understand behaviors that may be playing a role. ABA principles have helped to identify a negative and positive behaviors in eating time. Reinforce the positive and change the negative is no too difficult that we think. Clinical applications of feeding research provide an evaluation to the behaviors in meals and common positive and negative behaviors identification, procedures to modification and rules to maintain an optimum feeding. The importance of maintaining a well-balanced perspective when managing problems with eating. Parents and professionals must seek out support and training in their community and strive for excellence and consistency when working with special population. A collaborative approach within a multidisciplinary team will ensure the long-term success of the program: Are you a problem eater? Are you a normal eater? Are you a resistant eater? Maybe you can resolve this questions if you learn about behavior and feeding behavior research.

Keywords: Feeding behavior, eating behavior, applied behavior analysis, behavior modification

FOOD COMPOSITION DATA FOR DECISION-MAKING TO PROMOTE HEALTHY DIETS

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Food composition data are critical inputs into the process of food security and nutrition assessment, food labeling, nutrition education, poverty estimation and agricultural investment for healthy diets, such as crop breeding for nutrient dense cultivars. However, in most countries food composition data are out-of-date, incomplete, and inaccurate. When such data exist, they are not always publicly available or in a format that can be easily matched to information on the quantity of food produced or consumed. Though standards for identifying foods and describing their attributes exist, such as the FoodEx2 classification system and CODEX guidelines for nutrient labeling, they have not yet been widely adopted. The data gaps and associated needs continue to grow, with the global trend toward more diversified diets and increased consumption of processed foods, alongside a rapid decline in the biodiversity of food species. These types of weaknesses in food composition data are rarely revealed as limitations or uncertainties in relevant data analyses to inform policy.

This presentation will discuss a set of theoretical and empirical case studies in which poor food composition data could either slow the process of policy formulation or lead to fuzzy or inaccurate conclusions. Case studies will include: the role of food composition data in diagnosing and acting on anemia in Ethiopia; the sensitivity of the global prevalence of undernourishment indicator to food composition assumptions; the challenge of isolating the role of diet in the rapid rise of overweight in Bangladesh; and how an accurate understanding of the effects of agricultural management practices, crop breeding, and climate change on the nutrient value of food supply depends on up-to-date food composition values.

Despite progress by actors like INFOODs, food technology institutes, and academics to remedy these data gaps, donors have been reluctant to scale up support to their endeavors. As a step toward crystallizing an investment agenda, the authors propose an ambitious set of approaches for rounding out food composition resources. Potential investments include: applying a standardized food coding system (FoodEx2) to all food composition databases to facilitate food identification and matching with food consumption data (e.g. through the FAO/WHO GIFT and INDDEX 24 platforms); creating a central repository for food composition data that can be more easily linked to dietary data (INDDEX24); honing innovative technological solutions to reduce the cost and speed of food analysis; strengthening regional composition databases with the mandate and funds for routine updates; incorporating more mixed dishes, fortified and biofortified foods, wild foods, and biodiverse cultivars into existing FCTs; and exploring private sector partnerships for amassing processed food composition information. These types of solutions, if adequately resourced, would mark a significant step toward improving the ability to make sound decisions that affect the diet quality of people worldwide.

Keywords: Food composition, Food policy, Diet quality, Diet assessment

PROMOTING NUTRIGENOMIC EDUCATION IN NUTRITION, DIETETICS AND OTHER ALLIED HEALTH CURRICULA, AN ISNN INITIATIVE

NUTRIGENOMICS CASE STUDIES AS TEACHABLE MOMENTS IN NUTRITION EDUCATION FOR HEALTH PROFESSIONALS

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Curricula of health professionals are crowded and leave little room for further content. It is difficult to add disciplines such as nutrigenomics despite their importance in clinical research and practice. The challenge can be met by integrating nutrigenomic case studies into many different parts of existing curricula. There are numerous opportunities to highlight specific roles of the genome while explaining key concepts in a wide range of foundational and clinical subjects. Such teachable moments may bring to life important complexities of intestinal absorption, metabolic homeostasis and clinical pathologies. Other examples may highlight how specific anatomical structures, the blood coagulation system, genetic disposition and avoidable behavior may trigger catastrophic clinical outcomes.

An example that may bring together multiple levels and topics of instruction is the well-documented correlation of the common FUT2 variant rs601338G>A (W143X) with vitamin B12 inadequacy. At the simplest level, here is an opportunity to weave a tapestry illuminating vitamin B12 function and macrocytic anemia, the mechanisms governing vitamin B12 absorption, secretor status and atrophic gastritis due to chronic H. pylori infection. Vitamin B12 supports DNA methylation, which may explain the slower fetal brain development in mothers with FUT2 variants and the risk of accelerated cognitive decline with aging due to a stomach bug. At another level, the FUT2-vitamin B12 link could transition to fucosylation of proteins including ABO antigens and intrinsic factor, the epithelial exocrine origin of Lewis antigens on red blood cells, vulnerability of secretors to gastrointestinal virus infections, and overly simplified links of blood groups to health risks in general. Yet another conversation could explore the analogous importance of different FUT2 missense variants in non-Caucasian populations, such as I129F (rs1047781A>T) in people of Indian and Chinese descent. This could raise awareness of risks from limiting human research to mostly Caucasian cohorts and thereby potentially failing to serve the needs of many others.

Teaching the urea cycle may become less tedious with case histories illustrating potentially fatal consequences of high-protein foods in seemingly healthy young women who happen to carry a loss-of-function variant of the X-linked gene ornithine transcarbamylase. An unaccustomed large steak may be enough to trigger an episode of ammonia accumulation in blood. At the simplest level, the presentation would probably cover the biochemistry and pathophysiology of ammonia metabolism, best diagnostic practices and treatment options. Another strand could emphasize that uncommon variants taken together are not rare, mention copy-number variants, X-inactivation and mosaicism. Instructors could also highlight how some people respond differently to nutritional exposures than others, explore the metabolic consequences of diverse eating patterns, and recognize that pressuring adolescents to discontinue vegan lifestyles may put some of them at grave risk.

Another teachable moment could explore the intersection of vitamin C, cardiovascular disease and common haptoglobin variants Hp1/Hp2. Presentations could touch on iron-mediated oxidative stress, hemoglobin clearance rates differing by genotype, and increased cardiovascular risk with mega-dose vitamin C supplementation in Hp2-Hp2 carriers.

Illustrative examples of nutrient gene interactions abound everywhere we look and can add color and context to many subjects in healthcare education.

Keywords: Medical education, case studies, nutrigenetics, teaching omics, personalized nutrition

OMIC EDUCATION FOR GRADUATES IN NUTRITION AND HEALTH-RELATED SCIENCES

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We show herein a Chilean experience providing postgraduate courses on "-omics" disciplines to MSc and PhD students at School of Medicine of Pontificia Universidad Católica de Chile. After an introduction on genetics concepts and nutritional epidemiology studies, a nutrigenetic approach of classical topics is first presented in the context of day-to-day nutrition examples and human evolution (focused on genetic variation of lactase persistence, salivary amylase, taste sensitivity). Strong emphasis is provided to nutrition strategies that apply to management of severe monogenic diseases (for example, glycogen storage diseases, phenylketonuria, GLUT1 deficiency), as examples of precision medicine based on nutritional strategies. We specially focus on strategies involving the use of next-generation sequencing techniques to find new genetic causation of diseases that might be eventually actionable through nutrition (examples of monogenic forms of autism with epilepsy are presented). Additionally, selected examples are provided for gene-environment interaction and/or mediation in complex traits in a genomic context, with especial focus on the study of Body Mass Index. Examples of nutrition-related variables as effect modifiers (gene x environment interactions; sweetened beverages) or as mediators (eating behaviour variables) are provided in the context of childhood obesity. Nutrigenomic studies assessing gene expression modulated by nutrients are shown in different contexts, ranging from acute or chronic nutritional interventions. Epigenomic studies on body weight regulation are mainly contextualized within the description of animal models (for example, obesity in the Agouti mice with viable-mutations, methylation in honey bees) and in the study of human eating behaviour (example: methylation in the POMC gene). Metabolomic contribution in the study of human nutrition is presented from the point of view of the assessment of biomarkers of intake on one hand, and in the in-depth study of human metabolome after the ingestion of nutrients (for example, after oral glucose loads) on the other hand. The incorporation of the study of microbiome adds an additional layer of complexity in

the assessment of the relation between nutrients/diets and human health. In general, we perceived a great and growing interest in our postgraduate students and in general in the biomedical community in Chile for acquiring knowledge on techniques, approaches and methods of analysis that apply to the integration of omics disciplines in the study of nutrition-related diseases and traits.

Keywords: Nutrigenetics, nutrigenomics, nutrigenomics, metabolomics, microbiome, education

THE STATE OF NUTRIGENOMICS EDUCATION

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The European higher education system formerly varied from country to country, until 1999, when 29 states signed the Bologna Declaration and the European Higher Educational Area was created. This European higher education system is divided into three sequential cycles, leading to bachelor's, master's, and doctoral degrees. The European Qualification Framework was also established by the European Union. Teaching programs can vary from country to country, but also between universities in the same country.

In Poland, 45 third-level institutions, including medical and life science universities, teach dietetics. Of these, 14 offer nutrigenomic or nutrigenetic courses. Specifically, almost 40% of private universities and 26% of public universities teach nutrigenetics.

In addition, summer schools of nutrigenomics have been organized by the NuGO and the International Society of Nutrigenetics and Nutrigenomics. The latter was the organizer of the European Summer School of Nutrigenomics in Camerino (Italy), as well as of national summer schools, which have been held in Poland and France, among other places.

Separate nutrigenetic or nutrigenomic courses are not commonly included in the programs of dietetics courses.

Evaluation of the courses usually shows that students of dietetics generally expect information about the practical aspects of nutrigenomics.

Keywords: Higher education, dietetics, nutrigenomics, summer school

LEARNING COMPLEX NUTRIGENOMICS TOPICS USING IN SILICO LAB ACTIVITIES AND WEBEX™ CONFERENCING

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Upper level undergraduate and graduate course should not only teach students advanced concepts, but also help them to utilize the information in their research projects. Within the department of Human Nutrition, Foods, and Exercise at Virginia Tech, the undergraduate/graduate joint class in Nutritional Genomics is structured to provide concept learning, hands-on activities, and weekly discussions with international scientists doing nutrigenomics research. The course is held in a "scale-up" room that was specifically designed to facilitate active learning, with round tables, four projection screens, walls of whiteboards, and connected laptops for all students in the course. The course is structured as a 3-times-per-week, 50-minute time period, with lectures and discussion Mondays, in silico hands-on exercises on Wednesdays, and invited international speakers, via WebEx™ conferencing, on Fridays. The topics in the course are built on one another such that students start off examining single nucleotide variants (SNVs) in a gene of nutritional interest (i.e. methylene tetrahydrofolate reductase gene, MTHFR), and then examine these SNV-specific allele frequencies in populations. In the subsequent weeks, they examine whether an SNV changes the amino acid sequence or if it is in a non-coding region and affects gene or protein expression. In the later weeks of the course, the topics include increasingly complex areas, such as gene-gene and gene-environment interactions, and the ethical and societal implications of nutritional genomics. Students utilize online analysis sites, such as the National Center for Biotechnology Information (NCBI) website (http://www.ncbi.nlm.nih.gov/), other free genomic databases and software, such as My Family Health Portrait (https://familyhistory.hhs.gov/FHH/html/index.html), Howard Hughes' biointeractive site "Creating Phylogenetic Trees" (http://www.hhmi.org/biointeractive/creating-phylogenetic-trees-dna-sequences), and some pages devoted to specific genetic diseases, such as the G6PD page (http://www.g6pd.org/en/Home.aspx) and Online Mendelian Inheritance in Man page (http://omim.org/). The students write up their lab reports weekly, and the course culminates in a final paper in which students choose a gene of interest to them, and analyze this gene using at least five of the tools they had learned. On Fridays, WebEx™ conferencing brings in renowned speakers from all over the world, including the United States, England, Spain, Tanzania, and Italy. Speakers are chosen based on the weekly topic, giving a ~25-minute seminar on that topic, followed by a ~10-minute question and answer period. Since the WebEx site allows for live interaction, the speakers are able to control their own presentations and students are able to hear and see the slides, regardless of the time zone. Likewise, the speakers are able to see and hear each of the students through their own live video feeds and audiocasts. Overall, this course structure give students the background knowledge they need to understand nutrigenomics, as well as hands-on activities to use this knowledge in their own studies, and interactions with scientists working in nutritional genomics around the world.

Keywords: Nutritional genomics, genetics, graduate, undergraduate, hands-on

Track 2: Nutrition Through Life Course

AGING GRACEFULLY: STAYING HEALTHY AND WELL LATE INTO LIFE

NUTRITION FOR THE AGING BRAIN: FUNCTIONAL ASPECTS AND STRATEGIES

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Aging is a highly complex process marked by a temporal cascade of events that promote alterations in the normal functioning of an individual organism. The triggers of normal brain aging are not well understood, even less so the factors which initiate abnormal cognitive decline or steer neuronal degeneration which underlies disorders such as dementia. A wealth of data on how nutrients and diets may support cognitive function and preserve brain health is available yet the neurobiological mechanisms of action of nutrition in both normal aging, age-related cognitive decline and in the development of neurodegenerative disorders have not been clearly elucidated.

This talk aims at evaluating the vulnerabilities associated with poor cognitive aging, highlighting potential protective mechanisms and evaluate dietary interventions as a strategy to promote these mechanisms, and addressing vulnerabilities which predispose towards accelerated or dysfunctional brain aging.

This presentation will focus on some of the current state of knowledge on nutrition and cognitive aging reflecting the academic research talks and discussions held during the 2nd workshop 'Nutrition for the Aging Brain: Functional Aspects and Mechanisms', held in Copenhagen in June 2016 and produced by the Nutrition and Mental Performance Task Force under the auspice of the International Life Sciences Institute Europe (ILSI Europe).

In the first part of this talk, we will examine early-life stress, the gut-microbiome and non-communicable diseases such as obesity and diabetes as vulnerabilities associated with poor cognitive aging. We will then highlight potential cellular and molecular mechanisms mediating cognitive health such as adult hippocampal neurogenesis, inflammation and epigenetics. Finally, we will show evidence that those mechanisms can be targeted and modified by nutritional intervention such as Omega-3 fatty acids and polyphenols to mitigate cognitive aging.

Conclusion: We will conclude that future research on the impact of nutrition on cognitive aging will need to adopt a "longitudinal" approach to ensure the effect of early-life is adequately controlled, and multimodal nutritional interventions will likely need to be imposed in early-life to observe significant impact in older age.

Keywords: Cognitive aging, nutrition, early-life stress, neurogenesis, epigenetics

Conflict of Interest disclosure: ST declares no conflict of interest. This review highlights some of the academic reports from the workshop 'Nutrition for the Aging Brain: Functional Aspects and Mechanisms', held in Copenhagen in June 2016. This workshop was organized with funds from the ILSI Europe Nutrition and Mental Performance Task Force. Industry members of this task force are listed on the ILSI Europe website at www.ilsi.eu.

COMPARING HEALTH INDICATORS ACROSS GEOGRAPHY: A LOOK AT ASIA AND LATIN AMERICA

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Background and objectives: The One ILSI (International Life Sciences Institute) Healthy Aging Project is a multi-branch research collaboration whose goal is to identify mid-life factors that contribute to healthy vs. pathological aging in Asia and Latin America. The purpose of this presentation is to compare selected countries in these two regions with respect to: 1) indicators describing the health status of the adult population; 2) disease causes of premature mortality, causes of disability, and risk factors for disease and disability among adults. Methods: Indicators (health status indicators, risk factor indicators) were chosen from the Global Reference List of Core Health Indicators adopted by the United Nations for reporting health priorities of the Sustainable Development Goals (SDGs). Country-specific data for these indicators were obtained from WHO reports. Information for disease causes of mortality, causes of disability, and risk factors for disease and disability were obtained from the Global Burden of Disease (GBD) 2015 studies. Data for 15 countries in Asia and 17 countries in Latin America were extracted and compared. Results: As a region, Lat-

in America had higher average life expectancy, higher healthy life expectancy (HALE), and lower probability of dying between exact ages 30 and 70 from CVD, cancer, diabetes or chronic respiratory diseases than Asia. Within Asia, high income Asia Pacific countries (Brunei, Japan, Singapore, South Korea) had the longest life expectancy, HALE, and lowest probability of dying between ages 30 and 70 from chronic diseases. Within Latin America, Southern Latin American countries (Argentina, Chile, Uruguay) had the longest average life expectancy and HALE, while Andean countries (Bolivia, Ecuador, Peru) had the lowest probability of dying between ages 30 and 70 from chronic diseases. The greatest health risk factors for the Latin American region were overweight, obesity, and per capita consumption of pure alcohol, while those for Asia were smoking and diets low in whole grains. In both regions, high blood pressure was a risk factor for premature death and disability. High income Asia Pacific and Andean Latin American countries had the lowest prevalence of raised blood pressure in adults. Results of GBD studies showed that ischemic heart disease is a cause of mortality across all countries in both regions. Common causes of disability in both regions were migraine, depression, skin and subcutaneous diseases, sense organ diseases, and low back and neck pain. Diabetes was a leading cause of disability across Latin America while stroke was a leading cause of death across Asia. Conclusion: In Asia, better population health is associated with higher socio-economic development but is not the case in Latin America. Both regions had similar causes of mortality and disability and a few differences. Risk factors differed between the two regions. The One ILSI Healthy Aging Project seeks to uncover underlying factors that drive these similarities and differences, both within and between geographic regions, and identify country- and region-specific best practices, policies, and programs to promote healthy and successful aging.

Keywords: Aging, Asia, Latin America, core health indicators, risk factors

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IMPACT OF MENOPAUSE ON THE NUTRITIONAL HEALTH OF ARGENTINIAN WOMEN" UBACYT PROJECTS 2008-2017

BODY MODIFICATIONS IN ADULT WOMEN AND INCREASED CARDIOMETABOLIC RISK. PROJECT PRESENTATION UBACYT 2008-2017

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The line of research on Nutrition in Perimenopause begins as an activity within the 1st Chair of Adult Dietary Therapy in the Nutrition Career of the School of Medicine at the UBA.

The topic was chosen evaluating the global problem and the statistical data that show that coronary disease and stroke are the main cause of mortality in adult women worldwide, being osteoporosis the second health problem for women during this period of their lives.

Cardiovascular disease in women appear later (an average of ten years later) than in men, mainly because the hormonal profile of the woman protects her until the onset of menopause.

The original objective of our research was to consider the impact at the bone and cardiometabolic level of the most prevalent nutritional risk factors in adult women, by screening population-related risk factors related to nutrition and analyzing the intake of certain nutrients critical in this population under investigation.

During aging per se, and particularly during the perimenopausal period, a number of body modifications are generated at a general level, with loss of height, increase of body weight and increase of abdomen-visceral fat distribution, the main anthropometric variations documented by Literature several years ago.

Regarding the corporal modifications undergone in this stage, the main results were:

Loss of average height of 1.26 cm, being accentuated as from the age of 55, postmenopause and time spent in menopause over 5 years. Only 10.8% lost> 3 cm, cut value considered a risk of increased osteoporotic fractures.

Regarding body weight, although at the onset of perimenopause, it was already increased by most of the women being studied, more than half of these women reported an increase of body weight [3] 10% of their usual weight. This gain of weight was independent of the caloric intake, and it was inversely correlated with the time elapsed in menopause. Being the greatest impact observed during the first years of estrogen deficiency.

With regards to cardiometabolic risk, the lipid profile is affected in this stage, with an increase in total cholesterol (ColT) and low density lipoprotein (LDL), triglyceride elevation (TG) and reduction of high density lipoprotein (HDL).

The waist-height index (CWI) showed a good correlation with the CVR factors and components of the metabolic syndrome. There was a strong positive linear correlation between the CI and the of WC and BMI values, and weaker but equally significant with age.

It is a priority to find a good indicator of risk at this stage, since the SF recognized worldwide as one of the main tools for its calculation, underestimates in this population the risk by not considering any of its variables any anthropometric component, nor the values of TG characteristic of the abdominovisceral phenotypic distribution.

Facing all these problems, it is essential that both, women and the professionals who accompany them, recognize cardiovascular risk factors, estimate it over time and understand the importance of making lifestyle changes that can reduce it, and implement preventive strategies more intense when necessary.

Keywords: Body changes; Cardiometabolic Risk; Adult woman; Perimenopause.

CHANGES IN EATING BEHAVIOR: CARB COMPULSION, BINGE EATING AND NIGHT-EATING IN RELATION TO THE STATE OF ANXIETY, STRESS AND SELF-ESTEEM OF WOMEN

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The objective of this dissertation is the analysis of the changes in the alimentary behavior during the hormonal transition of the adult woman and its relation with the own mood of this stage.

Eating is a complex behavior in which intervene, in addition to numerous hormones and systems of the body, a pleasure / reward mechanism that obeys specific and natural stimuli, regulated by neurotransmitters, allows the individual to develop learned behaviors. Estrogens seem to intervene in the regulation of appetite. Its modulating effect on the neurotransmitter system is broad and includes regulation of the synthesis and metabolism of various neurotransmitters. Substances that decline during the hormonal transition.

On the other hand, insulin, one of the hormones responsible for the regulation of dietary intake, plays an important role in the control of body weight. Its increase in blood, mediated by carbohydrate intake, significantly decreases the concentration of tryptophan's competing amino acids, allowing a greater entrance of the same to the brain, thus causing a greater increase of serotonin. In turn, increased serotonergic agents reduce the intake of foods rich in carbohydrates and stimulates the secretion of melanocortins, the most potent anorectic agents in the brain. Serotonin-dependent defects in neurotransmission have been postulated to cause mood disorders and an over-enthusiasm for consumption of foods rich in carbohydrates; This has led to the description of a syndrome called "carbohydrate addiction" characterized by signs of atypical depression accompanied by an urgency to consume foods rich in carbohydrates and consequent obesity. These signs are very common during this stage of a woman's life, being an obstacle to controlling the increase in body weight. Influencing negatively in all the cardiovascular risk factors that are presented.

Keywords: Alimentary behavior - menopause - serotonin

BONE CHANGES AND NUTRITIONAL APPROACH TO REDUCE THE RISK OF OSTEOPOROSIS. PROJECT UBACYT 2008-2017

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Life expectancy has increased significantly worldwide, rising in women over the past 160 years at a steady pace of about 3 months per year. However, the age when menopause occurs has remained relatively stable, so that, nowadays women will live more than a third of their lives with estrogen deficiency. It will produce specific effects in all organs that have estrogen receptors, among them the skeletal system.

The WHO refers to osteoporosis as the second health problem in adult women, after cardiovascular diseases. It is a global public health problem. It affects more than 200 million people and it is estimated that between 30 and 50% of postmenopausal women will develop this disease. But although it is a frequent disease, its real prevalence is difficult to establish since it is asymptomatic until the appearance of its complications. The peak bone mass of premenopausal women is the major determinant of subsequent risk of osteoporotic fracture. Therefore, maximizing bone mass during skeletal growth, developing it and maintaining it in the premenopausal years, will be important strategies in the prevention of osteoporosis.

According to the Argentine Society of Osteoporosis, in Argentina, there are 298 fractures annually per 100,000 women over 50 years of age. It is assumed that 25% of osteoporotic fractures are due to the lack of an adequate bony capital during adolescence; and the remaining 75% to have had excessive postmenopausal losses. Among the modifiable factors involved in progressive bone demineralization with age, lifestyle (less physical activity, smoking and alcohol consumption) and the type of diet consumed (low intake of calcium and vitamin D, increased ratio P / Ca, and consumption of sodium, protein and caffeine by participating in increased urine calcium excretion).

In this Symposium data on the research about the risk of osteoporosis, risk of fractures, the study of bone mineral density in relation to the lifestyle and the dietary profile of the women studied will be presented.

As expected, the social cost of morbidity and mortality associated to female menopause is very high, so it would be convenient to evaluate during this period the possibility of establishing a model of primary health prevention, applicable to women who begin this stage of their life, and that could include actions on their lifestyle, tending to reduce the risk of osteoporosis and fractures. In this context, the health care in during the Climacteric implies considering the nutritional aspects due to the great impact they can have on the quality of life. And within them, food education plays a predominant role in the prevention during this biological stage in the life of a woman.

Keywords: Bone changes. Risk of osteoporosis. Adult woman. Perimenopause.

PS_144/91
EARLY NUTRITION AND ITS EFFECTS ON HEALTH

GENETIC SUSCEPTIBILITY OF EARLY METABOLIC SYNDROME IN CHILDREN AND LATER CONSEQUENCES

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Childhood obesity is one of the most important public health problems of the 21st century, affecting both developed and de-

veloping countries. Obesity plays an important pathophysiologic role in the development of insulin resistance, dyslipidemia, and hypertension, leading to type 2 diabetes (T2D) and a risk of early cardiovascular disease (CVD). Obese children can exhibit metabolic syndrome (MetS) when a number of cardio-metabolic criteria, namely, hypertension, dyslipidemia, or altered glucose metabolism, all of them features of insulin resistance (IR), are present. However, there is a strong debate on the diagnosis and early phenotypic expression of the MetS in children. Nonetheless, our group has shown that irrespective of the classification used, the MetS is not only present in pubertal but also in prepubertal children. Indeed, international definitions of the MetS should consider criteria specific for children in the prepubertal period, i.e. children aged <10 years. In addition specific biomarkers of inflammation, insulin resistance and CDV risk are already associated with central obesity and early onset of MS in prepubertal obese children. The association of a continuous MetS score with specific risk biomarkers of inflammation, endothelial damage and CVD supports its use in the early identification of children at increased risk of metabolic dysfunction.

Numerous gene variants including SNPs and CNVs have been reported to be associated with obesity and some features of the MetS in adults, particularly, dislipidemia and hypertension. However, scarce data are found in children. We have described some variants in 11-BSDH, NPY and NPR genes, as well as to others related to the antioxidant defence system genes, namely CAT, GPX and PRDX, which are associated with some features of MetS in children. Characterization of the genes expressed in adipose tissue (AT) is key to understanding the pathogenesis of obesity and to developing treatments for this condition. Indeed, we have recently compared the gene expression in visceral AT (VAT) between obese and normal-weight prepubertal children and found previously unreported dysregulated genes that may be candidate genes in the aetiology of obesity and MS. As validated by qPCR, expression was upregulated in genes involved in lipid and amino acid metabolism (CES1, NPRR3 and BHMT2), oxidative stress and extracellular matrix regulation (TNMD and NQO1), adipogenesis (CRYAB and AFF1) and inflammation (ANXA1); by contrast, only CALCRL gene expression was confirmed to be downregulated. Additional functional studies of some genes as CAT, NPR document the importance of those genes in the control of glucose and lipid metabolism and their potential implication in the early development of MetS.

Keywords: Childhood obesity. Genes. Insulin resistance. Lipid mestabolism. Metabolic syndrome.

EPIGENETICS OF UNDERNUTRITION AND OBESITY

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Malnutrition involves either energy undernutrition or nutrient deficiencies, as well as overnutrition implicating calories or food excess consumption. Undernutrition usually concerns underfeeding, famine and poor nutritional status while obesity refers to excessive fat accumulation. These conditions are largely dependent on unbalanced energy equilibrium or in some nutrients, which are associated with starvation, impaired food consumption, or diseases, which trigger metabolic alterations. Interestingly, maternal undernutrition or overnutrition during gestation/lactation (inadequate maternal diet or health) negatively impact child growth and future physiopathological functions. Additionally, malnutrition is related to immunodeficiency, disease onset and accelerated aging, and has adverse influences on health in the adulthood, including excessive body weight, diabetes, dyslipidemia, cardiovascular events and eventually cancer or other diseases. Growing scientific evidences are supporting the view that environmental and social factors, including undernutrition, can alter epigenetic signatures (particularly DNA methylation, covalent histone modifications and non-coding RNA expression), affecting gene expression and subsequently cell functions, with lasting effects on adult life health. In this context, inadequacies in dietary methyl-donors (folate, choline, betaine or B vitamins) and other micronutrients, low-protein diets or calorie restriction and famine exposure during early stages, but also excessive calorie intake, high-fat and high-sugar diets, or obesity itself may modify the epigenome and promote the onset of several pathological conditions by impairing epigenetic mechanisms affecting genes associated with insulin sensitivity, growth, inflammation, adipogenesis, lipid turnover, etc. Interestingly, these breakthroughs are contributing to devise original dietary approaches targeting the epigenome.

Differences among individuals in disease predisposition rely on the DNA sequence (e.g. SNPs), and also on epigenetic phenomena affecting gene expression including the regulatory actions of DNA methylation and miRNA. Indeed, the recognition of individuals eliciting epigenetic changes at a perinatal period in the methylation profiles of specific genes might contribute to assess the future susceptibility for obesity and related comorbidities in adulthood. Furthermore, newer approaches for individualized dietary treatments by means of algorithms based on genetic and epigenetic

knowledge are paving the way for their possible implementation in precision individual´s nutrition by better understanding the role of genes regulating appetite, thermogenesis, nutrient turnover and deposition, oxidative and reticulum stress, and other metabolic pathways.

Summing up, current undernutrition and obesity research should be focused on understanding epigenetic marks and messengers related to the regulation of cell signaling, inflammatory and intermediate metabolic pathways, accentuating health interactions with social and environmental factors (diet, physical activity, stress, sleep) to achieve precision nutrition. Actually, recent findings have demonstrated an epigenetic underlying of different metabolic disorders with appearance in adulthood, such as obesity, cardiovascular diseases, and type 2 diabetes as well as cancer, and the involvement of some specific processes participating in the developmental origin of disease in the adult known as the DoHAD hypothesis.

Cordero P, et al. Dietary supplementation with methyl donors reduces fatty liver and modifies the fatty acid synthase DNA methylation profile in rats fed an obesogenic diet. Genes Nutr 2013;8:105-13.

Geraghty AA, et al. Nutrition during pregnancy impacts offspring's epigenetic status-evidence from human and animal studies. Nutr Metab Insights 2016;8:41-47.

Keywords Malnutrition, DoHAD, miRNA, DNA methylation, gestation

PREVENTION OF UNDERNUTRITION AND OBESITY IN CHILDREN AND ADOLESCENTS: A GLOBAL PERSPECTIVE

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Obesity prevalence is high in both developed and developing countries. Different types of undernutrition coexist with obesity, and this is more the case in developing than in developed countries. Growth retardation is often observed in children having obesity. Some micronutrient deficiencies are also frequent in children with obesity, such as iron deficiency anaemia or insufficient serum concentrations of vitamin D, as the most widely documented. This double burden of malnutrition observed at the population and at the individual level may be due to different causes. First of all, metabolic imprinting related with foetal malnutrition may be related with low birth weight in an important proportion of the new-borns. Obesity in the mothers and an excessive weight gain during pregnancy may also result in infants born large for their gestational age. Maternal micronutrient deficiencies should also be considered as part of the antenatal causes, mainly vitamin A and zinc.

During infancy and early childhood, children are often exposed to energy dense foods with low nutritional value. In addition, they are often sedentary. These factors may lead to the development of the double burden of malnutrition even at the individual level. Adequate nutrition is an essential driver of sustainable development because it plays a critical role in child brain development and generates broad-based economic growth.

Different strategies to prevent under- and over-nutrition are possible. At the general population level, policy changes should be introduced in order to reduce the exposure to the above mentioned determinants. Targeting the child, the family, the school, the community and the primary care health centres is also a necessary approach. Nutrition-specific interventions should be implemented by clinicians, including promotion of breastfeeding and complementary feeding practices and micronutrient supplementation and food fortification. Provision of nutrient dense foods with low energy density and reducing food insecurity are also efficient strategies. The final goal will be to reduce both sides of the malnutrition issue, affecting mainly low-income populations.

Keywords: Obesity, undernutrition, prevention, child, epidemiology

NEW EVIDENCE OF THE IMPORTANCE OF EARLY NUTRITION DURING THE FIRST 1,000 DAYS OF LIFE

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The first 1000 days of life (gestation and the first 2 years) represents a window of vulnerability for human development for several reasons: it is a period of high nutritional requirements, greater susceptibility to infections, rapid growth and development and full dependence on others for care, nutrition and social interaction. An area of great interest is the high sensitivity to programming affects during early life. In this presentation, we will review evidence of nutritional conditions that reduce human capital in the first 1000 days, among them iodine deficiency, iron deficiency and anemia, lack/short duration of breastfeeding, severe acute malnutrition, stunting and exposure to famine. Also, poor nutrition as well as excess in early life enhance risk of chronic diseases, perhaps through epigenetic changes, but the extent to which they do is not clear. It is important to recognize that the environment of the first 1000 days in low and middle-income countries has changed and is changing dramatically. From a combination of maternal underweight, short adult stature and micronutrient deficiencies, we are transitioning to maternal short adult stature (although heights are increasing slowly through improved growth in the first 1000 days) and obesity. In summary, the first 1000 days are a period of vulnerability but also a window of opportunity because it is during this time that nutrition interventions will be most effective in improving human capital and adult health. Effective policies and programs are needed for optimal child development in a globalized environment.

Keywords: 1000 days, human capital, adult health

PS_144/106

USING IMPLEMENTATION RESEARCH TO BUILD BETTER MULTISECTORAL PROGRAMS FOR IMPROVING MATERNAL AND CHILD NUTRITION OUTCOMES

INTRODUCTION: USING IMPLEMENTATION RESEARCH IN THE CONTEXT OF COMPREHENSIVE EVALUATIONS OF MULTISECTORAL PROGRAMS TO ASSESS PATHWAYS OF IMPACT AND INTERPRET IMPACT FINDINGS

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There is increasing evidence that multisectoral programs can improve maternal and child nutrition outcomes. However, multisectoral programs are complex and understanding the pathways by which such programs achieve impacts, and how these pathways can be leveraged to optimize impacts and coverage is not well understood. Some of the knowledge gaps can be addressed by working with program implementers as early as possible in the program cycle to design a program theory framework and the hypothesized pathways by which the program is expected to achieve impact, and embed data collection along these pathways as an integral part of the overall evaluation process. In recent years, there has been growing interest in using implementation research to fill the knowledge gaps related to program operation and implementation, as reflected for example in the launch of the Society for Implementation Science in Nutrition (SISN) in 2016. In response to this interest, a new generation of well-designed large-scale comprehensive evaluations of multisectoral programs focused on improving nutrition now includes implementation research as part of their overall evaluation plan.

This symposium reports on recent experience using implementation research in the context of comprehensive evaluations of multisectoral programs to assess how programs achieve impact and how researchers have worked with program implementers to promote uptake of the findings for program strengthening and scale-up. The target audience for this session includes researchers program implementers, donors, and policy makers who are interested in understanding how implementation research can be used to build better multisectoral programs.

The three learning objectives of this session are:

1) To strengthen the collective understanding of how implementation research can be used to build better multisectoral programs

2) To understand some of the challenges and opportunities of having program implementers and researchers working together to conduct implementation research

3) To catalyze collective action on using implementation research to build better multisectoral programs.

The introductory presentation in this session provides a general overview of what implementation research is and how it can be used to build better and more effective programs, drawing upon concepts highlighted by SISN.

LESSONS LEARNED FROM THE PROCESS EVALUATION OF HKI'S HOMESTEAD FOOD PRODUCTION PROGRAM IN BURKINA FASO

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Helen Keller International (HKI) has implemented its nutrition-sensitive agriculture model, Enhanced Homestead Food Production, across Asia for over 30 years, but only recently begun to adapt if for the context of sub-Saharan Africa. Thus, the collaboration with the International Food Policy Research Institute (IFPRI) on the first effort to deliver the program in Eastern Burkina Faso was especially valuable, both to evaluate the extent to which this multisectoral approach can improve nutritional outcomes in mothers and young children and to understand and strengthen the impact pathways in this setting. The study included a process evaluation carried out at midterm to assess the quality of delivery, request feedback from implementers partners and participants, and recommend necessary adjustments to strategy. A program impact pathways framework that identified how inputs and activities were expected to lead to changes in knowledge, practices and impact shaped questions for key informant and semi-structured interviews administered with implementing agents and beneficiaries, and with residents of control communities. Data were analyzed by IFPRI and shared with project managers and partners through a series of workshops, where weaknesses were discussed and solutions proposed. Overall, findings indicated that knowledge of both production and nutrition concepts was good and enthusiasm for the program was strong. However, water shortages due to fragile infrastructure and high poultry mortality posed major challenges to production, while lower than expected activity by community volunteers reduced the potential for impact on behavior change. To address constraints along the production pathways, the project team supported reparations to water points, promoted additional water conservation techniques, more drought resistant garden vegetables for the dry season, and expansion of vegetable production to the rainy season, and strengthened links to government veterinary health services. Solutions on the nutrition knowledge and practice pathways included organizing public recognition and

small gifts for community volunteers, and additional training to strengthen skills for interpersonal counseling and group facilitation and knowledge of key practices such as control of anemia and feeding the sick child. Changes were made to the program model as well to adapt it more closely to the local context. There were challenges to implementers in managing a complex, multisectoral intervention while meeting the demands of a rigorous research design with multiple rounds of data collection, analysis and application of learning. However, exposure to IFPRI's research methodologies also developed new skills among the implementing partners and deeper understanding of both quantitative and qualitative analysis. The collaboration between the research and implementing teams contributed to stronger program delivery and richer understanding of implementation challenges.

Keywords: Nutrition-sensitive agriculture, process evaluation

SCALING UP BEHAVIOR CHANGE INTERVENTIONS TO IMPROVE CHILD FEEDING: REFLECTIONS ON THE USE OF RESEARCH FINDINGS IN PROGRAM IMPLEMENTATION AND SCALE-UP

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Alive & Thrive's main purpose in using implementation research is to learn what works for program delivery. After developing an implementation framework based on experience across three countries in 2009-2014, we now apply implementation research as a tool for tailoring this framework and its components to new contexts in the following ways:

1. Making program design choices, specifically finding the priority behaviors in each program context that have the greatest potential to benefit and the specific determinants or drivers of these behaviors plus key influentials that need to be engaged including how best to reach these audiences for maximum coverage at the right time. The choice of program platforms is often driven by reach and timing of contacts.

2. Engaging the needed stakeholders and additional donors in the program by generating and compiling the evidence they need on critical gaps as well as what works.

3. Identifying exactly how and when to engage with other sectors such as WASH, education, and livelihoods by reviewing past experiences and conducting joint operations research and assessments to understand how these sectors can address design gaps or enhance program outcomes.

4. Monitoring, learning & evaluation to reach scale, and strengthen sustainability and equity components. This involves, continuous monitoring of reach and uptake, addressing gaps in quality as programs scale up, identifying where investments in institutional strengthening need to take place, conducting special studies.

Evaluation surveys conducted by IFPRI strengthened program strategies through identifying: the important role of local health providers in shaping IYCF practices in Bangladesh, negative im-

pact of C-section deliveries on early initiation of breastfeeding in Viet Nam, and dose-response relationship between the number of communication channels reaching mothers and their IYCF practices (all countries). IFPRI also demonstrated the value of investing in rigorous evaluation methods to advance credibility and global investments in large scale behavior change programs.

Implementation research covered a range of topics and methods in A&T countries:

• Qualitative rapid household trials in all countries on the feasibility of adopting new behaviors

• Willingness to pay study in Ethiopia on the viability of a processed complementary food

• Assessment of a franchising model within a government primary health care structure for IYCF counseling services in Viet Nam

• Media habits studies and opinion leader surveys in all countries

• Feasibility study of a package of maternal nutrition intervention integrated within an MNCH program in Bangladesh

• Studies on fasting in Ethiopia and the role of religious leaders to improve dietary diversity

• Testing a multi-component approach to improving washing hands with soap before feeding children in Bangladesh

• Assessing the role of husbands in Viet Nam and how to engage them effectively for supporting exclusive breastfeeding.

Challenges in A&T's use of implementation research included, limited research and analysis capacity in countries, reluctance to utilize research findings to shift program designs once the processes and materials were finalized at the start, short period of time to build a deep understanding of and commitment to a continuous cycle of 'design-learn-re-design' approach.

Keywords: Program delivery research, behavior change evidence, scaling up, breastfeeding, complementary feeding

ADDRESSING ISSUES OF SCALE, RIGOR AND CONTEXT IN THE DESIGN OF EVALUATIONS OF LARGE-SCALE BEHAVIOR CHANGE INTERVENTIONS IN BANGLADESH, VIETNAM AND ETHIOPIA

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Multisectoral programs are being launched globally to address the multiple determinants of poor nutrition simultaneously. As these program are designed and rolled out, it is apparent that interventions to support behavior change are a necessary major component of most multisectoral programs. However, the evidence

base on how to roll out and achieve impact through large-scale nutrition behavior change programs is limited, partly because of limited program efforts that are truly at scale and partly due to the challenges of rigorously evaluating complex large-scale programs. This presentation and its accompanying presentation (Sanghi et al, on Alive & Thrive) together address issues related to design and implementation of large-scale behavior change interventions and the evaluation of these large-scale interventions.

The evaluation of Alive & Thrive (A&T), a multi-year initiative that aimed to improve IYCF practices in Bangladesh, Vietnam and Ethiopia using multiple delivery platforms, addresses several evaluation challenges including: the technical aspects related to evaluating the nutritional impact of interventions targeted during the first two years of life when rapid growth faltering occurs; the identification of proper counterfactuals in the context of rapidly scaling-up programs; and the development of methodologies and tools to assess implementation, utilization and program impact pathways within evolving program portfolios. We designed the impact and process evaluations through a technically robust and programmatically engaged, step-wise process in three countries.

In Bangladesh and Vietnam, cluster-randomized probability evaluation designs were used; in Ethiopia, the evaluation used an adequacy design. In addition, different methodological approaches were utilized to answer critical "how" questions and to generate information on the many processes and pathways to program impact. The methodological approach that guided all process evaluation activities included four components: 1) developing detailed program impact pathway models, 2) linking data collection to program impact pathways (PIPs) utilizing mixed methods, and multiple data sources, 3) linking evaluation timelines with program implementation timelines, and 4) engagement with the program implementation and management teams.

Using these approaches, in all three countries, theory-driven impact and process evaluations based on program impact pathways, and using mixed methods, generated information on impact of the interventions and on factors that facilitated or prevented achievement of impact and scale. Intervention impacts on infant and young child feeding practices, were largely positive, but mixed. Behavioral impacts were greater with intervention platforms that were able to reach higher coverage and where the population context was conducive to behavior change. There was no impact on child growth in any of the contexts, although impacts were seen on motor and language milestone achievement in Bangladesh.

We conclude that robust impact and process evaluations of complex, large-scale nutrition programs are feasible, but that early implementer-evaluator engagement and shared vision and motivation to establishing rigorous designs are essential. The positive, but mixed, impacts on behaviors suggests that accompanying multisectoral interventions that address other constraints may deliver much greater impact. The program and evaluation experience offer multiple lessons for implementation and evaluation of behavior change interventions at scale.

Keywords: Behavior change, program evaluation, scale

LESSONS LEARNED FROM DESIGNING AND IMPLEMENTING AN INTEGRATED NUTRITION, LIVELIHOOD AND ECD PROJECT IN MALAWI

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Abstract In Malawi, 37 percent of children aged 6-59 months are stunted and 63 percent are anaemic (DHS, 2016). As a member of the Scaling Up Nutrition movement, the government promotes a multi-sectoral approach to tackling malnutrition in Malawi. The national Early Childcare and Development (ECD) programme targets all children aged 0-8 years by providing safe, stimulating environments, access to health and nutrition services, and capacity building for parents and caregivers through community based preschools and parenting groups. Today, there are an estimated 9,000 community-run preschools across Malawi, serving 32 percent of all 3-5 year olds in the country, of which 20% are orphans and vulnerable children.

One of the main causes of low preschool attendance and closure in Malawi is lack of food (The World Bank, 2014), when communities are not able to provide food for the mid-morning snack. To address this issue, Save the Children began integrating nutrition, agriculture and livelihood components to its ECD programmes to build community capacity to provide nutritious food in preschools all year round, and improve household food security and nutrition at the same time. Best practice was drawn from large nutrition and livelihood projects like the USAID funded Wellness and Agriculture for Life Advancement project (WALA) and used to create an ECD nutrition and livelihood package. It was piloted and implemented in the World Bank Protecting Early Childhood Development Project (PECD) reaching 199 preschools in 4 districts with support from Conrad N Hilton Foundation. It was then further improved and evaluated in Save the Children's ongoing ECD programme in Zomba district with support from PATH's Nutrition Embedding Evaluation Program (NEEP).

Using preschool kitchens and gardens and parent groups as training platforms, parents and community members learn new recipes, food processing and preparation techniques, agricultural methods, and techniques to grow and store climate resilient nutritious foods all year round. A village savings and loans system is also set up to help community members, women in particular, set up small businesses and earn cash. This integrated ECD, nutrition and livelihood package benefits the preschool, the households and the community as a whole to become more organised, climate resilient and food secure, which in turn helps improve child nutrition and development.

Where community preschools are present, they provide a valuable platform for building community and household capacity and resilience to improve food security, child health, nutrition and development. A cluster randomised trial has been conducted by IFPRI, the University of Malawi and Save the Children to evaluate the impact of this integrated package on agricultural production, caregiver behaviours, child nutrition and development (presented separately). Further work is needed to simplify the training package and prioritise messages across the sectors before scale up nationwide.

Keywords: Malawi, preschools, livelihood, early childhood development, ECD

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OPTIMIZING AN ECD-BASED, AGRICULTURE AND NUTRITION PROGRAM TO IMPROVE THE DIETS OF PRE-SCHOOL CHILDREN IN MALAWI

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The Nutrition Embedded Evaluation Program Impact Evaluation (NEEP-IE) study is a cluster randomised controlled trial designed to evaluate the impact of a childcare centre-based integrated nutrition and agriculture intervention on the diets, nutrition and development of young children in Malawi. The intervention includes activities to improve nutritious food production and training/behaviour change communication to improve food intake, care and hygiene practices. This presentation summarises the findings of the cluster randomised trial and the implications for policy and implementation.

Keywords: Impact evaluation, early childhood, diets, policy, implementation.

PS_ 144/71

THE WHA GLOBAL NUTRITION TARGETS FOR 2025: TACKLING THE DOUBLE BURDEN OF MALNUTRITION THROUGH THE LIFECYCLE

WHO TOOLS TO SUPPORT COUNTRIES IN SETTING NATIONAL NUTRITION TARGETS

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The translation of global targets into national targets needs to consider country context. This involves, first, the identification of nutrition challenges and, second, setting targets to address those challenges. The WHO Nutrition Landscape Information System (NLIS) provides country profiles with key indicators in nutrition s a system that links to all WHO nutrition databases. It provides country profiles that combine data from WHO and its partners on nutrition outcomes and causal factors related to food, health and care at the immediate, underlying and basic level. National targets are adapted from the Global Nutrition Targets, using tools such as the WHO Tracking Tool.

Third, countries need to select priority interventions to address the identified problems and reach their national targets. The WHO Global Nutrition Targets Policy Briefs provide a summary of action needed to effectively address the targets. Furthermore, the WHO e-Library on Evidence for Nutrition Action (eLENA) provides the evidence, the current recommendations and the rationale for more than 100 nutrition interventions. Interventions in eLENA are also linked to the Global Nutrition Targets, where evidence suggest linkages exist.

Fourth, the detailed planning for scaling up priority interventions will depend on the political willingness, the health system, human resources and other infrastructure in the country. The Landscape Analysis country assessment tools provides a methodology for rapid assessment of country commitment and capacity, as a measure of their readiness to scale up nutrition action. The UN OneHealth Tool allows countries to do the detailed costing and planning of different scaling-up scenarios. The Tool contains a series of health programme modules including one for nutrition covering the WHO Essential Nutrition Actions that target the 1000-days window of opportunity from conception to 2 years of age. It incorporates the Lives Saved Tool (LiST), which estimates the impact of planned programmes on child mortality and morbidity as well as stunting, wasting, anaemia, low birth weight and breastfeeding. The WHO Global Database on the Implementation of Nutrition Action (GINA) provides information on policies and actions being implemented in countries, including lessons learnt and best practices that would be helpful to other countries.

The fifth and final step involves monitoring of progress made and evaluation and outcomes reached, using key indicators such as those in the Global Nutrition Monitoring Framework. Another aspect of monitoring includes tracking of expenditures to nutrition specific and sensitive actions implemented through the health sector, which could be facilitated by the Health Accounts.

Keywords: Evidence-informed nutrition policy planning; National nutrition target setting; Evidence-informed nutrition actions; Costing of nutrition actions; Nutrition policy monitoring

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PS_ 144/78

OBJECTIVE ASSESSMENT OF BREASTFEEDING PRACTICES

THE IMPORTANCE OF OBJECTIVE ASSESSMENT FOR EVALUATION OF BREASTFEEDING PRACTICES IN AFRICAN INFANTS

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Exclusive breastfeeding has been recommended by the World Health Organization for the first six months of an infant's life, yet

in Africa reported exclusive breastfeeding rates are low. There are many cultural barriers and breastfeeding myths that prevail and in a continent with high levels of HIV infection, HIV-infected mothers also experience many challenges when wishing to practice exclusive breastfeeding.

The dose-to-mother deuterium dilution technique has made it possible to distinguish between water ingested by the baby via breastfeeding and water from sources other than human milk thus allowing objective evaluation of whether a mother is exclusively breastfeeding her infant as well as the volume of human milk. This technique makes it possible to compare this objective measure of exclusive breastfeeding with maternal recall of infant feeding practices. Furthermore the technique also enables these objective measures of infant feeding to be used to assess the true impact of exclusive breastfeeding on other infant outcome measures.

The dose-to-mother deuterium dilution technique was used to evaluate human milk intake and the exclusivity of breastfeeding, which was taken to be ≤25g/day of water from sources other than human milk. Determination of exclusive breastfeeding by maternal recall was established from a list of foods / liquids that the mother gave to the baby.

Infants from seven African countries were enrolled as part of various national and regional projects supported by the International Atomic Energy Agency. Reported and objective exclusive breastfeeding data was collected at 3 months (459 infants) and 6 months (154 infants).

Using the human milk intake data, further studies were carried out in South Africa, viz. human milk output in HIV-infected and –uninfected mothers and the effect of early breastfeeding practices on infant body composition at 12 months.

The pooled results revealed that at 3 months there was no significant correlation between reported and objectively measured exclusive breastfeeding (P=0.14, K=0.03). At 6 months the correlation was significant but the Kappa value was low (P=0.00, K=0.28) indicating only a poor agreement between the two methods of determining exclusive breastfeeding.

Other key findings using the dose-to-mother technique in South Africa included that HIV-infected mothers were able to produce sufficient volumes of human milk, which were comparable to non-infected mothers and without compromising their own health; and that infants who were exclusively breastfed up to 6 months had a lower percentage fat mass at 12 months.

The large discrepancies found between reported and objectively measured exclusive breastfeeding suggest that maternal recall, while being a good indicator for large-scale health surveys, is not ideal when an objective measure is needed to study the impact of exclusive breastfeeding interventions. Measurement of exclusive breastfeeding using the dose-to-mother technique has thus made it possible to objectively study important infant outcomes that could result from early infant feeding choices.

The benefits of an objective measurement of exclusive breastfeeding in this pooled study of African infants were highlighted by the poor correlation with maternal recall of exclusive breastfeeding and its potential to be used to study other important infant outcomes.

Keywords: Exclusive Breastfeeding; Deuterium dilution; Maternal recall; HIV-infected mothers; Human milk intake

BREASTFEEDING IMPACT ON BODY COMPOSITION AND GROWTH IN THE FIRST YEAR OF LIFE IN LATIN AMERICAN INFANTS

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Breastfeeding promotes infant growth through its nutritional and bioactive properties, by reducing incidence and severity of potentially growth-affecting infections, and by improving feeding during illness. Besides preventing growth deficit, especially among poorer populations, breastfeeding may prevent obesity during childhood. Evidence about breastfeeding, growth, and body composition has rarely been studied in Latin America. Therefore, we aimed to assess the association of breastmilk intake with body composition and growth in the first year of life in Latin American infants.

290 Latin American mother-infant pairs, who were part of an IAEA regional project in Latin America, were evaluated. They were from Argentina (n=18), Brazil (n=32), Chile (n=81), Cuba (n=24), Dominican Republic (n=50), Ecuador (n=27), Guatemala (n=36) and Uruguay (n=22). Infants were eligible if they had adequate length-for-age (> -2 SD) and BMI-for-age (-2SD>BMI-for-age<+2SD), and if they were receiving breast milk at 3 months. Breast milk and non-breast milk water intakes were measured using the deuterium-oxide 'dose-to-mother' technique at 3 months. Exclusively breastfed (n= 170) and non-exclusively breastfed infants (n=120) were defined based on mother's report. Growth was evaluated with length-for-age z-scores, and body composition was also determined using the deuterium dilution technique at 3 and 12 months. To assess the association between breastmilk intake, body composition and growth in the first year of life we ran random effects models with exposure defined as breastmilk intake at 3m, and outcomes defined as change in z-scores for length-for-age, and change in fat mass index (FMI) and fat-free mass index (FFMI) from 3 to 12 months, adjusted for sex.

48% were girls. At enrollment, the mean (SD) age was 3.8 (0.6) months, mean length-for-age and BMI-for-age z-scores were -0.83 (1.19) and, 0.64 (1.13), respectively. Exclusively breastfed infants received 857.6 (821.8, 893.4) g/day (mean, 95% CI) of human milk and 69.7 (46.3, 93.1) g/day of non-breast milk water, whereas non-exclusively breastfed infants received 516.0 (454.2, 577.8) g human milk and 451.2 (358.9, 543.6) g non-breast milk water per day at 3m. We did not find differences in body composition and length-for-age (z-scores) between exclusively breastfed and non-exclusively breastfed infants at 3 and 12 months, and no effect on changes in body composition was observed. However, a daily breastmilk intake of 100 g/day was associated with a mean increment of 0.01 (95% CI= 0.003, 0.11) length-for-age (z-scores) during the first year of life in infants who were exclusively breastfed at 3 months of age.

This study in eight Latin American countries did not find any association between breastfeeding patterns at 3 months and changes in body composition in the first year of life. Exclusive breastfeeding led to a modest increment in length in the first year of life.

Keywords: Breastfeeding, body composition, growth, infants, Latin America

BREASTMILK INTAKE AND COMPLEMENTARY FEEDING PRACTICES IN INFANTS AND YOUNG CHILDREN IN URBAN AND RURAL AREAS OF INDIA

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Exclusive breastfeeding for first six months of life, followed by complementary feeding and continuation of breastfeeding is advocated by international health agencies. The preliminary results of the National Family Health Survey of India (NFHS-4, Year 2015-16) show that the prevalence of stunting, wasting and underweight in under-5 children is 38.4, 21 and 35.7% respectively. Percentage of children under age 3 years who are breastfed within one hour of birth is 41.6, and only 55% of infants under age 6 months are exclusively breastfed. Complementary feeding is introduced in 42.7% of infants aged 6 to 8 months, and minimum adequate diet, as defined by the WHO-UNICEF, is seen in only 8.7% of breastfed infants in the age group 6 to 23 months.

Our observation of infant and young child feeding practices in 500 urban and rural infants in India are similar. The rate of continued breastfeeding in rural infants at 12 months was 90% and at 24 months it was up to 52%. In longitudinal follow up of rural breastfed infants, human milk intake measured using stable isotope technique, was 693 ± 178 g/d (190 ±37 g/kg/d) at 1 month age, 866 ± 127 g/d (128 ±18 g/kg/d) at 6, 596 ± 193 g/d (79 ±29 g/kg/d) at 12, and 380 ± 239 g/d (38 ±24 g/kg/d) at 24 months. The total human milk intake per day observed in this population was comparable to that reported from other developing and developed populations. Poor dietary diversity in infants beyond 6 months age was predominated by low consumption of animal-source food and also of vitamin-A rich fruits and vegetables.

High rates of continued breastfeeding beyond the age of 12 months in rural infants underpins the need to ensure adequate nutrition of lactating women. Ensuring optimal dietary diversity in infants through complementary feeding should also be a priority to prevent growth faltering.

Use of stable isotope technique helps not only to measure intake of human milk and non-milk oral water intake in breastfed infants, thereby providing quantitative information about the practice of exclusive breastfeeding, but also the follow up measurements give valuable information about milk intake volume in infants who continue to be breastfed beyond 6 months of age. Combination of data obtained from stable isotope techniques (viz. human milk intake and infant's body composition) and data from anthropometry and dietary intake provide important tools to measure determinants of growth in early life. This research was funded by the International Atomic Energy Agency, Vienna, Austria.

Keywords: Breastfeeding, complementary feeding, stable isotope, India.

INFECTIONS IN PREGNANCY: A HUGE, AND AVOIDABLE, CAUSE OF MALNUTRITION IN CHILDHOOD

MAINSTREAMING THE CONTROL OF MATERNAL INFECTIONS INTO NUTRITION PROGRAMMES

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Across the world, many women suffer from infections during pregnancy. Even when not specific to the reproductive organs, these infections can disrupt the normal course of pregnancy and/or reduce the flow of nutrients to the foetus, causing premature delivery, intrauterine growth restriction, or both. Both prematurity and intrauterine growth restriction manifest in small body size at birth, and very often these low birth weight babies fail to catch up their growth during infancy and childhood and remain visibly malnourished into adolescence and beyond. Given the high prevalence in some locations of infections such as malaria and peri-

odontal disease, and the high attributable risk of others such as syphilis, it is quite plausible that maternal infections could contribute as much as one third of the total burden of low birth weight in Africa and Asia.

At present, the detection and treatment of infections during pregnancy is not considered an integral part of nutrition programming in low or middle income countries. Instead, nutrition programmes delivered during pregnancy tend to focus on the provision of micronutrients (particularly, iron and folic acid) and dietary advice. Interventions which are not focused on increasing intake of one or a combination of nutrients are seen as "somebody else's business". A concerted effort needs to be made to re-conceptualise nutrition programmes, during pregnancy and beyond, as a comprehensive set of interventions delivered to clients with the aim of improving nutritional outcomes—such an approach would immediately elevate the importance of tackling infections during pregnancy.

We propose a *R-A-D-I-C-A-L* approach to mainstreaming the control of infections in pregnancy within the context of nutrition programmes. This would involve:

- *R*eviewing the local epidemiology of relevant infections to determine which are likely to be contributing to prematurity and small-for-gestational age in specific sub-groups of women;

- *A*ntenatal care promotion as a key component of nutrition programming;

- Point-of-care *d*iagnostics in antenatal care to screen for infections such as malaria or asymptomatic bacteriuria;

- *I*mmunising pregnant women against preventable infections such as influenza;

- *C*ounselling to encourage appropriate management of illness such as STIs;

- *A*ward recognition for health workers who increase the prevalence of detection and treatment;

- *L*ine-listing and follow-up of all pregnant women to ensure that tests and treatments are not missed and treatments are effective.

The recent publication of new WHO guidelines on "antenatal care for a positive pregnancy experience" provide an ideal opportunity for strengthening the co-delivery of effective nutrient and infection control interventions. In India, this has coincided with the announcement of a new Prime Ministerial Initiative to improve antenatal screening at each health facility once a month. Building on these opportunities, the Children's Investment Fund Foundation is supporting Jhpiego and the Government of Rajasthan to pilot the R-A-D-I-C-A-L approach in four districts in the state, with results expected early in 2019.

Keywords: Infections, pregnancy; low birthweight; nutrition programmes.

PRESUMPTIVE TREATMENT OF PREGNANT WOMEN WITH ANTIMALARIALS AND ANTIBIOTICS IN MALAWI: IMPACT ON CHILD GROWTH, DEVELOPMENT AND MORTALITY UP TO FIVE YEARS

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Background: Stunting affects a quarter of the world's children and is associated with increased mortality and developmental delay. We showed earlier that intermittent preventive treatment against malaria and other infections in pregnancy was associated with reduced prevalence of neonatal stunting in Malawi. In this follow-up, we assessed whether these gains were sustained and reflected in the epidemiology of childhood growth, development, and mortality.

Methods: We enrolled 1320 women with uncomplicated second-trimester pregnancies in a randomised, partially placebo-controlled, outcome assessor-blinded, three-arm clinical trial in rural Malawi and preventively treated them for malaria and other infections with either two doses of sulfadoxine-pyrimethamine (SP, control), monthly SP, or monthly SP and azithromycin twice (AZI-SP). Child height/length and mortality were recorded at one, six, 12, 24, 36, 48 and 60 months and child development at 60 months of age. Our primary hypothesis was that the difference in mean length at birth would be retained for five years and reflected in a permanently lower incidence and prevalence of stunting among babies born to women treated with AZI-SP. We also hypothesized that these children would have a higher mean developmental score at the age of five and a lower mortality by five years than children born to women in the control group.

Findings. Between December 1, 2003 and October 11, 2006 we enrolled 1320 women to the study and randomised them to the control (n=436), monthly SP (n=441) and AZI-SP group (n=443). There were 3, 2 and 2 twin pregnancies in the control, monthly SP and AZI-SP groups, respectively, resulting in 1327 fetuses for follow-up. Throughout the follow-up mean child length was

0.4–0.7 cm higher (p<0.05 at 1-12 months), prevalence of stunting 6-11% lower (p<0.05 at 12-36 months) and five-year cumulative incidence of stunting 13% lower (hazard ratio 0.70, 95% CI 0.60 to 0.83) in the AZI-SP than control group. Mean developmental score was 108.6, 110.2 and 112.4 (difference in means AZI-SP vs control 3.8, 95% CI 1.1 to 6.4; AZI-SP vs monthly SP 2.2, -0.4 to 4.8) in the control, monthly SP and AZI-SP group, respectively. There were no statistically significant differences between groups in the cumulative five-year mortality (hazard ratio AZI-SP vs control 0.84, 95% CI 0.59 to 1.20; AZI-SP vs monthly SP 0.85, 0.60 to 1.21). Total mortality during pregnancy (abortion/stillbirth) and childhood was 15.3%, 15.1%, and 13.1% (risk ratio AZI-SP vs control 0.86, 95% CI 0.62 to 1.19; AZI-SP vs monthly SP 0.87, 0.62 to 1.20) in the control, monthly SP and AZI-SP group, respectively. For postneonatal mortality (secondary outcome), the proportions were 5.5%, 3.3%, and 1.9%, respectively (risk ratio AZI-SP vs control 0.34, 0.15 to 0.76; AZI-SP vs monthly SP 0.56, 0.24 to 1.32).

Interpretation. Provision of AZI-SP rather than two doses of SP during pregnancy reduced the incidence of stunting in childhood in Malawi. AZI-SP during pregnancy also had a positive effect on child development and may have reduced postneonatal mortality.

Keywords: Maternal, infection, treatment, child, growth

MATERNAL HIV EXPOSURE AND POOR CHILD GROWTH

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Areas of high HIV prevalence, mainly in Sub-Saharan Africa, overlap with areas of food insecurity and high exposure to other infectious diseases. Simultaneous exposure to maternal HIV, deficient diet, and infectious diseases can have both additive and synergistic adverse effects on infant and child growth and nutrition.

With the roll-out of antiretroviral therapy (ART) in Africa, including Option B+ which permits safer breastfeeding by HIV-infected, ART-treated women, the proportion of HIV-exposed infants who themselves become HIV-infected has decreased dramatically. However, those who do become HIV-infected continue to suffer high levels of malnutrition. Growth deficits of HIV-exposed infants start in utero, as indicated by their lower birth weight than that of HIV-unexposed infants, so that even those who remain HIV-uninfected themselves are at risk of stunting. Once a child becomes HIV-infected, growth faltering can be progressive so that the earlier in life HIV infection occurs, the greater the growth failure. Fortunately, growth faltering can be mitigated by early infant HIV diagnosis and treatment with ART. In addition, it is now recognized that many children who became HIV-infected years ago, before ART was widely available, are surviving into adolescence and adulthood with chronic malnutrition and frequent infections. Diagnosing these older children and getting them onto ART in order to improve their growth, nutrition and health is a priority.

Slow growth in itself is not a major concern unless it is associated with functional problems. In the case of maternal HIV exposure, there is evidence that the poor growth is associated with functionally important deficits to the immune system and in mental and motor development. Although as yet data are limited for African children, HIV-exposed children may be at high risk for chronic diseases in later life because of low birth weight, early growth faltering and, for the HIV-infected children, being treated with ART for most of their lives.

The causes of poor growth among HIV-exposed children are likely multiple and interacting. Socioeconomic consequences of parental HIV infection may contribute to malnutrition. Parental HIV infection, with consequent increased household exposure to opportunistic pathogens, increases rates of child infections which reduce growth. In the past, reduced duration of breastfeeding in order to reduce risk of child HIV infection could have reduced children growth through both poor nutrition and reduced immunological protection; however, with Option B+, breastfeeding rates by HIV-infected African women have improved. Placental abnormalities, including inflammation and infection, may contribute to the prenatal growth faltering and, through reduced placental transfer of immunoglobulins, increase risk of infant infection.

Maternal ART, in spite of its potential side effects on child growth, has both direct and indirect, through reduced maternal infection and improved ability to care for her family, benefits on health of HIV-exposed children so programs scaling up maternal ART should be supported. Since there is evidence that the growth faltering begins in utero, all forms of maternal care during pregnancy, including improved nutrition and treatment of infections, will likely benefit the infant's growth and nutrition.

Keywords: HIV, growth, infant, breastfeeding, maternal health

THE IMPACT OF SCREENING AND TREATMENT OF MATERNAL GENITOURINARY TRACT INFECTIONS ON PRETERM BIRTH AND SMALL FOR GESTATIONAL AGE IN RURAL BANGLADESH

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Approximately half of preterm births are attributed to infections in pregnancy, which are commonly undetected and untreated in low-resource settings. Maternal genitourinary tract infections may result in systemic infection and inflammation, increasing risk of preterm birth and, potentially, fetal growth restriction. Two infections that are potential targets for antenatal screening include abnormal vaginal flora (AVF) and urinary tract infection (UTI).

We aimed to determine the impact of early pregnancy screening and treatment of maternal genitourinary tract infections (AVF and UTI) on the incidence of preterm live birth and small-for-gestational-age (SGA) in Sylhet, Bangladesh.

We conducted a cluster-randomized, community-based trial in rural Sylhet district, Bangladesh. Twenty-four clusters (population/cluster: ~4000; births/year: ~120), each served by a community health worker (CHW), were randomized to either: 1) the intervention arm, which received routine home-based antenatal and postnatal care, plus screening and treatment of pregnant women between 13-19 weeks of gestation for genitourinary tract infections, or 2) the control arm, which received routine home-based antenatal and post-natal care only. In the intervention clusters, CHWs performed home-based screening for AVF and UTI. Self-collected vaginal smears were Gram stained and Nugent scored. Women with AVF (Nugent score ≥4) were treated with oral clindamycin, rescreened and retreated after 3 weeks as needed. Urine culture was performed and UTI treated with nitrofurantoin. Repeat urine culture was performed after 1 week for test of cure.

Between January 2012 and March 2016, 9712 pregnancies were enrolled (n=4840 intervention clusters, n=4391 control clusters). There were 3818 live births in the intervention arm and 3557 in the control arm. The prevalence of AVF infection was 16.3% (95%CI: 15.1-17.6%) and UTI was 8.6% (95%CI: 7.7-9.5%) in the intervention arm. Coverage of home-based treatment and rates of cure were 86.2% and 58.0%, respectively, for AVF, and 85.5% and 70.7% for UTI. There were no significant differences between intervention (I) and control (C) groups in: mean gestational age (I: 38.7 wks [SD 3.1], C: 38.9 wks [SD 3.1]; mean difference: -0.14 [95%CI: -0.37-0.07]), incidence of preterm birth (I: 21.8%, C: 20.6%, relative risk (RR): 1.07 [95%CI: 0.91-1.24]), incidence of low birthweight (I: 21.4%, C: 20.7%; RR: 1.03 [95% CI: 0.78–1.37]), or SGA (Intergrowth 21st) (I: 29.7%, C: 33.1%; RR: 0.90 [95%CI: 0.76-1.06]). Rates of stillbirth (I: 53.3/1000 births, C: 44.6/1000; RR: 1.19 [95%CI: 0.91-1.55]) and neonatal mortality (I: 31.4/1000 live births, C: 37.7/1000; RR: 0.82 [95%CI: 0.57-1.18]) did not significantly differ between groups.

A community-based screening and treatment program for AVF and UTI did not reduce the incidence of preterm birth or SGA in rural Sylhet, Bangladesh. Potential reasons for the lack of population-level impact include the relatively low prevalence of infection and rates of cure, as well as heterogeneity in the composition of AVF. Further research is needed to understand the microbiota of AVF in different populations and its role in preterm birth, as well as the identification of other targets for the primary prevention of preterm birth.

Keywords
Abnormal vaginal flora, urinary tract infection, preterm birth, small for gestational age, low birthweight

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ADOLESCENT NUTRITION GLOBALLY: A NEW FRONTIER FOR ACTION

ADOLESCENT HEALTH AND NUTRITION ANALYSIS FROM OBSERVATIONAL STUDIES: KEY FINDINGS FROM A GLOBAL LEARNING INITIATIVE

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Supporting the transition from childhood to adulthood is an important element of the Sustainable Development Goals. Researchers have started addressing the information gap about the adolescent's demographic group, examining issues of health and access to health services, food security, empowerment, nutritional status, enrollment in education, etc. The Sackler Institute has been contributing to this global effort by focusing on describing the multi-faceted nature of challenges faced by adolescents in low and middle income countries through a collaborative learning initiative.

Nine studies were funded in 2015 with the goal of mining existing datasets for information on adolescent's nutritional status from

Asia (China, Bangladesh, India, the Philippines), Africa (South Africa, Ethiopia, Gambia, Ghana) and Latin America (Peru), thus gathering and comparing data from cross-sectional surveys, longitudinal studies and intervention trials. Taken together, these studies painted a heterogeneous picture in terms of size and direction of effects of known predictors (e.g. living in rural areas, household income, schooling, and gender) on dietary adequacy and quality. Regarding nutritional status, rising rates of overweight and obesity at an increasingly younger age prompts the need to better capture food decisions and the influence of the food environment in low and middle income countries. When discussing implications for future interventions, this group of studies illuminated an unanticipated research gap: there is a dearth of knowledge relating to the type of activities and occupations adolescent girls and young women engage in, including formal and informal, full time or part time, employment. Describing occupation types and how it links to nutrition and health will highlight a potentially important pathway towards empowerment, and help inform intervention strategies aimed directly at this group. An additional round of studies, funded in 2017, will be addressing this specific question.

Keywords: Adolescent, Nutrition, Occupation, Collaboration

GLOBAL BURDEN AND EPIDEMIOLOGY OF ADOLESCENT NUTRITION: ISSUES AND RISK FACTORS

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Globally there are 1.2 billion adolescents, equivalent to almost 20% of the total world population, 90% of whom live in low and middle income countries (LMIC). In the coming decade, regions with high fertility rates such as sub-Saharan Africa will see rapid growth in their adolescent populations, as compared to regions where fertility is declining, such as in Asia and Latin America. Adolescence is a period of rapid growth and development when the influence of adequate nutrition may be high. Peak linear growth velocity occurs in adolescence, wherein 15-25% of adult height and 50% of adult weight is attained. As such, adolescence and the growth spurt that occurs in this period is often thought of as a period of potential catch up of growth deficits that occurred in early childhood. Nutritional status also influences onset of menarche and subsequent linear growth, both of which have a wealth differential.

In many settings, adolescents especially girls fail to reach their full growth and development potential. Although global data are lacking on the burden of poor growth and nutritional deficiencies, stunting, low BMI and anemia (largely related to iron deficiency) have been identified as public health concerns. Another rising concern in LMIC is the trend of high BMI, although the cluster of countries where low and high BMI exist tends to be different. Iron deficiency has been identified as one of the top 15 leading global risk factors for death and DALYs in ages 10-19 y among box sexes in 2013. Additionally, vitamin A deficiency was included in the 15 top ranking factors for DALYs in ages 10-14. Micronutrient

deficiencies beyond these are not well recorded and dietary intake data are urgently needed to determine inadequacies, given high nutritional requirements for energy, protein, calcium, iron, and other nutrients during this time.

Social factors such as gender norms discriminating against girls, early marriage, school drop out, and sexual abuse are important drivers of poor adolescent health and nutritional well-being, especially among girls. Eating patterns, food habits and preferences, peer and parental influences, and body image all influence the diets of adolescents in addition to socioeconomic and cultural factors influencing food intake. In some settings, adolescents may be vulnerable to food insecurity. In contrast, snacking, lower physical activity, and alcohol and tobacco use frequently begin during this period of life, especially in urban locales, and likely impact nutritional status during this age.

Adolescent pregnancy, especially in girls 15-19 y of age, not only increases morbidity and mortality risk but compounds the nutritional problems. Young mothers are at an increased risk of adverse birth outcomes, including preterm birth and fetal growth restriction. Preconception undernutrition and increased nutrient requirements of pregnancy takes a toll on both the young woman and her infant. Premature pregnancy can result in halting linear growth among adolescents with consequences for short stature in adulthood.

The period of adolescence is overwhelmingly data-poor related to nutritional status, calling for the need for systematic assessment of nutritional indicators, diet, and factors influencing these, globally.

Keywords: Adolescence, nutrition, stunting, anemia, diet

EFFECTIVENESS OF NUTRITION INTERVENTIONS AMONG ADOLESCENT GIRLS; HOW DOES THE EVIDENCE STACK UP?

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Adolescence is a critical stage in the lifecycle and adequate nutrition is necessary for the proper growth and development of individuals, and of their offspring. In this paper we have comprehensively reviewed all published systematic reviews (till October 2016) on adolescents (10-19 years) and women of reproductive age including pregnant women that targeted interventions related to nutrition. For interventions where there was no existing systematic review on adolescents, we reviewed primary studies/trials. We included interventions on micronutrient supplementation, food energy/protein supplementation, nutrition education for pregnant adolescent, obesity prevention and management and management of gestational diabetes.

We identified a total of 35 systematic reviews of which only five were conducted on adolescents; and 107 primary studies on adolescents. Our review suggests that iron alone, iron-folic acid,

zinc and multiple micronutrient supplementation can significantly improve serum hemoglobin concentration. While there was a lot of variability in study design to detect dose-response results, the overall evidence suggests that daily IFA supplementation reduced the prevalence of anemia (RR 0.52; 95% CI 0.28, 0.96; 3 studies, n=1979) and improved the serum hemoglobin concentrations (MD 10.07; 95% CI 4.05, 16.10; 5 studies, n=822) among adolescent girls; and that weekly iron/folic acid supplementation also led to reduction in anemia (RR 0.73; 95% CI 0.58, 0.92; 9 studies) and improved the serum hemoglobin concentration (MD 2.24; 95% CI 0.36, 4.12; 6 studies, n=2839). While, zinc supplementation among pregnant adolescent showed improvement in preterm birth and low birth weight, we found paucity of trials on food protein/energy supplementation and other micronutrients. We shall also share findings from the individual subject data analysis from a recent collaborative exercise on the impact of multiple micronutrient supplements on adolescents during pregnancy compared to other age groups. Interventions to prevent and manage obesity showed a non-significant impact on reducing body mass index.

This review underscores the importance of adolescent nutrition interventions and paucity of policy relevant information therein. It is imperative that countries should design nutritional interventions particularly for adolescents.

Keywords: Adolescence, Nutrition, Micronutrients

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HOW CAN COMMUNICATIONS FOR MATERNAL INFANT AND YOUNG CHILD NUTRITION BE IMPROVED? LESSONS FROM SOUTH ASIA

CHALLENGES IN DEVELOPMENT AND IMPLEMENTATION OF M-SAKHI – (MOBILE-SOLUTIONS AIDING KNOWLEDGE FOR HEALTH IMPROVEMENT) TO IMPROVE MATERNAL AND CHILD HEALTH AND NUTRITION IN RURAL MAHARASHTRA, INDIA

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Innovative mHealth solutions have the potential to enhance the monitoring and delivery of nutrition, healthcare and other supportive services to pregnant and lactating women and their infants even in remote rural areas of India. We recently deployed M-SAKHI (Mobile-Solutions Aiding Knowledge for Health Improvement) a mobile based IT solution in 241 villages of central India that has enrolled 1540 pregnant women, for improving nutrition and health outcomes in the first 1000 days of life. This multi-component package aims to promote data collection by community health workers (CHW), aid in counseling of beneficiaries, provides timed targeted text and voice messages, and, real time monitoring of beneficiaries on the server. Numerous challenges are encountered when new technology is deployed. Identification, addressing and sharing of experienced challenges serves to enable sustainability and inform other M-health interventions.

To describe the challenges identified in development and deployment of M- SAKHI

This qualitative study collected data on challenges during technical development, and deployment in the field in the following ways i) weekly meetings with developers and the implementers, ii) daily reporting using Whatsapp groups, iii) daily reporting of challenges put into a "challenge reporting box". The recorded challenges were then sorted and categorized under various themes.

Challenges identified were in the following area - i) Obtaining government approvals for the use of M-Health technology by the existing government health providers, ii) obtaining funding, iii) sourcing technological partners, public health, nutrition and clinical expertise to develop technology that responds to the nutrition and health needs of rural pregnant women, iv) recruiting experienced staff for implementation, v) developing culture and language specific counseling messages and videos embedded in the App, vi) formulating nutritionally appropriate, culturally acceptable text and voice messages of suitable length, vii) synchronization of triggers for delivery of server based alert messages, viii) data entry and synchronization of data across different delivery platforms of multiple health providers, ix) training and retention of CHW, x) beneficiary outreach – poor cell phone network, unavailability of personal phones, missed calls, switched off phones, frequent change of contact numbers, wrong mobile numbers, "do not disturb" category of clients, xi) other nutrition related issues–unaffordability, lack of availability of foods, and cultural barriers that deter behavior change.

M-Health solutions requires initial technological investments and support, frequent training of project staff and proficient monitoring for its sustenance. Despite the multiple challenges, it has the potential to enhance coverage of appropriate nutrition and health practices in hard to reach rural areas.

Keywords: Mobile Technology, mHealth, innovation, challenges, nutrition

USE OF MOBILE PHONES FOR INFANT AND YOUNG CHILD FEEDING COUNSELLING IN SRI LANKAN TEA ESTATES: A FEASIBLE OPTION FOR HEALTH SYSTEM STRENGTHENING

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In Sri Lanka, 0.9 million people (4.3% of population) live in plantations, predominantly in tea and rubber estates. Nutritional status of children in these estates is poor, and innovative strategies are needed to improve this situation. With the advancement of technology, mobile health communications (m-health) have been used effectively in many countries to strengthen primary health care. However, it is rare to find use of m-health for infant and young child feeding (IYCF) counselling in South Asia. The SAIFRN Sri Lankan group used a stepwise and scientific approach towards using m-health for IYCF counselling in the tea estates. This presentation aims to discuss development and feasibility of the m-health intervention.

Our approach consisted of:
Phase 1: Formative study to explore perceptions of stakeholders
Phase II: Development of mobile phone intervention package
Phase III: Pilot testing of the intervention

Phase 1: A formative study was conducted among pregnant mothers, mothers of children, family members, and health staff in two tea estates, using Focus Group Discussions and In-depth Interviews. We found that mobile phone usage was common in this community and m-health platform could be a promising initiative to strengthen the existing face-to-face nutritional advice provided by the health staff to improve the nutritional status.

Phase II: Age appropriate text and voice messages were developed for pregnant women and mothers of children. Overall there were 108 messages, which were incorporated to a mobile platform.

Phase III: In this pilot study, 108 participants (pregnant mothers over 28 weeks of gestation and mothers of infants up to 2 years of age) were enrolled from one tea estate, and provided with mobile phones. Age appropriate voice and text messages were sent according an automated schedule. Each participant received 2 voice and 2 text messages per week for 12 months period. Pre- and post-intervention assessments were performed using qualitative research.

Estate health team and study participants expressed positive attitudes toward IYCF counselling through mobile phone, message delivery times, and content of messages. Use of mobile health technologies reduced the workload of the estate health care team. Husbands helped their wives to answer the calls, reading the text when his wife was involved in the household work; and provided cash for maintenance phone account. Few young participants shared the messages with their family members, friends and neighbours. Most of participants confirmed that the intervention improved their knowledge and behaviours on IYCF.

Perceived barriers included weak signal strength and network coverage, lack of recharge facilities, and poor literacy.

We found that IYCF counselling through mobile phones is a culturally acceptable and efficient communication method. Mobile health is a possible technology to deliver IYCF counselling, with relatively lower costs in these settings by improving access, quality, and timeliness. Use of mobile phone technology could strengthen the existing services to improve the nutritional status of children.

The study resulted in a m-health package. We recommend that a large-scale trial be conducted to evaluate the effects of this m-health package in improving nutrition status of infant and young children.

Keywords: Mobile health. m-health. infant and young child feeding. undernutrition. South Asia.

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LEARNING FROM IMPLEMENTATION: EXPERIENCE OF REACHING URBAN WORKING MOTHERS IN BANGLADESH

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Exclusive breastfeeding for 6 months followed by continued breastfeeding along with adequate complementary feeding for 2 years is recommended as the feeding pattern providing the best child survival and nutritional status. Community-based interventions peer counseling have shown to improve breast feeding practices in many countries. However, successful models of improving breastfeeding patterns of low income working mothers are not

available. Few studies in nutrition have comprehensively examined the steps of implementation and utilization in pilot interventions, thus limiting the interpretation of impacts of interventions. In this analysis we have mapped pathways of how a novel intervention to promote breast milk feeding was implemented and utilized to enable contextually grounded interpretation of results, differentiate poor design from poor implementation, and identify factors that might influence the utilization of interventions. Objective: We used program impact pathway (PIP) analysis to understand study an intervention that installed breast milk supportive technology such as breast pumps and breast milk pastaurization device in a garment factory setting to promote expressed breast milk feeding among low income working women in Bangladesh. Methods: The study was conducted among 70 mothers working in a readymade garment factory with <1 year old infants in Gazipur, Bangladesh from August 2015-March 2016. The PIP was developed through an iterative process with the program implementation team; the PIP then guided the choice of methods and tools. Using mixed methods, we reviewed the content of training materials for implementation staff, measured their IYCF knowledge (n = 2), observed their communication with mothers (n = 10), and examined factors influencing promotion of IYCF practices and their trial and adoption by mothers (n = 62). Results: Implementation staff demonstrated good knowledge and maintained fidelity to the intervention to a large extent. Mothers identified them as their primary sources of information, and a majority of mothers tried recommended breastfeeding practices. Key facilitators included family support, positive attitude towards breast milk feeding and perception of cost reduction whereas lack of time, lack of care givers and perceived negative health outcome of the infant were salient barriers to adopting recommended practices. Conclusion: Using a PIP analysis identified critical issues pertaining to implementation (e.g., the role of work breaks and supervisor support) and utilization such as supportive care givers at home, supplementary food for lactating women that need further research and programmatic attention. These conclusions will help address the needs of women in the workforce.

Keywords: Breastfeeding, pasteurization, urban, Bangladesh, working mother

COMBATING MALNUTRITION IN MAHARASHTRA

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Background: In Maharashtra, 39% of children below the age of two years were stunted in 2005-06 and 19.9% were wasted. Maharashtra was the first state in the country to take a decision to tackle malnutrition in 'Mission – mode' with the purpose of reducing child malnutrition by focusing on the first 1000 days from conception. The Rajmata Jijau Mother – Child Health & Nutrition Mission was thus launched in its first phase in 2005 and the second phase in 2011.

Objective: To describe the goals of the mission, its activities, and its impact and future policies for sustaining the impact of the mission.

Methods: This is a description of policies that enabled the development of the mission and its goals to significantly reduce rates of child malnutrition by targeting mother and child nutrition for the first 1000 days of from conception.

Results: The mission was funded by the state and received technical support from UNICEF. It had the highest political commitment of the Chief Minister and a cabinet approval. There was a phase wise expansion of the mission over five years to cover all 0-6 year old children leveraging on the existing tracking systems used by the public health department and the Integrated Child Development Scheme (ICDS) for service delivery. The mission specially focused on high burden districts, blocks and tribal areas. The three pillars were i) capacity building and skill development, ii) inter-sectoral collaborations between government, non-government organizations, UN bodies like UNICEF and the corporate sector, iii) community ownership and participation. The phase wise activities were as follows: a) establishment of Nutrition Rehabilitation Centres (NRCs) at District Hospitals for management of SAM (Severe Acute Malnutrition) and MAM (Moderate Acute Malnutrition) cases b) training of Anganwadi workers in the new WHO growth standards, taking height and MUAC measurements, identifying wasting i.e. SAM and MAM, c) establishment of Village Child Development Center (VCDC) and day care centres in tribal areas for under 3 children in phase I. In phase II, partnerships were established with the government bodies like the ICDS, National Rural Health Mission (NRHM), public Health department, NGOs, civil society and corporate sector to help achieve the mission goals.

The impact of the mission is evident from the improved rates of stunting and wasting from 39.0% to 23.3% and from 19.9% to 16.3% respectively and the fact that other states are also considering its adoption for malnutrition alleviation. The mission provides a holistic approach for addressing malnutrition through inter-sectoral collaboration in the areas of health, nutrition, agriculture, WASH (water, sanitation and hygiene), education, food security, agriculture, tribal and rural livelihoods. The public health department has taken over ownership of the nutrition mission and has proposed a comprehensive MIYCN (Maternal, Infant and Young Child Nutrition) policy which covers adolescent health, maternal health during pregnancy and lactation, breast feeding and complimentary feeding.

Conclusion: The mission demonstrates that high level political commitment and inter-sectoral collaborations help to reduce malnutrition and provide sustainability for mainstreaming comprehensive nutritional interventions.

Keywords: Malnutrition, Nutrition Mission, Stunting, Severe Acute Malnutrition and Moderate Acute Malnutrition

OVERVIEW OF THE PAKISTAN IYCF POLICY ENVIRONMENT

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High levels of malnutrition have serious consequences on the health and survival of infants and young children. Almost 44% of children in Pakistan are stunted, 30% are underweight and 15 % are severely wasted according to the National Nutrition Survey of 2011. One of the major reasons for such high rates of malnutrition is inappropriate Infant and Young Child Feeding (IYCF) practices which includes breastfeeding and complementary feeding. Association of inappropriate feeding practices with malnutrition has been shown by various studies. The World Health Organization (WHO) and United Nations International Children's Emergency Fund (UNICEF), with the broad participation of many stakeholders, developed the Global Strategy for IYCF to revitalize global commitment for improving infant and young child nutrition by promoting, protecting and supporting appropriate IYCF. Effective interventions for IYCF are well established, including but not limited to interventions for skilled support by the health system, interventions for community based counseling /support and IYCF in emergency circumstances. Additionally, training and capacity building of community health workers to deliver IYCF support and intervention is also imperative. But for the best outcomes at national level, such interventions need to be supported by appropriate policies. And the development of these policies is influenced by the major stakeholders of the policy environment including the ministry, nutrition officers, academicians, researchers, development partners, etc.

The health policy environment of Pakistan has been markedly influenced by its unsteady political environment especially, after the devolution of the Ministry of Health in 2011, whereby a number of federal health responsibilities were placed under the jurisdiction of other government ministries/divisions. However, within the past couple of years an improvement has been observed at the policy level showing commitment of the major stakeholders to the cause. This paper outlines the progress made so far in the IYCF policy environment in terms of implementation, especially of the provinces of Punjab and Sindh, two of the most populous provinces in Pakistan with the most rapid pace towards development.

Keywords: Malnutrition, IYCF, policy, Pakistan

OPPORTUNITIES TO STRENGTHEN THE POLICY ENVIRONMENT TO BETTER SUPPORT APPROPRIATE IYCF AND REDUCE CHILDHOOD MALNUTRITION: SRI LANKAN EXPERIENCE

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Sri Lanka provides free health for all through a well established preventive and curative government health service island wide. Family Health Bureau of the Ministry of Health is assigned with the responsibility for the implementation of MCH programme where maternal and child nutrition services are delivered as an integrated package. All relevant evidence based interventions are implemented throughout life cycle at all levels of health system.

National Nutrition Policy (2010), MCH Policy (2012), MNH strategic plan (2012-2016),National Strategy for IYCF 2015-2020,Code to regulate marketing of designated products provide guidance for implementation. Formal training packages on IYCF for capacity building of health personnel ingrained in the MCH programme.

A well established mechanism is in place to strengthen policy implementation at various levels. At the Presidential Secretariat National NutritionSecretariat has been established to facilitate multi-sector collaboration to improve nutrition; NationalNutrition Council comprises of senior ministers and chaired by HE the President, National Nutrition Steering Committee consists of secretaries of relevant ministries and Technical Advisory Committee provides technical guidance for policy formulation. At Ministry of Health, Nutrition Steering Committee (NSC) chaired by the secretary health functions as a multi-sector platform to address nutrition issues in health sector. Two subcommittees of this NSC, Maternal and Child Nutrition subcommittee and Nutrition Communication subcommittee chaired by the Deputy Director General Public Health Services function as technical advisory bodies to make recommendations to the NSC which includes advice on policy formulation, planning, financial allocation, resource management and other relevant issues pertaining to MCN and guidance in the development, review/revision of policies, strategies, guidelines and other relevant documents in relation to maternal and child nutrition.

Keywords: Child malnutrition. IYCF. Policy.

TOWARD A NEW PARADIGM FOR ASSESSING CHILD GROWTH: A CAPABILITY APPROACH

HOW SHOULD WE DEFINE HEALTHY CHILD GROWTH?

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Measuring a child's weight and height has been central to the assessment of child growth. This has had implications not only on how we identify poorly or healthily growing children but also on how we assess the achievements of the targets for the Millennium Development Goals, and more recently the Sustainable Development Goals. Over the past decades, the focus has shifted from a mere biomedical approach to a social epidemiological approach, and several multi-sectoral frameworks have been developed in the recent years. Although, these frameworks have allowed an increased insight into the social determinants of child growth, they still fail to address how people's capabilities are central to healthy growth. We argue that there is a need for advancing current frameworks and monitoring practices toward a capability approach to child growth to allow better targeting of inequity and inequalities. In such an approach child growth is considered as a plural space, including but not restricted to the physical dimension. Other dimensions could be derived from the broader clusters love and care, mental well-being, bodily integrity and safety, social relations, participation, education, freedom from economic and non-economic exploitation, shelter and environment, leisure activities, respect, religion and identity, time autonomy, and mobility as derived from the Rights of the Children. Dimensions and indicators could be identified using theories from other disciplines, such as demography and evolutionary biology. The nutrition transition theory helps to understand that we may want to deal with low birth weight differently depending on a countries stage in the nutrition transition: in countries where low birth weight is highly prevalent, rapid growth may result in adverse later health outcomes and the advice to parents should be accordingly. Theories from evolutionary biology, such as life offspring theory, or parent offspring conflict theory are indicative of the importance of including for example, birth order or maternal body composition as indicators of child growth. By conceptualising child growth as a multi-dimensional outcome, we fundamentally change our perspective to child growth, and open up new ways for policies and interventions. In such a capability approach societal and parental context will be embedded into the growth measurements. This will have consequences not just on how children are being measured, but also on how health professionals will be trained, how care-givers will be counselled and how policies and interventions will be developed. Eventually, this could contribute to improved morbidity and mortality rates.

Keywords: Child growth, Capability approach, Inequalities, Sustainable Development Goals.

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IUNS Task Force "Towards Multi-dimensional indicators of Child Growth and Development"

CHILD HEALTH: JUSTICE AND CAPABILITIES

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The initial, modern idea for the theory of human capabilities can be traced back to the 1979 Tanner Lecture on Human Values entitled "Equality of what?" given by the Nobel Prize laureate Amartya Sen. In the lecture he identified the weaknesses of measuring inequality, poverty and well-being purely in terms of income or resources, negative liberties, basic needs, or utility (happiness) and suggested human "capabilities" and capabilities equality/equity as a more coherent alternative. Over the three decades since the lecture, and following from many publications by Sen and others on the subject, an extensive interdisciplinary school of thought has developed around the initial idea of human capabilities. Scholars, researchers, and practitioners have developed and used the approach as an analytical and normative framework in which to ground theoretical, evaluative, and prospective analyses as well as concrete applications in a broad range of fields. These have included the analysis and measurement of national wellbeing, poverty and inequality, the prescription and design of welfare policies, the modelling and evaluation of development projects, and the assessment of living standards. The papers in the present task force symposium are applying the capabilities approach to child growth and wellbeing.

This paper will present the basic conceptual components of the capabilities approach such as resources, capabilities, conversion factors, functionings and how these concepts can be applied in measurements of child growth. The discussion will then explain how capabilities are seen to be both constitutive of human wellbeing as well as instrumental to human wellbeing; both the means and ends of policy. If the argument that human wellbeing should be seen in terms of capabilities is convincing, then the argument is that measuring wellbeing is in the space of capabilities, and the causes of the contraction or expansion of capabilities encompass biological and social factors. This has important implications when applied in child growth. This conceptual framework of human wellbeing in general, and in child growth in particular in terms of capabilities will then be situated in discussions about equity and justice.

Keywords: Capabilities approach, Amartya Sen, wellbeing, equity, justice.

ALL ELSE EQUAL – A CAPABILITY FRAMEWORK TO CHILD GROWTH MEASUREMENT

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In the past few decades, scholars of child nutrition and healthy growth have increasingly become interested in scrutinizing the social determinants of growth faltering. Those efforts were crucial to argue that child growth is not only about nutritional inputs, but also about the economic arrangements and resource allocations, societal settings and individual differences. Nevertheless, when it comes to the monitoring and measurement of child growth, anthropometric outcomes remain to be the sole output to be evaluated. In this paper, we claim that, by measuring the anthropometric indicators as the key output, we do not pay due attention to the plurality of elements that interact together to make healthy growth.

The paper applies the Capability Framework to Child Growth (CFCG) as the conceptual framework. The CFCG helps bringing a multidimensional paradigm to the measurement level. This paper defines child healthy growth as the process of continuous physical, psychological and social change that builds a child's capacities to maximize life chances at the individual and societal level. The paper aims to examine how a CFCG gives insights into multiple attributes of healthy growth as a set of capabilities. I use Demographic Health Survey data on India (2005-2006) as the case study. Capabilities of healthy growth are defined under eight core dimensions: life and physical health; love and care; bodily integrity; education; shelter and environment; respect and personal autonomy; social relations and mobility

Some of the findings of this paper include:

Of all dimensions of child healthy growth, the mean achieved functionings are lowest under the "utilization of childcare services," "information", and "sanitation". Children with higher and lower functionings for healthy growth are not equal in their parental education and in using prenatal and breastfeeding services. Furthermore, our analysis suggest that improving utilization of prenatal services, information, sanitation and birth registration improves height for age (fertile functionings). This is while disadvantage under physical integrity (domestic violence) and service dignity has negative impacts on height for age (corrosive effect).

At the first glance, our results may sound similar to studies that apply Social Epidemiology (SE). The paper elaborates in detail on differences between CFCG and

SE at the conceptual and empirical level. However, one key difference is about distinguishing social and individual characteristics (conversion factors) from capabilities. In SE, 'predictors' include factors such as age, sex or religion (individual or social characteristics), as well as capabilities (education or employment). The CFCG distinguishes between the two concepts. Focusing on capabilities helps us acknowledging the 'agency' of caregivers.

Keywords: Child growth, Capability Approach, Fuzzy analysis

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Track 3: Public Health Nutrition and Environment

HISTORY AND LEGAL CHALLENGES OF CREATING AND PROTECTING A SUGAR–SWEETENED BEVERAGE TAX IN MEXICO: LESSONS FOR THE GLOBE

CAMPAIGN STRATEGY FOR A TAX ON SUGAR-SWEETENED BEVERAGES IN MEXICO

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Background and objectives: Mexican civil society organizations together with academics and public interest lobbyists played a fundamental role in securing the approval of a 1-peso-per-liter tax ($0.05 U.S. dollars [USD]) on sugar-sweetened beverages, and subsequently have succeeded in defending this fiscal measure against attempts of the industry to reduce and eliminate it.

Methods: The tax on sugary beverages in Mexico was achieved through a three-pronged effort, that included academics, a large network of civil society organizations, and lobbyists working in the public interest. The civil society campaign strategy was composed of three stages: a) exposing the human drama of obesity and diabetes, including its catastrophic future consequences, in order to generate the urgency to act; B) highlighting one of the main causes of this tragedy, which is the consumption of sugary drinks and, c) presenting a proposal for the first action necessary to confront this situation, a tax on sugary drinks. The campaign focused on transmitting these three campaign stages through both traditional media and social networks using a variety of tools: academic forums, public demonstrations, public campaigns (in traditional media), formal and ironic videos (in social networks). The campaign also ensured the maintenance of a strong and consistent presence in the media and the capacity to react quickly to the strategies of the beverage industry to stop this measure.

Results: The tax was presented by the executive branch as part of the 2013 fiscal reform package and was approved by Congress despite strong lobbying of the beverage industry, which experienced its highest sales per capita in Mexico, the country that is also home to the largest Coca Cola bottling plant in the world. In 2015, civil society, academia and public interest lobbyists were able to curb the industry's attempt to reduce the tax levied on sugary drinks that contained under a certain threshold of sugar.

Conclusions: The experience of the struggle for a sugary-sweetened beverage tax in Mexico demonstrates three important lessons. First, the importance of collaboration among academia, civil society organizations, and the work of public interest lobbyists with decision-makers. These three axes are essential to

provide evidence and build consensus for the need for a tax on these products. Secondly, the Mexican experience demonstrates the need to make the dimension of the health problem resulting from the consumption of these drinks, visible, in order to create awareness across the population for the need to act, and consistently relying on scientific evidence to support such action. Thirdly, the importance of rigorous activism to maintain the topic in the public eye and to constantly explore diverse and attractive ways of communicating and engaging the public on the issue.

Keywords: Sugar-sweetened beverage tax. campaign strategy. coalition building

LOBBYING AND LEGAL STRATEGY

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Background and objectives: The lobbying and legal activities for the promotion and approval of the excise tax on Sugar Sweetened Beverages (SSBs) in Mexico started in early 2012, as part of a broad advocacy strategy on obesity prevention that included the participation of different stakeholders, including the National Institute of Public Health (research purposes), the non-governmental organization El Poder del Consumidor (communications and awareness purposes, as well as strategic litigation) and the advocacy firm Polithink (design and carrying out of the advocacy and the legislative strategy).

The tax is conceived as part of a comprehensive policy agenda on obesity prevention in Mexico, which includes the regulations on child-targeted marketing, front-of-package labeling and school food policy and nutrition, as well as the access to potable water in schools and public spaces. The decision to choose the tax as the first policy to be promoted was based on an analysis of adequate timing, political scenarios, implementation processes, short-term effects in consumption and awareness, and the possibility of creating a strong social and political debate.

Methods: The main objective of the lobbying strategy was to position the tax in the political and legislative agendas, by taking into consideration several key elements for the promotion of the tax with the Federal Government, and for the introduction and approval of the tax in Congress. The six key elements of the lobbying strategy were: problem identification; context analysis; stakeholder mapping and engagement; definition of policy needs; communication strategy; and political outreach. The strategy considered a combination of direct lobbying activities performed by Polithink, and advocacy activities performed by civil society organizations and coalitions (such as the ContraPESO Coalition).

Results: The lobbying strategy was developed in four stages: (1) The drafting of the bill; (2) The introduction of the bill in Congress; (3) The winning of the debate; (4) and the Voting of the bill

in Congress. It is important to highlight that the lobbying activities carried out through these stages were not isolated to the research and communication activities done by the other partners. Hence, it is not coincidence that the launch of some awareness campaigns, or the release of research studies, matched key congressional timings, which supported advocacy strategies.

Conclusion: The tax was approved on October 2013 and implemented on January 2014 as a \$1 peso per liter on all SSBs. Following this win, the lobbying strategy was shaped to defend the tax from industry proposals to discard it or reduce it after its first year of implementation, and to increase it to an optimal level of a \$2 pesos per liter (a 20% rate based on international recommendations).

Keywords: Advocacy. lobbying. legal strategy. civil society coalitions. political timing

RESEARCH TO PROMOTE POLICY CHANGE AND MEASURE IMPACT OF POLICIES

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Background and objectives: México is facing an obesity epidemic (overweight and obesity) of 70% in adults and about 33% in school-age children and adolescents. The National Public Health Institute in Mexico (INSP) has generated scientific evidence supporting the design of obesity prevention policy. Monitoring though periodic National Health and Nutrition Surveys since 1988 has provided information about the magnitude, distribution and trends of excess BMI during the last three decades. From 1988 to 2012, obesity in adult women increased from 9.5% to 35.2%. This dramatic rise alerted the government about the urgent need for interventions.

Methods: INSP has conducted the following set of studies aimed at generating information to inform policymaking: a) Monitoring changes in key drivers of obesity have been useful to identify shifts in the diet that may be responsible for the increase of obesity. b) Formative research allowed recognition of obesity promoting elements in different environments and barriers for the adoption of healthy eating and physical activity. c) Randomized efficacy trials have tested effects of specific interventions. d) The evaluation of policy actions has provided feedback for redesign or improvements.

Results: The research conducted by INSP to justify the SSB´s tax implemented in Mexico since 2014 is an example of the use of evidence to support the design of policies. The study of the dietary intake of the Mexican population, using 24-hour recall methodology, showed that about 25% of total energy intake in the diet was provided by sugar-sweetened beverages and non-basic energy-dense processed-foods (referred to by the population as "junk food"). One of the known dietary risk factors for obesity is the

high intake of added sugars and particularly of sugar-sweetened beverages. It also showed that the average intake of added sugars is 12.5% of total energy intake, well above the WHO recommendations. Moreover, SSB´s contribute with 70% of all added sugars. Estimations of own and cross price elasticity of the demand for SSB showed that the demand of these products was elastic and that substitutes were healthy beverages. These findings indicated that taxes would result in a reduction in the intake of SSB´s. Modelling effects of different tax levels on weight loss and diabetes prevention provided evidence about potential impacts of the tax on health. This scientific evidence produced by INSP, along with the information about the negative effects of SSB intake on health, was instrumental for approval of the SSB´s tax by the congress in 2013.

Conclusion: INSP along with the University of North Carolina (UNC) have evaluated the effects of the tax on prices and on the intake of SSBs. Results indicate that tax passed along to consumers for SSBs in general and that the purchases of taxed products have decreased while those of untaxed substitutes have increased. In addition, the tax has generated revenue that should be used to fund obesity prevention actions and for partially correcting high negative externalities. The Mexican experience has demonstrated that taxing SSB and other unhealthy foods are successful components of a multifaceted prevention strategy.

Keywords: Evidence based public health. tax sugar-sweetened beverages. Mexico

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DIETARY GUIDELINES IN EUROPE: RECENT DEVELOPMENTS

FOOD BASED DIETARY GUIDELINES IN EUROPE AND THEIR SCIENTIFIC BASIS

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Nutrition recommendations can be divided into nutrient-based recommendation and food-based dietary guidelines. Traditionally, the food-based guidelines were merely a graphical example of how individuals and populations could reach the nutrient-based recommendations. Hence, these guidelines could be regarded more as communication, not as something based on solid science. The situation is different at present. This is mainly due to a great number of recent population-based cohort studies linking foods, food groups and entire diets to health outcomes.

Studying the relationships between foods and health is difficult and therefore conclusions must be based on a considerable number of studies. Some patterns are, fortunately, quite consistent: higher consumption of whole-grain cereals, fruit, vegetables, legumes, fish and oil (particularly olive oil) are predictors of, e.g., lower mortality lower incidence of type 2 diabetes and cardiovascular diseases. In contrast, higher consumption of sugar-sweet-

ened beverages, processed meat and also red meat are predictors of worse health outcomes. Theoretical measures of a healthy diet (e.g. the Mediterranean Diet Score, the Health Eating Index and the Baltic Sea Diet Score) are also quite consistent predictors of positive health outcomes. The number of randomized, food-based clinical trials is lower, but positive results have been found for, e.g., adding olive oil or nuts to the diet.

The European food-based dietary guidelines are at first glance rather similar, but some important differences exist. The main differences are apparently related to how much the above mentioned scientific basis for food vs. health associations are applied. Several guidelines still include butter and oils/margarine in the same "box", they do not separate whole-grain cereals from refined grains and meat is recommended to the same extent as fish. Others are now using a more detailed classification of foods and these food-based dietary guidelines can be regarded as more science-based.

Some researchers have suggested that since the food-based dietary guidelines pay attention also to non-nutrients in the foods (e.g. flavonoids), they could even replace the nutrient-based guidelines. I don't totally agree with this suggestion, since surveillance and food-policies are still partly dependent also on information related to nutrient intakes and distributions. However, the role of food-based dietary guidelines is clearly emerging.

Keywords: Food, diet, recommendations, guidelines, health

THE ROLE OF FOOD BASED DIETARY GUIDELINES IN TRANSLATING NUTRITIONAL RECOMMENDATIONS FOR PUBLIC USE

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The basic principle underlying nutritional recommendations is that the essential nutrients need to be identified and the amounts needed to prevent deficiency disease arising need to be determined. For most essential nutrients (except for energy) for which there are such recommendations, the latter exceed the minimum requirement to achieve maximum population protection. In order to derive these recommendations, it is necessary to have quantitative information about the role of the nutrient, and the values then derived (whether RDA, DRV, DRI) are based on a statistical analysis of the data available such that the recommendation is normally 2 SDs above the mean intake, as this will prevent deficiency in the majority of the population. Clearly attitudes towards nutrition and health have moved on substantially from the 'prevention of nutritional deficiencies' which dominated nutritional science and public health in the early to mid parts of the 20th Century, but this is not reflected in the principles underlying dietary recommendations. Thus, achieving optimum health is the goal of good nutrition but we do not have any evidence based dietary recommendations which are designed to achieve this.

The UK Scientific Advisory Committee on Nutrition released a report on Carbohydrates and Health in 2015, which recommended a change in one of the Carbohydrate DRVs (namely for dietary

fibre) and also recommended that there should not be a reference value for Free sugars as these were not essential components of the diet. The report did recommend limiting Free Sugars intake to no more than 5% of total energy in order to minimise disease risk and promote good oral and cardiometabolic health.

The challenge for Public Health professionals and the general public itself, is how to translate the quantitative nutrient recommendations into food based guidelines. Different countries use different approaches - plates, wheels, pyramids etc - and some are simply qualitative whereas others are more prescriptive about ho often certain foods should be eaten and how others should be limited. This presentation will compare some of the major national food based dietary guidelines and show how easy, or otherwise, it is to turn these guidelines into actual meals and diets. The other challenge about food based dietary guidelines is of course that individual foods are usually sources of more than one nutrient and so whilst the guidelines may be phrased in simple language, the actual contributions to achieving a good nutritional status are much more complex.

Keywords: Dietary Reference Values, Food based dietary guidelines, optimum health

Conflict of Interest disclosure: The Author has Advisory Board roles with Mars Inc and Mars Europe, Nestle and IKEA. All honoraria are paid to the University of Nottingham and used for research purposes.

The Author is a member of the UK Government Scientific Advisory Committee on Nutrition and Chaired its Carbohydrates Working Group

FOOD BASED DIETARY GUIDELINES: OPTIONS FOR REGIONAL INITIATIVES

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Food-based dietary guidelines (FBDGs) are recognized as modern, simple, and practical tools in public nutritional education, as well as in process of forming national strategies for dietary improvement. Their overall goal is to recommend the intake of certain foods and food groups and their combinations in order to provide the adequate intake of all necessary nutrients. Since different countries have different nutrition situation, different food culture, specific nutrition-related health problems, development of specific national FBDGs are of vital importance. In last two decades the process of developing and implementing national FBDGs has received increased attention from national and international scientific bodies. Food and Agricultural Organization (FAO) has published guidelines for FDBG development and has formed The Nutrition Education and Consumer Awareness Group with a task to help developing FBDG in different countries based on scientific principles. The European International Life Sciences Institute (ILSI Europe) has also organized workshops and published document on experiences in FBDG development in 2004. European Food Safety Authority (EFSA) gave scientific opinion on FBDG in 2009 intended for the whole European region.

The process of scientifically-based national FBDG development consists of several steps and requires existence of reliable data on country specific nutrition-related health problems and dietary deficits, as well as data on national specific food consumption patterns and food composition tables. Unfortunately, for many low-income countries those data are either unavailable or not collected in standardized way, and adequate expertise in data interpretation is often lacking. One solution for mentioned problems could be development of FBDG on regional level that could be used in countries with similar geographic characteristics and dietary cultural heritage.

Federation of European Nutritional Societies (FENS) in order to assist South-East European countries in the process of FBDG development organized at the end of 2016 a workshop to discuss the status and potential developments of dietary recommendations and guidelines in this region. The representatives from public health institutions from Slovenia, Croatia, Serbia, Montenegro, Macedonia, Bosnia and Herzegovina, Romania and Bulgaria, participated at the workshop. The workshop intention was to establish a nucleus of scientists from nutrition and public health that could work conceptually and practically at improving and aligning such guidelines in this region. It was recognized that there is a high potential for capacity building in this area which could best be addressed by collaboration among the local stakeholders and input from those who already went through phases of establishing such guidelines. The following conclusions were drawn: (1) The Belgium food-based dietary guidelines, currently under development, could be a good show case for the South-Eastern countries; and (2) for those countries which are candidates to become a member of the European Union, a common initiative might be worthwhile to ask for expertise and funds for meetings and capacity building within the region. It was the common conviction that the countries of South Eastern Europe share similar backgrounds in scientific infrastructure and culinary practices and that some of the recommendations and guidelines should been issued not nationally but for the region.

Keywords: FBDG development, South-Eastern Europe region

NOVEL DEVELOPMENTS IN FOOD BASED DIETARY GUIDELINES

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There is a worldwide interest to establish Food Based Dietary Guidelines (FBDGs) for each country or region as a tool to counsel the population and to formulate health/nutritional policy aims. An excellent overview of the situation is currently being available at the website of FAO. This international organization together with WHO can also refer to a number of documents – some of

them from the 1990ies – that describe the background of the FB-DG-concept. In modern terms, FBDGs are a translational tool of nutritional scientific knowledge into a practical food guide. FB-DGs should consider the dietary practice and understanding of the population by giving guidance regarding the intake of food and food groups. In contrast to nutrients, there is a high common understanding what a specific food or food group include. Thus, in the WHO/FAO documents, the communication of FBDGs is an important aspect. FBDGs are often communicated as simple and understandable graphics such as plates, cycles, and pyramids. The documents also highlight that the process of developing FB-DGs for a country/region should involve as many stakeholder as possible.

EFSA, the European Food Standard Agency, also contributed to the concept of FBDGs in 2009 by an own panel-document, available as article in the EFSA-Journal. This document gave guidance how to establish regional/national FBDGs in the European Union.

We should realize that some of the basic documents on FBDG are reflecting thoughts that had been partly developed two decades ago. This might not be bad but it is the question whether these documents still provide a suitable frame that helps to issue a FBDG for each region/country. In particular, with more FBDGs, the need is increasing to harmonize the scientific concepts underlying a FBDG. We already learned from the previous lectures that different criteria are addressed in the European FBDGs such as risk reduction or meeting the nutrient recommendations. In addition, new areas of concerns recently became obvious in relation to food use such as sustainability and energy overflow. It is therefore the question, on which basis new initiatives such as the South-Eastern-Europe FENS initiative should work.

In the upcoming time, therefore, the development of FBDGs should been given an updated concept. This regards several aspects ranging from the scientific basis to the graphical display. One aspect is the scientific basis and the way evidence is generated and used. It is obvious that only solid evidence can be used to guide the population regarding a healthy diet. This principle of solid evidence regards all criteria underlying a FBDG such as recommended nutrient intakes, food –disease relationships and potentially climate impact. Thus, it would be a useful to establish public data bases that collect the single study results and make them accessible to all groups working on FBDGs. It should also been agreement on how to weight the many findings and which of them give priority and why. Similar discussions and harmonizing the thoughts including presenting suitable alternatives could be done regarding other aspects of FBDGs.

Keywords: Food based dietary guidelines, disease risk, recommendations, harmonization

IMPACT OF LARGE-SCALE FOOD–RELATED REGULATORY EFFORTS: MEXICO AND CHILE

OVERVIEW OF GLOBAL REGULATORY EFFORTS

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Background and objectives: The major focus for preventing obesity, diabetes and all nutrition-related noncommunicable diseases lies with shifting our populations toward a much healthier eating pattern and ultimately creating a culture of healthy eating.

Methods: I review the main set of large-scale regulatory tools and taxes considered.

Results: First, to date we have focused on attempting to create a price structure where we tax unhealthy foods and sugary beverages with a great focus on sugary beverages as a prime example, but there are other economic tools affecting subsidies and trade being considered. Second, is the area of marketing controls that are based on some nutrient profiling system. Third, is front-of-the-package (FOP) logos. It is ideal if these are based on the same nutrient profiling systems as the marketing controls. The major nutrient profiling systems that are increasingly being deployed in all regions of the world include a negative or positive FOP logos. It is strongly recommended that one not allow claims on food packaging not allowed under each FOP system. And as the Chilean law has shown, removal of characters from nonapproved products is also very important. In all cases the goal is to minimize added sugars, unhealthy saturated fats, sodium and promote fruit and vegetable, legume and whole grain-based diets. This is the big three we expect will have the largest impact. A fourth area is food in public institutions, especially schools and hospitals. To date much less work and few studies show major impact on shifting school and other public facilities (e.g., hospitals) meals, marketing, and availability of junk food and beverages; however, we see this also as critical to changing the entire culture of eating and our overall food system in a healthier direction. The short-term and long-term impact of these changes needs to be better understood, but we do also deem them important to achieve any long-term shift in eating patterns.

We have completely neglected globally systematic regulations related to the away-from-home fast food and restaurant sector (e.g., calorie pricing where each calorie charged for a burger or drink must cost the same). Similar with the massive transition of our farm to fork food system we have not figured out how and what impact shifts in government policies toward farmers can make. We do know that until we eliminate major marketing efforts of unhealthy eating, it will be imposible for public education to make a major impact.

Conclusion: As we will show with this set of presentations there are several countries that have or will provide strong evidence on the impact of various regulatory and tax efforts.

Keywords: Taxation. marketing bans. front-of-the-package labeling. nutrient profiling

IMPACT OF MEXICO'S SUGAR-SWEETENED BEV-ERAGE TAX: OVERALL AND ACROSS SUBPOPU-LATIONS

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Background and objectives: Mexico implemented a 1-peso per liter excise tax on sugar-sweetened beverages (SSB) on January 1, 2014. We present evidence on changes in taxed and untaxed beverages sales and purchases overall, and by subgroups of the population, before and after the SSB tax was implemented.

Methods: Three different data sets have been used for evaluating how Mexico's SSB tax relates to beverage purchases and sales: 1) Household purchases by a longitudinal panel of urban households (2012-2015) to estimate changes in overall purchases of taxed and untaxed beverages and by socioeconomic status, adjusting for pre-tax trends, household sociodemographic characteristics, seasonality and macroeconomic variables. 2) National Income and Expenditure Surveys (ENIGH) rounds 2008, 2010, 2012 and 2014 to estimate changes in overall purchases and by income level, place of residence and type of household, adjusting for household sociodemographic characteristics and economic. 3) Aggregated monthly data on national sales of SSB and bottled water (2007-2015) to estimate changes in per capita sales adjusting for economic activity and seasonality activity.

Results: Among the panel of urban households, we found an average 7.6% reduction in purchases of taxed beverages two year after implementation of the tax (5.5% reduction in 2014 and a 9.7% reduction in 2015). The reduction was higher among household at the lowest socioeconomic status. We also found a 2.1% increase in untaxed beverages. Meanwhile, estimates from the ENIGH show a 6.3% reduction in SSB purchases in 2014, higher among lower income households, residents living in urban areas and households with children; and a 16% increase in bottled water. Finally, Mexico's national sales showed that there was a 7.3% average reduction in sales of sugary beverages and a 5.2% increase in bottled water compared to 2007-2013.

Conclusions: Results across the different studies using various data sets show that the SSB tax was associated with a reduction in purchases/sales of SSB and increases in untaxed beverages. Reductions in SSB purchases were larger among key populations: low income groups and households with children, but there were lower reductions in rural areas. Findings from the second year suggest a sustained and increasing response from the population. Results from Mexico provide important evidence for other countries considering the use of fiscal policies to lower the consumption of SSB along with other interventions.

Keywords: Sugar-sweetened beverages. tax. Mexico

MEXICO: IMPACT OF THE NONESSENTIAL ENER-GY- DENSE FOODS TAX

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Background: In an effort to prevent continued increases in obesity and diabetes, in January 2014, the Mexican government implemented an 8% tax on nonessential foods with energy density ≥275 kcal/100 g and a peso-per-liter tax on sugar-sweetened beverages. Limited rigorous evaluations of food taxes exist worldwide.

Aim: examine changes from 2012-2013 (pre-tax) and 2014-2015 (post-tax) in volume of taxed and untaxed packaged food purchases and in the proportion of taxed purchases from total purchases. We examined the effects in the entire sample and stratified by socioeconomic status and by pre-tax purchasing pattern.

Methods: This study uses longitudinal data on household packaged food purchases representative of the Mexican urban population from The Nielsen Company's Mexico Consumer Panel Services. We included 6,248 households for the 2014 evaluation and 6,089 households for the 2015 evaluation. We used a longitudinal, fixed-effects model that adjusted for preexisting trends to test whether the observed post-tax trend was significantly different from the one expected based on the pre-tax trend. We controlled for household characteristics and contextual factors like minimum salary and unemployment rate.

Results: The mean volume of purchases of taxed foods in 2014 changed by -5.1% beyond what would have been expected based on pre-tax (2012–2013) trends, with no corresponding change in purchases of untaxed foods. Low SES households purchased on average 10.2% less taxed foods than expected; medium SES households purchased 5.8% less taxed foods than expected; whereas high SES households' purchases did not change. In 2015 there was a decrease in both taxed and untaxed purchases, therefore we focused instead in the change in percentage of taxed purchases from total purchases. Post-tax declines in the % taxed food purchases were -4.8% in 2014 and -7.4% in 2015 (-6.0% in 2014-2015), beyond the counterfactual. Households were classified based on median pre-tax purchases: low untaxed/low taxed ("low"), low untaxed/high taxed ("unhealthy"), high untaxed/low taxed ("healthy"), and high untaxed/high taxed ("high") purchasers. In 2014-2015 Healthy purchasers showed no post-tax change in % taxed food purchases beyond the counterfactual, while unhealthy, low and high purchasers decreased (-12.3%, -5.3% and -4.4%, respectively).

Conclusions: Household purchases of nonessential energy-dense foods declined in the first and second year after the implementation of Mexico's nonessential foods taxes. Households with low SES and greater preferences for taxed foods before the tax showed a larger decline in taxed food purchases. Future studies

should evaluate the impact of the taxes on overall energy intake and dietary quality.

Keywords: Food taxes, Mexico, evaluation

CHILE: IMPACT OF THE SSB TAX

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Background and Objectives: In October 2014, Chile, a middle-high income country, implemented an 18% excise tax (representing a 5% increase over previous levels) on sugar-sweetened beverages (SSBs) ≥15g sugar/240mL, while SSBs <15 g sugar/240 mL were reduced 3% to a 10% tax rate, and beverages including milk, juice, and water remained untaxed. To our knowledge, there has been no evidence to date about the impact of an SSB tax on household food purchases in a middle-high income country. The objective is to examine the change in price and change in household beverage purchases after Chile's SSB tax.

Methods: Using longitudinal data on 2,000 households from Jan 2013- Dec 2015, we used a fixed-effect model to explain change in unit values of 0%, 10% and 18% taxed beverages (Chilean pesos/liter). We utilized fixed effects models to examine post-tax changes in the volume and kcal of household 0%, 10% taxed, and 18% taxed beverages and compared these to the counterfactual (the expected post-tax purchases based on projected pre-tax trends), controlling for household characteristics and macroeconomic conditions. We examined whether there was a difference in response for high vs. low socio-economic status households.

Results: Preliminary results show that the price increase from the tax was not passed on to consumers for the 18% tax, and that households did not change their purchases of 18% taxed, 10% taxed, or untaxed beverage purchases. There were no differences by socio-economic status.

Conclusions: Despite a higher overall tax rate, the relative increase in price of SSBs was small and not passed through to the consumers. Governments considering the use of an SSB tax to change SSB purchasing behavior should consider greater than a 5% relative price increase.

Keywords: Soda tax. sugar-sweetened beverages. Latin America. global nutrition. food policy

CHILE: THE CHILEAN MARKETING LAWS: INITIAL STUDIES

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Introduction: To prevent the continued increase of obesity and obesity-related non-communicable diseases in children and adults, the Chilean government recently passed the most comprehensive set of food environment regulations in any country to date. In July 2016 the National Law of Food Labeling and Advertising was implemented with 3 major components: (i) improving consumer information by using front-of-package warning labels on unhealthy packaged foods, (ii) restrictions on marketing (i.e. prohibitions of using any licensed character, toy or give-away or child-targeted imager) and advertising (on TV or websites) of unhealthy foods to children under age 14y, and (iii) limiting the availability of unhealthy foods at preschool and school settings by restricting sales of any product with a warning label. Methods: This comprehensive evaluation includes before and after analyses of: i) Nutrient content of 5,000+ packaged foods and beverages, Ii) Marketing on packages (e.g. characters, health claims) of the 5,000+ products photographed, iii) Marketing on TV using a representative sample of two months of TV programming from the four main broadcast channels and four cable networks with the highest children´s audience, iv) Food/beverages purchases at home using the Kantar World Panel, which follows a representative sample of 2,000 households from urban areas, and v) food knowledge and perceptions, diet, and anthropometry (body mass index and waist circumference) collected through face-to-face surveys of 700 +low-middle adolescents and 900+ low-middle preschoolers.

Results: Baseline analyses show that 63% of the packaged foods studied would be classified as unhealthy based on the policy's initial nutrition standards (this number will increase to about 83% as standards become more stringent, based on the policy's incremental rollout). Preliminary analysis on beverages reveals that products with a child-friendly character had higher sugar and calorie content than beverages without a character. Baseline evaluation of the marketing restrictions indicate that children see a lot of food ads for sweet and savory snacks (22%) and sugary drinks (12%), and about 2 out of 3 food ads include strategies attractive to children. Post-implementation data will allow us to assess the impact of the different actions implemented.

Conclusion: There is an unique opportunity of understanding how the package of regulatory actions implemented in Chile will

impact the food environment, people's behaviors and ultimately, people's diet and obesity rates.

Keywords: Obesity regulatory actions. Chilean law of labelling and marketing restrictions. food environment

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MONITORING AND ENFORCEMENT OF THE INTERNATIONAL CODE OF MARKETING OF BREAST-MILK SUBSTITUTES: EXPERIENCES WITH A NEW WHO/UNICEF PROTOCOL

NATIONAL IMPLEMENTATION OF THE INTERNATIONAL CODE OF MARKETING OF BREAST-MILK SUBSTITUTES: CURRENT STATUS

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The international Code of Marketing of Breast-milk Substitutes was adopted by the World Health Assembly (WHA) in 1981, in an attempt to halt the aggressive and unethical promotion of breastmilk substitutes that undermines breastfeeding practices and places infant and young child health, development and survival at risk. In adopting the Code, the WHA called on all Member States to translate the Code into national legislation, regulations or other suitable measures. In spite of some progress, the World Health Assembly has expressed concern over persistent reports of Code violations and the ineffectiveness of some national measures, particularly voluntary measures, to ensure compliance. In 2016, WHO, UNICEF and the International baby Food Action Network (IBFAN) collaborated on the realization of a comprehensive report on the status of Code implementation around the world, utilizing all data and information sources available to the three organizations, and using agreed criteria to categorize national measures. This talk will present the status of implementation of the Code in accordance with the findings of the joint Report, describing briefly the methodology, findings in terms of legislative status of the Code, as well as a discussion of the challenges faced by Governments in implementation, monitoring and enforcement of the Code, as well as recommendations for action.

Keywords: International Code of Marketing of Breast-milk Substitutes; implementation; legal status; challenges

Further collaborators (N/A if not applicable)
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A NEW PROTOCOL FOR MONITORING AND ENFORCEMENT OF CODE VIOLATIONS

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As of March 2016, 135 countries had enacted legislation implementing at least some of the provisions in the International Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly resolutions (the Code). However, very few of these countries have operational monitoring systems to assess compliance with either the full Code or with national laws. WHO and UNICEF have formed a Global Network for Monitoring and Support for Adherence to the Code (NetCode) to assist countries and civil society in strengthening their capacity to monitor the Code. NetCode has developed a monitoring protocol with practical tools and guidance to help countries establish effective monitoring systems. The protocol is composed of two main components. The first focuses on ongoing monitoring to detect, investigate and act on alleged violations of existing national measures and the Code. The second component is a standard for periodic assessment of the state of marketing of breast-milk substitutes.

For ongoing monitoring, national systems need to include systems for detection of violations, reporting, validation, and activation of an enforcement mechanism. While NGOs and consumer organizations could feasibly assist with detection and reporting of violations, validation and enforcement are inherently governmental functions. Therefore, it is critical that governments, including nutrition, health services, food and drug control, and trade departments, are actively engaged in the monitoring and enforcement process. Monitoring should cover media advertisements (TV, radio, online, print materials), promotion in shops and pharmacies, interactions with health professionals, health facility activities, and community promotions. The NetCode protocol includes a standard monitoring and reporting form with electronic tools for easy data collection and management.

The periodic assessment component of the monitoring protocol covers four main groups or settings for assessment of how breast-milk substitutes are being promoted: mothers of children under 24 months, health workers in primary health care facilities, retail outlets, and media including television and the internet. The protocol includes detailed instructions for conducting a survey of mothers of children under 24 months of age that are attending primary health care centers. The survey asks about exposure to advertising through multiple channels, receipt of gifts, feeding advice received, and interactions on social media. Health workers in the same primary health care centers are to be asked about their interactions with representatives of manufacturers and distributers of breast-milk substances. In addition, visual inspection of the centers is to be conducted along with analysis of any educational materials on infant feeding. Retail outlets similarly are to be inspected for promotion and products purchased for analysis of the labels on all infant feeding products. An analysis of television and internet advertising is also included.

Countries that utilize this new protocol can protect mothers from the marketing pressure that interferes with breastfeeding and thus create a more supportive environment for optimal feeding.

Keywords: Breastfeeding, breast-milk substitutes, monitoring, legal enforcement

MARKETING OF BREAST-MILK SUBSTITUTES IN MEXICO: RESULTS FROM MATERNAL AND HEALTH PROVIDER SURVEYS

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Background: Breast-milk subtitutes marketing has been identified as a barrier to improving breastfeeding practices. The international code of marketing of breast milk substitutes (The Code) was adopted by the World Health Assembly in 1981 to encourage breast feeding and to protect mothers from pressure to use substitutes for breast milk. It is of paramount importance to ensure the compliance to The Code.

Objective: To estimate the prevalence of violations of the international code of marketing breast milk substitutes (BMS) and its subsequent resolutions in health facilities, point of sales and labelling on BMS in Mexico.

Methods: Sampling was based on the Network for Monitoring and Support of the International Code of Marketing of Breast-milk Substitutes (NetCode) protocol. The sample included 10 municipalities (5 per state), selected according to their birth rate, of two States of Mexico, Puebla, located in East-Central Mexico, and Chihuahua, located in Northwestern Mexico . For each municipality between 4 to 5 health care facilities were randomly selected, according to the number of prenatal consults provided the previous year of the study. At health care facility level 16 to 17 mothers of infants under 24 months of age were selected and 1 health care provider (total in two states: 693 mothers and 48 health providers). In addition, 10 points of sale were selected. In both settings it was explored BMS promotions, free-samples, and marketing. Finally, and inventory of BMS available was done from the points of sale visited and labelling and inserts were evaluated according to The Code. Data analysis considered the cluster sampling, using Stata V. 14.1

Results: Almost 50% of the interviewed mothers reported they were recommended to use BMS to feed their infant and more than 80% mentioned they had seen publicity of BMS in the media in the previous 6 months. More than 10% of them reported receiving BMS sampling and 8.5% of them had received baby bottles as gifts. The recommendations, coupons and gifts were mainly from health providers. On the other hand, 15 % of health providers interviewed reported that BMS manufactures had contacted them at least once in the last 6 months. More than 50% of health providers reported not knowing The Code or strategies for its implementation in Mexico, and less than 30% reported had received any training on the Code. Promotions of BMS were identified in all point sales visited, being price promotions the most common. Finally, more than 90% of BMS labels used an image or text idealizing its use .

Conclusions: Violations of The Code were detected in two states of Mexico using the NetCode protocol. There is BMS samples distribution in the health facilities as well as distribution of gifts and coupons. BMS manufactures had contact with health providers in the previous six months and BMS products do not comply with The Code. Important to design and implement a monitoring system to identify violations of the Code.

Keywords: Breast-milk substitutes, The Code, NetCode ,Mexico

MONITORING FOR CODE VIOLATIONS THROUGH ROUTINE SERVICES IN CAMBODIA

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In 2005, the Royal Government of Cambodia enacted the Sub-Decree on Marketing of Products for Infant and Young Child Feeding (SD133) which includes many provisions of the International Code of Marketing of Breast-milk Substitutes. However, a decade after SD133 was passed, research found low awareness and enforcement of SD133 by the four line ministries tasked with upholding the law and aggressive promotion of breastmilk substitutes. In response, the government established a multi-sectoral Oversight Board led by the Ministry of Health, which included Ministries of Commerce, Information, and Industry and Handicraft. With support from WHO's Netcode initiative and Helen Keller International, the board developed terms of reference and implementation guidelines for monitoring, and monitoring checklists for all relevant institutions at the national and sub-national level.

Municipalities in four provinces were chosen to pilot the routine monitoring, and officials from the Ministries of Health, Commerce, Information, and Industry and Handicraft were trained on their respective responsibilities between October 2016 and January 2017. SD133 monitoring began in early 2017, including supervision visits to health facilities and inspections of retail locations. The monitoring checklists were used to identify potential violations, which were then reported to the Oversight Board for action.

Early observations suggest monitoring responsibilities have been undertaken with greater ease the more closely they align with existing routine responsibilities. Ease of implementation is also dependent on whether the underlying system is well-functioning. Officials with existing inspection protocols and schedules have been more successful in integrating their new SD133 responsibilities, while others, particularly at the subnational level, have been challenged by limited or siloed human and financial resources. There have also been challenges transferring the strong commitment and political will from the Oversight Board and national level down to the subnational officers responsible for the routine monitoring for violations.

Integrating monitoring into routine services and inspections capitalizes on existing capacity, infrastructure, and resources; however, additional attention may be required to reinforce the underlying systems.

Keywords: Breastmilk substitute, policy, monitoring, integration, Cambodia

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PS_144/1051

THE SCALING-UP NUTRITION (SUN) MOVEMENT STUNTING PREVENTION PROGRAM 'RIGHT FOODS AT THE RIGHT TIME: TARGETING NUTRITION OF CHILDREN UNDER TWO' IN MALAWI

IMPACT EVALUATION OF A COMPREHENSIVE NUTRITION PROGRAM TO PREVENT STUNTING AMONG CHILDREN 6-23 MONTHS OF AGE IN RURAL MALAWI

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Background: The Malawian Government launched a comprehensive stunting prevention program with technical and financial support from the World Food Program (WFP) and the Children's Investment Fund Foundation (CIFF), respectively. The program provides a daily lipid-based nutrient supplement (LNS) and social behavior change communication (SBCC) package to improve infant and young child feeding practices (IYCF), targeting children 6-23 months.

Objective. To evaluate the impact of the comprehensive program on child nutritional status.

Method: A quasi-experimental study design was used to measure nutrition outcomes in one program and comparison district. The impact evaluation included three cross-sectional surveys (baseline, midline, endline) and an imbedded longitudinal cohort of children. Results for the endline survey are being examined and will also be shared during the symposium.

Midline evaluation: The one-year (interim) program impact was measured using cross-sectional baseline (January-March, 2014; n=2,404) and midline (January-March, 2015; n=2,378) survey data. Estimates of impact were generated using Kernel Propensity Score Matching Difference-in-Difference (PSM-DID) analyses using both baseline and midline data.

Longitudinal evaluation: Two cohorts of infants (n=367), aged 6-7 months, were enrolled in either the program (n=176) or comparison (n=191) district, and followed-up after 6, 12, and 18-months, or at 12, 18, and 24-months of age, respectively. Program impact was estimated using a difference-in-differences (DID) method at 6, 12, and 18-months follow-up, adjusting for confounding variables and study design.

Results: Midline evaluation: While the burden of undernutrition remained high at midline (after one-year program exposure) with half of children stunted across both districts, improvements in nutritional status between midline and baseline in child weight, MUAC, WAZ, and WLZ favored the program over comparison district by 0.20kg, 0.29cm, 0.23 Z-score and 0.30 Z-score, respectively ($p<0.05$). In the same way, the percent children underweight, wasted, or experiencing MAM were 7.5, 3.8%, and 2.8% lower, respectively ($p<0.05$). No significant differences were seen for indicators of LAZ or stunting.

Longitudinal evaluation: Early and full (18 months from 6 to 23 months) program exposure improved LAZ and WLZ by $0.34z(p=0.01)$ and $0.22z(p=0.07)$ respectively, with increasing (but non-significant) impact between 6 to 12-months of program exposure. Similarly, the program impact on WAZ was significant at $0.16z(p<0.05)$ from 6-month follow-up and maximized at 18-month follow-up ($0.41z,p<0.01$). Further, relative to the comparison district, at 12 and 18-month follow-up, the percentages of children stunted was marginally reduced by $10.4\%(p=0.08)$. In the same way, the percentages of children underweight were significantly reduced by $8.2\%(p<0.05)$ and $11\%(p<0.01)$ at 12 and 18-months follow-up, respectively. After 6-month of program exposure MUAC was significantly improved ($0.25cm,p<0.01$) relative to the comparison district, but there was no program impact in reducing wasting or moderate acute malnutrition (MAM), at any follow-up.

Conclusion: The more gradual impact on linear growth is consistent with a biologically plausible explanation that 18-month program exposure (starting at 6-months) may be required to detect improved linear growth, whereas weight gain is more responsive and, thus, evident within months of program exposure.

Keywords: Stunting, LNS, Infant and Young Child Feeding

Further collaborators: World Vision, Malawi; Wadonda Consult Limited

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GROWING THE EVIDENCE FOR NUTRITION PROGRAMMING: PERCEPTIONS AND IMPLEMENTATION OF A STUNTING PREVENTION PROGRAM RURAL IN MALAWI

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The delivery of efficacious nutrition interventions in a programmatic context can hamper the achievement of nutrition impact due to logistical and sociocultural challenges associated with their implementation. Understanding how programs work to improve child nutrition and feeding behaviors is critical for scaling up nutrition interventions globally.

To study how a nutrition program in rural Malawi was perceived, accepted, and implemented.

Methods: The nutrition program in Malawi includes the monthly distribution of lipid-based nutrient supplements, Nutributter, to all children 6-23 months, and a social behavior change communication campaign to promote optimal infant and young child feeding (IYCF) practices. An independent impact evaluation was led by Johns Hopkins University to measure child nutrition outcomes after 3 years of implementation. This study falls under the impact evaluation, which included a qualitative and a process evaluation study. The qualitative study employed in-depth interviews (IDI) with mothers (n=34) and household members (fathers, n=11; and grandmothers, n=4), focus group discussions (FGD) with village leaders (1 with n=11) and program staff (3 FGD with n=12, n=10, and n=11), to elicit beneficiary and community perceptions of the facilitators and barriers to the uptake of the program's intervention components. Grounded theory guided all study processes, wherein emerging themes were incorporated into continuing data collection, coding, and analysis. The process evaluation study measured the program's conformity to its original design (program fidelity) through direct observations of program activities (n=28), knowledge questionnaires with program staff (n=84), and use of existing data from program monitoring mechanisms (pooled n=2,901). Process indicators were categorized as "working well" (>75%), "needing improvement" (25%-75%), and "not working" (<25%).

Findings from the qualitative study demonstrated that Nutributter was viewed positively by all members of the household and community, who ascribed perceived changes in child health and growth to the consumption of Nutributter. Barriers to the monthly collection of Nutributter were competing household obligations, such as caring for ill family members. When asked to discuss program messages, mothers demonstrated limited and superficial knowledge of IYCF messages. This, in combination with the lack of financial and physical access to nutritious foods promoted by program messages were perceived as significant barriers to enacting desired IYCF behaviors among mothers.

Direct observations of Nutributter distributions conducted under the process evaluation demonstrated that most procedures were functioning at 85% or higher, with some areas needing improvement, such as the conduct of multiple counseling sessions throughout distributions to account for latecomers. Despite the relatively high implementation of training activities as planned (73.3%), the completion of training modules for breastfeeding (22.9%) and complementary feeding (18.6%) was low, which may have contributed to the limited focus of observed one-on-one counseling on these same topics. Nevertheless, knowledge level of key IYCF messages among program staff was high (85.3-85.7%), with the exception of being able to list the 6 food groups (22.9%).

The documentation of the perceptions, facilitators and barriers to, and implementation of the Malawi program generates important lessons for current and future policy, programming, and scale-up of nutrition interventions in this setting.

Keywords: Process evaluation, LNS, SBCC, qualitative
Further collaborators:
World Food Programme, World Vision Malawi, Wadonda, Inc.

COMPREHENSIVE PROGRAMING LEADS TO IMPROVEMENTS IN OUTPUTS AND OUTCOMES ACROSS THE PROGRAM IMPACT PATHWAY

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The Government of Malawi initiated the Scaling-up Nutrition (SUN) 1000 special days initiative in 2011. In Ntchisi District, World Food Programme and World Vision provided technical and operational support to this initiative. Programming included comprehensive social and behaviour change communication (SBCC) for improved infant and young child feeding (IYCF) and improved water, sanitation and hygiene (WASH). Nutrition-sensitive activities included small animal husbandry and homestead gardening promotion for diet diversification. Nutrition-sensitive activities and SBCC messages were delivered through peer-to-peer support (caregroups). The programme also strengthened community management of acute malnutrition and provided small-quantity Lipid-based Nutrient Supplement (LNS) to all children 6 – 23 months.

document changes along the programme impact pathway that are associated with nutritional status including formation and activity of caregroups, SBCC message delivery, nutrition-sensitive activity completion, as well as WASH and IYCF changes.

Output indicators were monitored monthly through programme performance reporting. Outcome indicators were measured using statistically-representative surveys conducted three times per year applied to mothers of children 6-23 months. Output indicators analysed for this report were caregroup formation, activity and coverage; activities to reinforce SBCC messages; and small animal husbandry and home gardening activities. Outcome indicators were MAD, MDD and handwashing facility ownership.

MDD and MAD were measured following the WHO/UNICEF methodology and calculated twice. LNS consumption was first included in a composite category of 'fortified and flesh foods' and, second, not included. The former analysis was performed to measure impact of LNS on dietary adequacy (i.e. dietary micronutrient profile) and latter to measure dietary diversity based on common home-foods. A Z-test for two population proportions comparing the same indicator annually (January 2015 and January 2017) was used to test for significance at an alpha value of 0.05.

The number of caregroups formed increased steadily: 2014 (268), 2015 (479), 2016 (513) and 2017 (610), which led to continuous increase in caregroup volunteer home visits from 2014 to 2017. By 2016, the coverage of caregroups was 100% in the district. There was an increase in SBCC activities from 2016 to 2017 such as number of billboards (14 to 21) and theatre performances (14 to 32), promoting nutrition and WASH. In 2016, small livestock were distributed to 3000 households. Another 3000 households received vegetable seeds. There was a continual improvement in children's MDD and MAD, and household handwashing facility ownership from 2015 to 2017. MAD and MDD including provision of LNS increased from 32% to 43% and 36% to 50%, respectively (p<0.05). Without LNS, MDD increased from 10% to 25% (p<0.05) and MAD increased from 12% to 29% (p <0.05). There was a significant increase in handwashing facility ownership from 45% to 17.4% (p < 0.05).

LNS significantly increased the number of children with adequate micronutrient intake, as indicated by MAD. The increase in MAD without consideration of LNS consumption indicated a benefit of SBCC and nutrition-sensitive activities. The quantified increase in SBCC and nutrition-sensitive activities is likely responsible for the positive impact on MDD, MAD, and WASH outcomes over the course of the stunting prevention programme.

Keywords: Scaling Up Nutrition, Stunting Prevention, Infant & Young Child Feeding (IYCF), Water, Sanitation and Hygiene (WASH), Malawi

SUPPORTING SCALING UP NUTRITION – FROM POLICY TO ACTION AT THE LOCAL LEVEL

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A multi-year stunting prevention programme was launched in Ntchisi District as a part of the roll-out of the 'Scaling-up Nutrition (SUN) 1000 special days' initiative' in Malawi in 2014. Ntchisi district was targeted due to its high stunting prevalence (above 50%) in children 6-23 months of age. The stunting prevention programme is a comprehensive approach to tackling stunting, including complementary feeding (distribution of a small quantity lipid-based-nutrient supplement) to children 6-23 months of age, as well as rigorous social behaviour change communication (SBCC) components, engaging the local community through various mechanisms, including peer to peer counselling through care groups. Additionally, community management of acute malnutrition (CMAM) treatment and Water Sanitation and Hygiene (WASH) activities were scaled up to include all health facilities in the district. To date, the programme has reached over 44,000 children between 6-23 months of age, with attendance rates being over 90% in the last seven months.

to demonstrate how the SUN movement, combined with other international and national initiatives and policies, was translated into local action to address stunting for improved nutrition in one district in Malawi.

a well-structured National SUN framework, reliable coordination platforms related to nutrition and health, and district owner-

ship by local stakeholders willingly taking leadership of the nutrition agenda.

Additional methods include capacity augmentation in the program area through staff presence. This has been in order to enable the creation of common nutrition vision, coordination and resource pooling and purpose at district level and promote country capacity strengthening and development.

Considering the stunting prevention program in Ntchisi, Malawi, was aligned with the national SUN movement roll-out, it supported strengthening nutrition governance capacities at both national and district level. Furthermore, making the best use of currently existing coordination platforms related to nutrition and health has enabled the program to situate itself in a strong in-country position and district ownership

Successful decentralisation and operationalisation of SUN at sub-national levels requires engaged local leadership and use of the existing structures, hence creating synergies and ownership.

Keywords: Scaling Up Nutrition (SUN), Stunting Prevention, Nutrition, Malawi, Governance

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PS_144/72

PROGRAMMATIC IMPLICATIONS FROM RISK-BENEFIT ANALYSIS OF IRON INTERVENTIONS IN YOUNG CHILDREN

RISK-BENEFIT ANALYSIS OF IRON INTERVENTIONS IN YOUNG CHILDREN

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The World Health Organization (WHO) recommends universal distribution of iron supplementation or multiple micronutrient powders to all children under-2 years in settings where anaemia is prevalent. However, there is evidence these interventions may also promote infections including malaria and diarrhoea. Thus, a decision to implement anaemia control interventions must incorporate a holistic analysis of both expected benefits and risks along with associated costs or economic gains. Differing epidemiology and infectious disease burdens likely mean the effects of interventions are different in each country-context. In each country where the prevalence of anaemia is such that universal iron interventions are recommended, or where interventions are presently being piloted, we modeled the risk-benefit and cost effectiveness of the iron interventions to under-2 children.

We developed a microsimulation model that generated individual patient histories over an 18 month horizon. We populated the model with country-specific epidemiologic, health service utilization and cost data, and simulated three cohorts of 5000 infants receiving different anaemia-control interventions between the ages of 6 and 12 months: 1) MNPs, 2) iron supplementation or 3) no intervention. We estimated country-specific, lifetime net differences in health outcomes (measured as disability-adjusted life years [DALYs] averted) and costs between MNPs and iron supplementation when compared with no intervention. Effects sizes were based on updated systematic reviews of MNPs or iron supplements versus control which have been used to inform WHO anaemia control recommendations, and modulated at the country level depending on malaria endemicity and individual level depending on access to malaria prevention. Cost data were based on estimates of unit-costs of interventions, programmatic costs, probability of health seeking, and costs per visit of health attendances.

There was marked variation in overall benefit in net benefit-risk from iron interventions between different regions, and in different countries within regions, from overall beneficial to overall harmful. The burden of disease attributable to anaemia was chiefly due to moderate and severe, but not mild, anaemia. Increases in diarrhoea from anaemia control interventions contribute considerable to DALYs in this model. Data on long term effects of iron interventions on cognitive performance were sparse but indicate no effect; this precluded incorporation of an effect from intervention on earning potential. There were differing costs per DALYs averted and different affordability of programmes between countries, with costs in some countries exceeding US$5000 per DALY averted. Benefits from iron would be entirely negated if iron raises mortality risk in children by 1 per 10000.

Iron interventions generally have a positive but modest effect on child health and are moderately cost-effective. Data from randomised controlled trials reporting on effects of iron interventions on functional health outcomes would inform and improve precision of the model.

Keywords: Iron deficiency, anaemia, DALYs, microsimulation model, children
Further collaborators:
IUNS

PS_144/82

SCIENCE BASED MEASURES TO INCREASE NUTRITION QUALITY IN GERMANY

EVIDENCE-BASED GUIDELINES ON FAT AND CARBOHYDRATE INTAKE

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Nutrition-related chronic diseases contribute increasingly to the total disease burden in many populations. Fat, carbohydrate and protein intake play a major role in human nutrition. However, consumer are faced with conflicting and sometimes contradictory

publications and opinions. In this systematic review the scientific evidence for the primary prevention of diseases like obesity, type 2 diabetes mellitus, dyslipoproteinaemia, metabolic syndrome, hypertension, coronary heart disease (CHD), stroke and cancer through the intake of various fat and fatty acids (SFA, MUFA, PUFA, TFA), carbohydrates (mono-, di-, polysaccharides) and proteins was evaluated. The evaluation was conducted by expert groups of the German Nutrition Society.

Method: Systematic literature searches were conducted with the primary focus on meta-analyses, systematic reviews and monographs. If these were not available, original intervention and cohort studies were considered.

Results: There is convincing evidence that a reduced intake of total fat and SFA as well as a larger intake of PUFA at the expense of SFA reduces the concentration of total and LDL-cholesterol in plasma. Furthermore, there is convincing evidence that a high intake of TFA increases risk of dyslipoproteinaemia and that a high intake of long-chain PUFA reduces plasma TGC concentrations. Additionally, a high fat intake increases the risk of obesity with probable evidence in an ad libitum diet. A larger intake of PUFA at the expense of SFA reduces the risk of CHD with probable evidence and a high intake of long-chain n3-PUFA reduces the risk of hypertension and CHD, whereas a high TFA intake increases the risk of CHD. A high carbohydrate intake at the expense of total fat and SFA reduces the concentration of total, LDL and HDL cholesterol. Conversely, a high carbohydrate intake at the expense of PUFA increases total and LDL cholesterol, but reduces HDL cholesterol. Furthermore, a high consumption of sugar sweetened beverages increases the risk of obesity and type 2 diabetes, whereas a high dietary fibre intake, mainly from whole-grain products, reduces the risk for obesity, type 2 diabetes, CHD and colon-cancer.

Conclusion: The evaluation shows that both the total amount of fat and the pattern of fatty acids as well as carbohydrate quality must be carefully considered in dietary recommendations. The findings suggest that a modification of the fatty acid pattern in favour of unsaturated fatty acids at the expense of SFA and TFA and of carbohydrates in favour of polysaccharides at the expense of mono- and disaccharides is desirable.

Keywords: Carbohydrate, fat, intake, chronic diseases

HEALTH EFFECTS OF PLANT-BASED DIETS: FROM WHOLESOME-MIXED DIETS TO EXTREME VEGETARIAN DIETS

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There is a high interest in a diet that based primarily on plant foods. The German Nutrition Society is favoring a diet which is composed of 75% of foods that originate from plants. The remaining 25% include mainly milk and milk products, fish, and to a comparable lesser extend meat and processed meat. The intake of meat including processed meat should be restricted to 600g a week at maximum. This recommendation in amount for a food group

that had been highly debated due to its relation to disease risk and environmental impacts consists of about half of the amount of current intake. Milk and milk products among the food groups of animal origin are particularly favored due to its content of calcium and also fish due to its content of long chain polyunsaturated fatty acids.

A diet characterized in such a way with some further specifications is been labelled as a wholesome mixed diet by the German Nutrition Society. It is obvious that compared to the current dietary practice particularly the reduction of meat and processed meat and the increase of fish will have impact on disease occurrence due to the many relationships with chronic disease endpoints in meta-analyses and also due to the discussed mechanisms. A further reduction of disease occurrence is expected by an increase of intake of fruit and vegetables. The German Nutrition Society is clearly in favor of 5 portions of fruit and vegetables which is equivalent to 650g/d according to German portions.

The German Nutrition Society discussed recently the impact of increasing the proportion of plant foods beyond the wholesome mixed diet approach in respect to nutrient intake and nutrient related health consequences in a specific working group. This working group also published a statement regarding the implication of a vegetarian and vegan diet in respect to nutrient recommendations. The working group concluded that the provision with some critical nutrients such as specific amino acids, vitamin b12, riboflavin, calcium, iron, iodine, zinc, selenium, and ω3 fatty acids is getting more and more difficult as more sources of animal food need to be replaced by plant food. The omission of meat and processed meat in the diet as prime aspect of a vegetarian diet does not seem problematic if replaced by proper plant foods. However, a diet without any animal food sources should include a consultation with diet expert and also a medical a surveillance of clinical markers reflecting the critical nutrient particularly vitamin B12. The German Nutrition Society does not favor a vegan diet for young children and pregnant women due to its high risk of nutrient deficiencies.

In terms of reduction of disease risk it is not be expected that a further reduction of animal foods beyond a mixed wholesome diet will have a large impact. Rather, it is to be expected that a lack of fish and milk and milk products will result in small increased risks compared to a diet with some portions of animal foods.

Keywords: Disease risk, vegetarien diet, plant foods, animal foods, Food based dietary guidelines

QUALITY STANDARDS FOR CATERING IN DIFFERENT SETTINGS

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Background: The nutritional situation in Germany is characterized by high prevalence of overweight and obesity in both: children and adolescents as well as adults. With increasing age also malnutrition, especially in the elderly and hospitals occur frequently. Against this background the Ministry on Health and the

Ministry on Food and Agriculture adopted the National Initiative on physical activity and healthy nutrition in 2008. Based on this publication the German Nutrition Society developed after intensive discussion within large expert groups quality standards for diverse settings like nurseries, schools, workplace canteens, geriatric care centers, meals on wheels and hospitals. Actually in these settings round about 2.49 billions of lunch per year are consumed.

Objectives: The quality standards make part of the primary prevention. They aim to support the persons responsible in mass catering for implementing adequate and nutritionally balanced meals and allow the guests a healthy choice. In schools and nurseries a link to nutritional education has to be established, so that nutritional behavior can be sustainably shaped. In other settings like workplace canteens or hospitals nutritional information is focused so that adults might learn what is good for them.

The content of the standards: The focus is on the nutritional quality of meals and drinks. For this purpose, the food quality of each group is clearly defined and the frequencies in which they should be offered in one week or during four weeks. The recommendations are derived from the German food-based dietary guidelines. At the same time, the D-A-CH reference values are important, but only some nutrients such as carbohydrates, fat and protein, fibre, vitamin C, vitamin E, folate, iron, magnesium and calcium as well as energy are checked. In addition, requirements to the preparation of food are established, as for instance a maximum warming time of 3 hours or frying with a minimum of fat, preferring rapeseed or olive oil.

Since the standards adopt Donabedian`s quality management systematical approach looking to the quality of structure, processes and results, other aspects beside the nutrition-relevant ones are also important. Therefore the standards describe requirements to the framework conditions such as the dining atmosphere, the quality of hygienic processes, the sustainability of food and production or the qualification of the staff.

Conclusion: The quality standards were harmonized and continuously updated in the last years. Within the scope of the 13th nutritional report of the German Nutrition Society research in nursing homes and nurseries has shown to what extent and in which way the implementation of the quality standards has changed the meal offer. However, up to this point of time, studies are missing that could reveal an alteration in the nutritional situation or the nutritional behavior of the guests. Such studies should be carried out in the future in order to demonstrate the effects of quality standards as primary prevention in different settings.

Keywords: Mass catering, primary prevention, healthy meals
Further collaborators:
German Nutrition Society

LATIN AMERICAN SURVEY OF NUTRITION AND HEALTH: WHAT HAVE IN COMMON AND IN WHAT THEY DIFFER, EIGHT COUNTRIES OF LATIN AMERICA?

MAJOR FOOD SOURCES OF SUGAR AND ITS ASSOCIATION WITH OBESITY AMONG COUNTRIES OF ELANS

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Overweight and obesity not only represent significant risk factors for developing non communicable diseases, the leading cause of deaths worldwide, but also imply high healthcare costs for governments. Nowadays, Latin American countries are facing not only the challenge of trying to overcome malnutrition due to deficiencies but also to stop the rapidly rising prevalence of overweight and obesity. The projection is that Latin America will be one of the regions with the highest increment during the next decade. Due to the high impact of overweight and obesity on human well-being, the world Health Organization has developed guidelines in relation to sugars intake, as this is one of the most important contributors to high energy intake.

The Latin American Health and Nutrition Study (ELANS), a multicenter study conducted in urban areas of 8 Latin American countries was developed with the objective to describe dietary intake and anthropometric nutritional status on this population. Two 24 hour detailed dietary recalls and anthropometric measurements (height and weight; neck, hip and waist circumferences) were collected in 9218 Latin Americans (15 to 65 years old). Food consumption was processed using the Nutritional Data System for Research (NDS-R) software. Multiple Source Method was applied to estimate the individual usual intake.

Around 14% of total energy intake came from added sugars. Argentina reported the highest percentage of energy intake from added sugars, in contrast to Ecuador with the lowest.

Beverages accounted for the highest percentage of energy intake from added sugars. All countries reported soft drinks/regular sodas, infusions and natural or ready to drink juices as the main dietary sources of sugar.

Dietary consumption analysis found that more than 25% of the participants are under or over reporters. After adjusting for plausible subjects, no association between added sugar consumption and body mass index was observed. Only Argentina and Chile seems to have a higher consumption reported by underweight people, but still not significant difference was observed.

This study contributes to improve our knowledge about added sugars consumption in the region and its main dietary sources. This can help to focus region and country health policies in order to decrease added sugar consumption and reduce excess calorie intake.

Keywords: Added sugar, beverage, energy, obesity, Latin America.

MAJOR FOOD SOURCES FOR ENERGY AMONG COUNTRIES OF ELANS: ARE WE ALIKE?

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It is well known that during the last 4 to 5 decades Latin America (LA) has undergone a process of nutritional transition, resulting in an increase of total energy intake that may be raising the overweight and obesity prevalence.

International comparisons of dietary intake are important to understand food habits and to contribute to the development of public health policies. However, comparisons of dietary intake across nations are not frequently reported due to the difficulty in collecting comparable data among different countries. Besides that, most of the scientific evidence has limited information on Latin American countries that have their own individuality as a region.

In order to correct this weakness, the ELANS group decided to evaluate the energy intake of 9218 subject, 15 to 65 years of age in 8 LA countries using two 24-hours dietary recall (24HR), following the multiple pass method. A total of 3351 types of food and beverages, reported in both 24HR, were grouped into 93 food types and 19 food groups. The percentage contribution of each food item to energy intake was calculated using weighted-proportions formula developed by Block et al (1985).

Ecuador had the highest intake of energy among the eight countries, followed by Argentina, Colombia and Peru. Conversely, Chile had the lowest intake, followed by Brazil, Costa Rica and Venezuela (data to be verified excluding miss reporters). The main source of energy in all countries was grains, pasta and bread followed by meat (not processed) and eggs and oils, fats and dressings. On the other hand, food groups such as vegetables, beans, legumes and soybeans and fruits have a low contribution to the total energy intake. Comparison between countries, reported that Peru is the one that get the highest energy from grains, pasta and bread and Colombia the lowest. Sugars and sweets are an important source of energy in the Argentinean diet, while oils, fats and dressings are the sources for the diet of Ecuadorians.

The distribution of energy throughout the day in the different meal times does not have a homogeneous distribution among the eight countries. For example, Venezuela gets the majority of the energy intake from breakfast and lunch, while Argentina does it from lunch and dinner. Finally, Brazil has an important intake of energy during the snacks along the day.

In conclusion, independent of the gender, in all countries, the main source of energy was grains, pasta and bread, followed by meat. The results reflected a dietary pattern that has been identified in LA population: high protein intake and low fiber, as fruits and vegetables are not consumed in the quantity recommended by the WHO. Regarding the mealtime pattern, none of the countries followed the pattern recommended by the FAO regarding the distribution of energy throughout the day (breakfast 20-25%, lunch 35-40%, dinner 15-25% and snacks 10-20%).

Keywords: Energy intake. Main source of energy. Energy distribution.

design, data collection and analysis, the decision to publish, or the preparation of this symposium.

Further collaborators: On behalf of ELANS group

HYDRATION PROFILE OF POPULATION OF COUNTRIES OF ELANS

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Water has been considered as the most important drink in relation to a healthy and adequate hydration. Therefore, its daily intake should be sufficient to compensate for metabolic needs such as body composition, physical activity level or fever. In a healthy adult, with normal physiological conditions and without exposure to extreme environmental conditions, the intake recommended by the EFSA (European Food Safety Authority, 2010) for daily fluid consumption is 2.0 liters for women and 2.5 for men. These values are lower than those previously proposed by The Institute of Medicine of the National Academies in 2005. According to these recommendations, water should be the most important drink and in great abundance among the population; however it does not specify the average amount that should represent the consumption of pure water in relation to the liquids ingested daily.

The Latin-American Study of Nutrition and Health (Estudio Latinoamericano de Nutrición y Salud - ELANS) evaluated the intake of pure water in relation to the total of fluids consumed in the population taking into account variations according to gender, age, socio-economic status, and region of residence. The results of two 24-hours (24HR) dietary recalls were used, following the multiple-step method in three Latin American countries (Argentina, Ecuador and Peru).

From the total sample of participants included in the study, 88.9% consumed pure water and the remaining 11.1%, were participants that consumed liquids from others liquids than water. Argentina had the highest total fluid consumption among the three countries studied, followed by Ecuador and finally Peru with significant statistical differences between them. The contribution of pure water in relation to the total of liquids consumed was superior in Ecuador representing 18%, unlike Argentina and Peru where 16% corresponds to pure water, with a significant differences between gender.

Water consumption of the studied population followed the recommendations established by the EFSA for total liquids daily consumption (2.5 for men and 2.0 liters for women). The percentage of pure water consumed by the population of the Latin American countries included in the present study represents a low percentage of the total fluids consumed.

Pure water is recommended as the main source to cover the daily needs of liquids.

In conclusion, the implementation of proposals must be directed to motivate and to improve the different ways to hydrate, prioritizing the consumption of water over other drinks that provide energy. This could contribute to prevention of overweight, obesity and their comorbidities.

Keywords: Hydration; consumption habits; water; population.

Further collaborators:
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LIFESTYLE PROFILE OF FERTILE AGE WOMEN IN LATIN AMERICA: RISKS AND CONSEQUENCES FOR THE NEXT GENERATION

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Women of child bearing age should achieve and maintain good nutritional status and lifestyle prior to conception in order to minimize health risks to both: themselves and their babies. Evidence supports that at the time of conception maternal nutritional status is an important determinant of embryonic and fetal growth. The characteristics of Latin American women of fertile age in terms of nutrition status, physical activity level and the socio-economic elements that define their environment are key to understand if they are well prepared to face pregnancies in adequate conditions.

Latin America (LA) has been deep into the nutrition transition process and showed the double burden of malnutrition, including "hidden hunger", as reported in the literature. How this process has influenced wellbeing in women of fertile age at regional level is a big concern for the scientific community in LA, and the question on the implementation of public policies is: how early should prevention start?

The Latin American Study of Nutrition and Health (Estudio Latinoamericano de Nutrición y Salud –ELANS), is a cross-sectional study conducted in eight Latin American countries with the aim to study: food consumption, physical activity level and socio-demographic and anthropometric characteristics. The study included 4,809 women, divided in four groups: adolescents; women between ages 19-34, women 35-44; and 45 -65 years old.

In general ELANS data reported a prevalence of overweight or obesity in 27% of adolescents, 50.77% of women between 19-34 years and 66.52% of women 35-44 years old. Chilean female adolescents showed the highest prevalence of overweight and obesity, whereas Costa Rican adolescents reported the lowest prevalence of excess. Waist circumference shows a trend for increasing with age in all countries.

Institute of Medicine estimated average requirements were taken as reference. Mean energy intake among all groups of ages are inadequate except for Costa Rica, where caloric intake reached 2000 Kcal/day or above in all age groups. All countries showed a trend to diminish caloric intake with age,. Interestingly, 99.3% of women of all ages had adequate intakes of protein. Micronutrients intake outcomes showed: calcium intake to be inadequate in all countries, and adolescents and women over 45 years were the most inadequate. Regarding vitamin A, the most inadequate intakes were in Brazil and Venezuela in all groups of age, vitamin C reported a general prevalence of inadequacy of 35.95% and most concerning: vitamin D reached 98.52% of inadequate intake.

According to IPAQ results, 61.93% of women have low physical activity (PA) levels, adolescents were the group with largest prevalence of inactivity or low levels of PA. Venezuelan adolescents were the most inactive, and the exception of Peruvian women who showed the highest prevalence of activity at all ages, particularly adolescents.

In conclusion, women of fertile age in LA showed a vulnerable nutritional status with inadequate intakes of key nutrients, that combined with high prevalence of inactivity constitute a profile of risk for embracing pregnancies in good condition; thus compromising a good start to life of the future generations.

Keywords: ELANS, Women, fertile age, lifestyle

Further collaborators:
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PS_144/125

CLIMATE CHANGE AND NUTRITION: CHALLENGES AND OPPORTUNITIES

CLIMATE CHANGE, AGRICULTURE AND HUMAN HEALTH

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Climate change and human health are related to each other by changes in agriculture. In this talk, I provide an overview of our group's work that analyses three such pathways.

First, I detail how climate change affects agriculture through changes in yields, which affects food consumption by changes in supply, which finally affects health by changes in food composition. Based on an coupled modelling framework, I present quantitative estimates of these climate-related health impacts.

Second, I detail how changes in food demand could impact both climate change and human health. I explore the climate change and health co-benefits of multiple dietary scenarios as estimated by a global comparative risk assessment paired with greenhouse-gas emissions.

Third, I detail how economic incentives could influence food consumption, as well as the health and climate change co-benefits associated with that. Using an agriculture-economic model coupled to a global health model, I present region-specific estimates of the impacts of levying emissions taxes on food commodities, with a special focus on designing tax designs that would result in both health and environmental co-benefits.

Keywords: Human health, climate change, agriculture, dietary change, global modelling

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PS_144/1040

SHAPING GLOBAL FOOD SYSTEMS FOR BETTER NUTRITION

ENHANCING MICRONUTRIENT DENSITY OF STAPLE CROPS OF FOOD SYSTEMS IN DEVELOPING COUNTRY

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In general terms, biofortification comprises the application of genetic engineering, agronomic and plant breeding technologies to enhance the contents of nutrients and phytochemicals in the edible tissues of living organisms. More specifically, biofortification via selective plant breeding for higher iron, zinc and provitamin-A (pVA) carotenoids in staple crops has made most progress insofar as crop development, varietal releases in middle and low income countries with high burden of these micronutrient deficiencies, and deployment of the biofortified varieties through a variety of demand push and pull strategies. Today, biofortified crops, including pVA-rich orange sweet potato, iron beans, iron pearl millet, pVA yellow cassava, pVA orange maize, zinc rice, and zinc wheat, have been released in more than 30 countries and are being tested and grown in more than 40 countries. More than 160 varieties of 10 major and minor staples have been released. Crop improvement continues to develop varieties with higher levels of vitamins and minerals that are adapted to a wide range of agro-ecological conditions. Ensuring that the best germplasm for climate-adaptive and consumer-preferred traits remains a basic criterion in breeding biofortified crops. To make significant headway in contributing to solve the global public health problem

of hidden hunger, biofortified crops must become the norm rather than the exception in staple food markets. To reach a billion people effectively in developing countries by 2030 will require 1) enhancing the knowledge base to develop and deliver more efficient technologies to accelerate plant breeding and hit the highest micronutrient levels possible successfully without sacrificing preferred agronomic and culinary traits; 2) mainstreaming plant breeding for nutritional traits at regional and national agricultural research centers; 3) improving the stability of provitamin A carotenoids post-harvest in maize, cassava, and sweet potato; 4) improve the bioavailability of iron and zinc when the increase in mineral density is insufficient to improve nutritional status; and 5) partnering with implementing agents in agriculture and nutrition in high burden countries. Certainly, serious consideration must be given to assessing the cost-benefit of crop genome editing and other genetic engineering technologies, and to working within the regulatory environment and with consumer education long before any GM product reaches an advanced development stage. But more importantly, each national and regional government must address micronutrient malnutrition disorders holistically and in responding to context-specific requirements and opportunities. There are no magic bullets but there are many interventions, including biofortification, that are already available and waiting to be deployed in an integrated fashion.

Keywords: Biofortification, crops, food, micronutrients, mainstreaming

SHAPING MARKETS FOR BETTER NUTRITION: INSIGHTS FROM THE ASSESSMENT OF THE MARKETPLACE FOR NUTRITIOUS FOODS

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Today, poor quality diets are the leading contributor to the global burden of disease and are in large part the result of the failure of the food system to support the accessibility (i.e., availability and affordability) of nutritious foods to all segments of the population. The world's poor are net buyers of food, yet there have been few efforts to leverage markets as an entry point to improving diets. Private-sector actors involved in processing, distributing, and retailing foods influence the availability, affordability, safety, and nutritional content of foods in the marketplace and hence in part govern access to nutritious diets.

In sub-Saharan Africa, the vast majority of businesses are small and medium enterprises (SME) and these entities provide a sizable share of foods purchased by low-income populations. These businesses face many challenges in establishing sustainable, profitable operations and it is recognized that support is necessary to foster their establishment. Supporting SMEs to improve the nutritional quality and safety of their products in ways that are inclusive of low-income communities and to overcome barriers to growth has

the potential to sustainably improve access. However, a knowledge gap exists around ways to effectively engage the private sector, and measures of the food environment that are appropriate to assess the impact of private-sector investments on consumer access to nutritious foods in markets are sparse.

The Marketplace for Nutritious Foods (MNF), a program implemented by GAIN since 2013, has helped companies in Kenya, Rwanda, and Mozambique identify ways to improve the nutritional quality of their foods and overcome barriers to expand into new and existing markets through technical and financial support. This presentation will share insights from a case study assessment of MNF aiming to (i) develop and test novel measures of the food environment appropriate for impact evaluations of market interventions aiming to improve access to nutritious foods and (ii) document lessons in engaging the private sector for nutrition.

Keywords: Market access; food systems; food environment
Further collaborators:
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PS_144/44

PHYSICAL ACTIVITY AND HEALTH: NEW KNOWLEDGE IN RESEARCH AND TECHNOLOGIES

INTRODUCTORY REMARKS: STATE OF THE SCIENCE ON THE BIOLOGICAL IMPORTANCE OF DIET AND PHYSICAL ACTIVITY IN DISEASE RISK REDUCTION AND HEALTH MAINTENANCE

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Non-communicable chronic diseases (NCDs), also known as chronic diseases, are the main cause of disease in the world. According to the WHO, NCDs kill 40 million people each year, equivalent to 70% of all deaths globally, affecting not only developed but also developing countries. Each year, 17 million people die from a NCD before the age of 70 and 87% of these "premature" deaths occur in low- and middle-income countries. Cardiovascular (CDV) diseases account for most NCD deaths, or 17.7 million people annually, followed by cancers (8.8 million), respiratory diseases (3.9 million), and diabetes (1.6 million). These 4 groups of diseases account for 81% of all NCDs deaths.

Tobacco use, physical inactivity, the harmful use of alcohol and unhealthy diets all increase the risk of dying from a NCD. Indeed, an important way to control NCDs is to focus on reducing the risk factors associated with these diseases. Hence, the authentic way for preventing NCDs is linked to healthy lifestyles with a multidisciplinary focus addressed to the individuals and their environments.

A varied and moderate diet, with small food size portions and low-energy density, as well as generous in vegetable and fruits, and low in free added sugars, salt and trans fatty acids, have been demonstrated to have a role in the prevention of NCDs. In addition, physically active persons show a reduced risk of developing CDV diseases as well as other NCDs. Decreasing the risk of CDV diseases requires the participation of subjects in programs of regular physical activity (PA) for a number of years. However, there are significant benefits for the individuals derived of PA in only a few weeks, namely improvement of CDV response, decrease of blood pressure, increase of muscle mass, and decrease of moods and anxiety, and those effects are independent of the genre, age and race.

People affected of type 2 diabetes, who usually are obese (80%), hypertensive (60-80%) and dilipidemics (40-50%), benefit from regular PA as, independently of the weight loss, it contributes to the improvement of the cardiovascular response, glucaemia control, blood pressure, and plasma lipids. In addition, numerous studies have demonstrated that there is an inverse relationship between the level of PA and insulin resistance, not only in adults but also in adolescent and children, particularly in those obese.

A number of changes in lifestyle habits seem to have a key role in the starting and progression of neurodegenerative diseases. In fact, longitudinal studies followed up for periods of 5-7 years have shown that physically active persons have a lower decreased risk (20-50%) of having dementia as compared to less active persons. Based on animal studies, the reasons behind those beneficial effects of PA appear to be related to the increased cerebral plasticity that favours the regenerative and adaptive processes, which are mediated by neurotrophic factors, augmented expression of neuron growth factors, which are important for the neurogenesis and neurotransmitters production, an improvement of the immune response associated with a reduction of neurotoxic citokines, and increased elimination of β-amyloid in brain.

Keywords: Non-communicable diseases. Cardiovascular diseases. Diabetes. Neurodegenerative diseases. Physical activity

Conflict of Interest disclosure: This Sympoisum hasn been sponsored by ILSI

DIET AND PHYSICAL ACTIVITY: USING CONTEXTUAL DATA TO IMPROVE ASSESSMENT

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Access to methods to enhance objective data collection of physical activity and dietary intake are becoming more available. Use of accelerometers have enhanced knowledge regarding the benefits of physical activity. For diet, use of images from mobile phones or video have improved objective data capture with regard to foods, time of eating, and location of eating. Associations with accelerometer data and health outcomes are stronger than those observed with self-reports. The benefits of physical activity timing have been elucidated as a result of time-stamped accelerometer data. On the other hand, mixing self-reported physical activities with an objective accelerometer can provide specific information

about best activities to achieve 5 minute bouts. Examples of these advancements in physical activity assessment and its associated outcomes will be shared. For dietary intake, subjective or cultural terms (e.g., supper) for eating occasions have had mixed results with regard to overall diet quality. The use of objective time measures have revealed distinct temporal dietary patterns with significant differences in diet quality. Examples will be shared to demonstrate the improvement in dietary assessment that can accrue from objectively documenting time of eating, the environment of eating, and other contextual data. The new methods available to implement these data collection activities will be summarized.

Keywords: Physical activity, bouts, dietary assessment, temporal dietary patterns.

THE EXERCISE IS MEDICINE (EIM) IN CHINA

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Background and objectives: A third of the world's population does not meet the recommended levels of physical activity, which lead to substantial health and economic burdens. Over the past several decades, along with the changes of lifestyle in Chinese population, the physical activity and fitness of Chinese has decreased, where as physical inactivity becomes a major causal risk factor for the rapid increase of overweight and obesity and many of their associated co-morbidities have increased. In China, 86% of deaths due to non-communicable diseases and 8.3% of deaths related to physical inactivity already occur, but where a large gap in research and implementation of PA strategies exists.

Methods and Results: 'Exercise Is Medicine' (EIM) is a global health initiative managed by the American College of Sports Medicine (ACSM) that is focused on encouraging primary care physicians and other health care providers to include physical activity when designing treatment plans for patients and referring their patients to EIM Credentialed Exercise Professionals.

ILSI Focal Point in China signed the Memorandum with ACSM for the Cooperation in Exercise is Medicine (EIM) in China in 2012. The main objective is working on promoting the EIM solution and physical activity in China by holding EIM training courses, setting up EIM website and other projects.

To provide advices for clinicians to offer patients with exercise prescription, and to provide guidelines on scientific exercises and non-communicable diseases prevention, ILSI Focal Point in China has organized more than 10 training courses on EIM in collaborating with relevant organizations, and totally 1500 of clinicians have been trained by the end of May 31 2017.

Conclusions: To train the trainers and increase public aware is the key to the success of EIM in China. In this presentation, we describe the evolution and Chinese expansion of the EIM initiative, the implementation and future directions.

Keywords: Keywords: Physical Activity, Training, EIM, China

MINI SALTEN: A CASE STUDY ON LEARNINGS FROM ARGENTINA ON OUTCOMES AND CHALLENGES

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Global Recommendations on Physical Activity for 5-17 years old, of the World Health Organization (WHO), are to invest at least 60 minutes a day in moderate to vigorous physical activity (MVPA).

Mini SALTEN is a program developed to improve eating habits and increase moderate to vigorous physical activity at home and school in first grade children. It aims to assess the effects of a technology family-based and physical activity (PA) school-based intervention.

The design of the protocol was based in a cluster-randomized controlled trial designed to run from July 2015 to November 2016 in twelve public schools of the city of Buenos Aires, matched for socio-demographic characteristics. The intervention was based on two main components: a) virtual (V): web-based presentations delivered to the mothers via a multiplatform application; b) active breaks (AB): implemented during school breaks by a PA instructor. V: Especially designed web-based contents, targeting families and children aimed at encouraging the improvement of eating habits of the whole family both at home and at school, and increasing mothers' knowledge of the benefits of PA and consequences of sedentary behaviour, and proposing pleasurable movement entailing activities for the children. AB: included activities comprising movement during school breaks that were promoted with motivation as a backbone and devoid of a competitive strive; active play in which fun, pleasure, and sharing were emphasized. PA instructor guided activities with the goal of promoting active play for a minimum of 20-30 min/day, depending on each school. Using a computer generated random sequence participants were allocated to one of four intervention conditions resulting in 4 clusters: (AB), (V), (AB) + (V), and control (C). Outcomes are measured at baseline and 12 months post intervention, and included data collected from the dyad (child and her/his mother).. The levels of PA were measured using ActiGraph wGT3X-BT accelerometers for 7 consecutive days (24 hours). Outcomes were: time in light, moderate and vigorous PA and sedentary time (minutes/day). Family socio-economic level, home environment, and school environment were also assessed. This study provides objective information regarding dietary and PA patterns of first grade children of public schools of Buenos Aires. It is a pioneer assessment of the impact of a technology-based virtual intervention, involving the parents, designed to prevent obesity. planning public health policies.

Keywords: Physical Activity. childhood Obesity prevention. Technology. PA measures.

and ILSI Argentina. The founders had no role in study design , data collection and analysis, or preparation of this symposium. The authors declare no conflict of interest.

NEW COMBINATION METHODS FOR ADVANCING PHYSICAL ACTIVITY AND FOOD INTAKE ASSESSMENT FOR BETTER ADHERENCE TO PUBLIC HEALTH RECOMMENDATIONS

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Measurement of dietary intake and physical activity has become increasingly important for health monitoring, and providing interventions that optimize population health. Advances in technology have been useful for reducing survey or study participant burden and have increased objectivity and accuracy for some measures. A plethora of tools, applications and systems have been developed and although significant advances have been made, several limitations at the level of the individual measure limit the ability to capture information that is accurate. In November 2016 a group of experts on diet, physical activity, and the use of technology for health purposes gathered at the University of California, San Diego to examine current experience with the use of technology for research on physical activity and diet. This unique forum investigated current and emerging challenges related to improving energy balance behavior assessment and intervention via technology, and focused on how the research community might embrace and apply innovative new tools. The assembled experts made a number of recommendations that will be summarized in this presentation. To be able to fully take advantage of recent technological advancements for the measure of diet and physical activity:

1) A consensus is needed regarding current methodology and needs with regards to each area of assessment. This will foster inter-disciplinary collaborations among experts from technology, nutrition, public health, epidemiology, and medicine to address the gaps in this direction.

2) Additionally, a focus on assessing the validity and reliability of the available methods for dietary intake and physical activity assessment in adult, youth, and older adult populations ratified by expert researchers in the field will help guide investigators to obtain high quality measures.

3) Increasing efforts that are directed to facilitate a plug-and-play open architecture systems that allows for modular systems to be assembled for specific assessments. Success would include smartphone links with various software applications.

4) Establishing a committee or international working group to evaluate, manage or channel the huge influx of new apps and emerging technologies to measure dietary intake and physical activity, so that there is a focused and effective effort in this direction.

5) Development of novel biomarkers using the technological capabilities to increase objectivity of the measures.

6) Bridging between technology developed for research and consumer wearable technology will be important if research on diet and physical activity is to be optimized at the population level.

While there are still many limitations and challenges in the measurement of dietary intake and physical activity, there is much progress and even more promise for using technology to improve measuring diet, physical activity, and sedentary time. Managing the current knowledge base and facilitating a resource center for sharing measurement technology and analytic approaches are keys for success in obtaining accurate dietary intake and physical activity measures and contributing to higher quality research that can turn improve population health.

Keywords: Physical activity, nutrition, technology, measurement, public health recommendations

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DIET, NUTRITION, PHYSICAL ACTIVITY AND CANCER: TOWARDS THE 2017 WCRF CONTINUOUS UPDATE PROJECT UPDATE

EVIDENCE FROM THE LAST DECADE: WHAT HAS CHANGED?

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This talk will focus on new findings and substantive changes compared to the CUP Panel's conclusions of 2007 report arisen from recent evidence. Although there are changes in the specific conclusions relating nutritional exposures to risk of cancer, the most important changes are changes in emphasis across the overall relation between diet and activity, and cancer. There is a greater emphasis on nutritional state marked by body composition, and markers of growth and maturation, than of specific dietary factors. In particular the combination of adiposity and physical inactivity seems a key determinant of cancers common in high income countries. Within diet, there is greater emphasis on foods than on specific nutrients, and to a greater extent, on patterns of diet as opposed to single foods. In general, the strength of existing conclusions has been strengthened, but in some cases has reduced, while there are also new findings.Selected examples include that both vigorous physical activity and body fatness in young adulthood decrease risk of breast cancer. Possible reasons for these changes will be discussed, as well as possible mechanisms underpinning the changed or new findings. The updated CUP findings will be used to inform a review of WCRF International's Cancer Prevention Recommendations, expected in early 2018.

Keywords: Diet, Nutrition, Cancer, WCRF, CUP
Further collaborators:
World Cancer Research Fund International

PREVENTING CHILDHOOD OBESITY IN LATIN AMERICA: BUILDING THE EVIDENCE BASE FOR EFFECTIVE POLICIES AND PROGRAMS

NUTRITION STATUS DURING CHILDHOOD IN LATIN AMERICA

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Introduction: Over the last decades, Latin American (LA) has observed marked improvements in the control of under-nutrition but at the same time, the prevalence of overweight and obesity is increasing among LA children. Childhood obesity epidemic is a matter of concern given its association with earlier development of chronic diseases such as diabetes, cardiovascular disease, and some forms of cancers; it also increases economic and health-care burden.

Objective: to describe the current nutrition, dietary, and physical activity situation of LA children, the disparities between and within countries, and the potential challenges for ensuring adequate nutrition and physical activity in the region.

Methods: non-systematic review of articles, reports, and demographic surveys.

Results: across the region, children face a dual burden of under-nutrition and excess weight with important heterogeneity between and within countries. Nonetheless, in almost all groups overweight is rapidly increasing because of important changes taking place in the food and the physical environments. Rapid urbanization combined with greater penetration of the retail food and food service sector has promoted diets that rely on energy-dense, nutrient-poor foods and away-from-home foods. At the same time, sedentary behaviors have become the norm among children.

Conclusions: overweight and obesity are rapidly increasing in LA children because of recent changes in socioeconomic conditions, increase urbanization, growth of the retail food sector, and decrease in public transportation. If no action is taken, the rates of overweight and obese children will continue to rise in the region. Additional research and research capacity is needed to address this growing epidemic, particularly with respect to design, implementation, and impact evaluation of evidence-based obesity prevention interventions.

Keywords: Childhood obesity, nutrition transition, Latin-America, nutrition and physical activity status children.

PREVENTION OF CHILDHOOD OBESITY AND FOOD POLICIES IN LATIN AMERICA: FROM RESEARCH TO PRACTICE

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Evidence-based policies are needed to enable environments to prevent childhood obesity through lifestyle modification including diet and physical activity. The objective of this study was to document the process of translating research into obesity prevention policies in Latin America. Policies examined were selected based on their progress with implementation, awareness, and potential impact in the region. As a first step the following four case studies were developed excise taxes on sugar sweetened beverages (SSBs) and ultra processed foods (Mexico), front-of-package food label (FOP) legislation (Chile and Ecuador), industrial trans fatty acids (TFAs) removal from processed foods (Argentina) - even though not an anti-obesity policy per se, it represents a case study on product reformulation with important lessons to offer to the obesity prevention arena, and Ciclovías recreativas or "open streets" (Latin America). Each case was developed by a team formed by at least two individuals who collectively had strong experience involvement with the specific policy or program. The second step involved coding the case studies to identify implementation as well as sustainability theme sand sub-themes. The conceptual framework used was the complex adaptive systems (CAS) developed by the health care system sector and a consensus iterative process was followed to agree on the final coding and interpretation scheme. Findings showed that a series of negative and corresponding positive feedback loops led to the emergence, implementation, and sustainability of for effective anti-obesity policies. The following enabling factors were identified as being common across case study for successful policy implementation: strong evidence supporting policy; evidence-based advocacy driven by civil society; political will; legislation and strategic coordination across key sectors including government, private sector, and civil society. Scientific evidence and adequate program monitoring and evaluation played a key role in reaching the tuning points triggering the successful implementation of the policies examined. Prospective CAS policy research is needed to better understand how the complex web of negative and positive feedback loops detected in this analysis develop and interact across key sectors and stakeholders. This research is crucial to enable the successful emergence, implementation an sustainability of effective anti-obesity prevention policies in Latin America and beyond.

RESEARCH CAPACITY FOR CHILDHOOD OBESITY PREVENTION IN LATIN AMERICA

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As Latin America passed through the epidemiologic and lifestyle transitions in recent decades, obesity prevalence among children and adolescents increased markedly. However, in many countries the evolution of obesity is poorly documented and understood, in part, because of a lack of research support and training. Public health effort to build research capacity in the region over the past decades have focused largely on child survival and communicable disease prevention and the capacity for research and translation of that research related to chronic diseases, obesity, and physical activity promotion seems to be much less developed. In this presentation, we report on current research capacity in Latin America related to childhood obesity, nutrition, and physical activity. In addition, we identify key gaps and suggest priorities to further develop research capacity and apply it to public health policies and programs that can address obesity prevention in the region. We conducted a search of peer-reviewed articles on childhood obesity in Latin America with at least one Latin American author from 2010 to 2015. We coded 484 published articles for author affiliation, study subjects nationality, research topic, and study design and extracted a series of networks for each research topic, study design, and collaborating country. Obesity was the most frequently studied topic. Nutrition and obesity were somewhat better developed compared to physical activity and sedentary behavior. There were numerous observational and cross-sectional studies, indicating either a lack of capacity required for more complex research or that the extent of the problem and associated factors remain relatively unexplored. The low number of intervention studies and the near absence of policy articles suggest a void in research capacity in these areas and/or limited funding to support these types of studies. Given the growing concern for the increasing prevalence of childhood obesity in Latin America and the need to document the current state of the problem and design successful prevention and intervention efforts, there is a clear demand for increasing research capacity and extending studies from the merely observational to intervention and policy analyses. While adequate research funding and generating well-trained investigators are fundamental conditions for capacity building, our data show that there is still limited interaction among existing groups with-

in and across countries. Efforts to foster data sharing and scholar exchange can be started immediately and should be a component of any strategic capacity building plan. This interaction is also essential to permit smaller countries, with limited resources, to participate in multi-country studies and develop their own team of qualified scientists.

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FRONT OF THE PACKAGE PROFILING EMERGES AS A MAJOR REGULATORY TOOL GLOBALLY: NEW IMPACT RESEARCH

BRIEF OVERVIEW OF FRONT-OF-PACK LABELLING SYSTEMS

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Background and objectives: Across Europe, the Americas, Asia and Africa countries are increasingly using Front of the Package (FOP) food labelling systems to identify either healthy or unhealthy food products. This presentation introduces the topic and provides background context for the other presentations.

Methods: A review of front-of-the-package profiling purposes and approaches.

Results: Detailed on-pack nutrition information is necessary, but not suitable for daily shopping decisions by consumers. These front-of-pack labelling systems are organized and implemented at the national level. They are based on different nutrient profiling methods, that all adhere to the basic idea of reducing sodium, added sugar, unhealthy saturated fats, encouraging whole grains,

fruits, vegetables and legumes/pulses. Some like the PAHO system focus on removing the least healthful foods and do not encourage a focus on the healthiest foods. While all FOP systems share the goal of helping consumers in facilitating healthier choices in relation to non-communicable diseases, they differ in many aspects. WHO and many others demand regional and global coherence.

The four FOP labelling systems with strongest international presence are:

1. Voluntary positive logos, to indicate the best in class in each food category. The role of governments is strong in most cases and is complemented with cooperation by the food industry.

2. Mixed positive and negative indications, based on colour coding. The underlying nutrient profiling systems do not differentiate between product categories.

3. Health Star ratings on a scale from 1 to 5, on a voluntary basis

4. Warning labels to indicate products that are high in fat, sugar, salt and energy

The different labelling systems show a clear geographical difference. While positive logos have a strong presence in Asia, Africa and Northern Europe, the color coding is present in several Western European countries. The star system is in use in Australia, New Zealand and Canada, while Latin American countries tend to opt for warning labels. A regional coherence across these lines might be an intermediate goal to achieve. International food companies are not univocal in their preference and implement different systems in practice. When it comes to guidance for product reformulation, the product group specific nutrient profiling systems appear to be most suitable.

Conclusions: Research has now moved beyond consumer knowledge and attitude studies to explore the impact of the systems on food purchasing patterns. Many studies are on-going but preliminary results will be presented in this session.

Keywords: Front-of-the-package labelling. nutrient profiling. geographical difference

THE IMPACT ON FOOD PURCHASES OF THE DUTCH CHOICES AND THE DANISH KEYHOLE FOP SYSTEMS

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Background/Objective: The costs associated with diet-related health problems are increasing. Information provision in terms of mandatory nutrition facts sheets placed at (the back of) pre-packaged food is one of the strategies that public authorities use to counteract this development. However the level of understanding and use of the information has been proved to be inadequate as consumers have limited information processing capability, and it requires time, effort and knowledge to understand such detailed information. The use of FOP nutrition symbols aims to make the information provided easier for consumers to access, however the overall effect of FOP nutrition symbols is still questioned. In a range of studies we aim at accessing how these symbols are valued by consumers, and whether they contribute to healthier food choices at the point of purchase, taking into account both individual differences in needs and wants, and country-specific differences.

Subjects/methods: Contrary to most previous research, these studies are based on real market data in the form of household scanner data from the Netherlands and Denmark. The data spans the period from one year before the introduction of the Dutch Choices and the Danish keyhole respectively to three years after. The data includes a range of different products, enabling comparison across product categories as well as across countries. Because of the unique characteristics of these data (large scale, brand level, longitudinal and with socio demographic characteristics of panel members), the sophisticated econometric models used allow us to control for a range of for confounding factors affecting the valuation and use of nutrition symbols.

Results: We find that consumers value products with the symbol higher than products without, hence the provision of the nutrition symbol constitutes additional value to the consumers for the majority of the products we have analyzed. The consumer's valuation of the Choices symbol is larger three months after the product obtained the symbol than immediately after which indicates that there may be a delay before the consumers notice the label, recognize it and potentially take it into account when making decisions on which product to purchase. Furthermore we find that the FOP labels increase purchases for most of products analyzed, hence displaying the label on the package lead to an increased market-share for the products doing so. There seem not to be any complementing behavior as overall healthiness of the households' food purchases, covering all food categories, is for most product categories positively correlated with the share of Keyhole products.

Conclusion: Credible nutrition symbols have value for the consumer and increase market shares for products that display the label. We therefor conclude that nutrition symbols are relevant tools to combat diet-related diseases by guiding consumers towards healthier diets.

Keywords: FOP labelling. value of information. longitudinal home-scan. point of purchase

IMPACT OF THE NEW ZEALAND HEALTH STAR RATING SYSTEM: RCT RESULTS AND EVALUATION OF ROLL-OUT

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Background: Interpretive, front-of-pack (FOP) nutrition labels may encourage healthier food choices by consumers and healthier reformulation of foods by industry.

Objective: We aimed to evaluate the effects of the Health Star Rating (HSR), a voluntary interpretive FOP labelling system on (1) consumer food choices, and (2) industry food reformulation.

Design: Study 1. In a parallel-group randomized controlled trial, we enrolled household shoppers across New Zealand who owned smartphones and were aged >18 y. Participants were randomly assigned to receive either Traffic Light Labels (TLL), HSR, or a control [Nutrition Information Panel (NIP)]. Smartphone technology allowed participants to scan barcodes of packaged foods and receive allocated labels on their smartphone screens. The primary outcome was the mean healthiness of all packaged food purchases, measured using the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (NPSC). Study 2. Annual surveys of packaged food labelling and composition were undertaken in supermarkets before and after adoption of HSR in New Zealand i.e. 2014 to 2016. Product data were linked with nationally representative household food purchasing data to obtain estimates of effects weighted by annual purchasing volumes. Outcomes assessed were uptake HSR by food group; composition of products displaying HSR compared with unlabelled products; and composition of products displaying HSR labels in 2016 compared with their composition prior to the introduction of HSR.

Results: Study 1. 1357 eligible shoppers were randomly assigned to TLL (n = 459), HSR (n = 443), or NIP (n = 455) labels. There was no significant difference in the mean transformed NPSC scores (healthiness) for the TLL group compared with the NIP group (P = 0.60), or for HSR group compared with NIP (P = 0.12). However, in a per-protocol analysis of participants who used the labelling intervention more often than average (n = 423, 31%), those assigned to TLL and HSR had significantly better NPSC scores than those assigned to NIP (P = 0.04 and 0.01 respectively). Study 2. Two years after adoption of the voluntary system, 5.3% of packaged foods surveyed displayed HSR labels (7.2% weighted by annual purchase volumes). Food groups with highest rates of uptake were cereals, convenience foods, packaged fruit and vegetables, sauces and spreads, and 'other' products (predominantly breakfast beverages). Products displaying HSR labels had significantly lower mean saturated fat, total sugar and sodium contents, and higher fibre contents than unlabelled products (all p-values <0.001). Small but statistically significant changes were observed between 2014 and 2016 in the mean energy (-29 KJ/100g, p=0.002), sodium (-49 mg/100g, p=0.03) and fibre (+0.3 g/100g, p=0.02) contents of products displaying an HSR label in 2016. Reformulation was greater for products carrying an HSR label than for unlabelled products.

Conclusions: In a randomised controlled trial, interpretive nutrition labels had no significant effect on consumer food purchases, though regular use of interpretive FOP labels may result in healthier food purchases. Roll-out of the voluntary HSR labelling system is driving healthier reformulation of some products. Greater uptake of the HSR system across the full food supply should improve population diets.

Keywords: Labelling. diet. behaviour. reformulation. randomized controlled trial

THE IMPACT OF THE UK TRAFFIC-LIGHT LABELLING SYSTEM ON DIETS

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Background: Front-of-pack nutrition labelling involving traffic-light color coding to indicate levels of fat, saturated fat, sugar and salt was first recommended by the UK Government in 2006 and is now found on an estimated 60% of packaged foods and non-alcoholic beverages sold in the UK. A considerable amount of research was carried out to inform the choice of nutrient criteria and format for the system but considerably less research has been carried out into the impact of traffic-light labelling on consumer and producer behavior. Such research that has been carried out is generally of low-methodological quality (e.g. very little is experimental and/or ecologically valid). It is difficult to draw conclusions about the impact of traffic-light labelling from such studies.

This presentation reports the preliminary, and as yet mostly unpublished, findings of the Front of pack food Labelling: Impact on Consumer Choice (FLICC) project. The main FLICC project study was of a web-based intervention designed to increase consumer use of traffic-light labelling to encourage healthier purchase decisions.

Methods: The main FLICC project study was a pilot two-arm randomized controlled trial of an intervention that incorporated a number of behavior change techniques and used super-market loyalty cared data to recruit participants (n=496), provide tailored

feedback as part of the intervention and to measure outcomes. The primary outcome measure was the healthiness of ready meals and pizzas that had traffic-light labelling purchased before (T1) and after (T2) the intervention

Results: There was no difference in the main outcome measure between intervention group and control group during period T1 (p=0.315) and T2 (p=0.594).

Conclusions: This study is the only example, known to us, of a trial of a behavior change intervention that utilized supermarket loyalty care data for recruitment, the intervention itself and outcome measurement. The trial did not provide evidence to suggest the specific intervention tested would be effective at changing purchasing behavior, but the process of conducting the trail has provided much information about using supermarket loyalty card data for future trials and delivery of public health interventions. It adds to the literature on the impact of interventions involving traffic-light labelling. It demonstrates some of the difficulties of finding effects on health-related outcomes of interventions involving front-of-pack labelling.

Keywords: Front-of-pack nutrition labelling

THE CHILEAN EXPERIENCE OF FOP DEVELOPMENT, IMPLEMENTATION AND IMPACT

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Applies to foods and beverages with high density of energy, sugars, saturated fats, and sodium. Such food must include a front-of-package (FOP) warning label (if packaged), cannot be marketed to children under 14y, and cannot be sold/offered to children at preschools and schools. This work discusses the process of development, implementation and initial impact of the Chilean FOP.

Methods: The FOP development was based on different steps: i) literature review on food labeling and warning labels, ii) qualitative study to assess the consumers and experts' opinions regarding food warning labels, iii) a 2-phase quantitative study in which low-middle income women (n=700) and adolescents (n=350) preselect 2 FOP alternatives out of 15 options (first phase) and then selected a final FOP (second phase) in terms of visibility, comprehension, and intention-to-buy. The initial impact evaluation is part of a larger study evaluating the Chilean regulation (2016-2020) and includes a survey on food knowledge and perceptions collected in 700+ adolescents and 900+ preschoolers' mothers from low-middle income background.

Results: The literature review revealed scarce information on the use of warning labels on foods, but helped defining the wording, design (use of symbols, position, size, colors) and the need of a neutral (without conflict of interest) and trusted source (i.e. Ministry of Health). The qualitative studies on consumers provided general information on the understanding on topics associated with foods/nutrients, on the wording preferred and most understood by Chileans, preferred colors (black & white, and red & yellow), and preferred symbols (triangles and stop signs), among other aspects; experts' opinions helped narrowing the designs options developed to that point. In the first phase of the quantitative study, 2 designs were selected by the interviewee: (i) a hand stating 'excess of sugars, it can cause diabetes', and (ii) a stop sign only stating 'excess of sugars'; both designs in black & white. In the second phase the stop sign had significant best performance in terms of visibility, comprehension, and intention-to-buy in women, and visibility among adolescents (with no differences in the other 2 items). Finally, the government decided to use a black & white stop sign with the phrase "High in…". Baseline data showed that prior to the law implementation 83% of adolescents and 94% of preschoolers' mothers belonging to the study understood correctly the FOP warning label and over 90% of both groups approved that the Ministry of Health helps identifying foods that are less healthy.

Conclusion: The Chilean FOP warning label was defined based on literature review and visibility, comprehension and behavior of a sample of Chilean mothers and adolescents. Baseline data indicates that the FOP implemented is well understood and received by the consumers. Post-implementation data will allow evaluating the impact of the FOP warning label and other aspects of the Chilean Law of Labeling and Marketing.

Keywords: FOP; Warning Labels; Obesity Regulatory Actions; Chilean Law of Labelling and Marketing Restrictions

SEVEN-COUNTRY STUDY ON ULTRA-PROCESSED FOOD INTAKE AND OVERALL DIETARY NUTRIENT PROFILE: FINDINGS AND GLOBAL POLICY IMPLICATIONS

ULTRA-PROCESSED FOODS AND NUTRIENT PROFILE OF DIETS CONSUMED IN CHILE AND COLOMBIA

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Background and Objective: A rapid simultaneous increase in sales of ultra-processed foods and prevalence of obesity and other diet-related non-communicable chronic diseases (NCDs) has been observed in Latin America over the past decades. Our study describes the consumption of ultra-processed foods and its association with the nutrient profile of diets in Chile and Colombia.

Methods: Data from probabilistic samples studied by cross-sectional dietary studies carried out in Chile (Chi) in 2010 (n=4920 individuals >2y) and Colombia (Col) in 2005 (n= 38643 individuals 2-64 y) were analyzed. Food consumption data were obtained by 24-hour diet recalls and food items were classified into the four NOVA food groups (unprocessed or minimal processed foods/ processed culinary ingredients/ processed foods/ and ultra-processed foods). In each country, the mean dietary nutrient content of total fat, saturated fat, trans fat and free sugars (as % of total energy intake), and the mean diet energy density (kcal/g) and fiber density (g/1000 kcal) were calculated across quintiles of the dietary share of ultra-processed foods (as % of total energy intake). Gaussian regression analyses and regression coefficients (β) adjusted for potential confounding factors (sex, age, location (urban/rural), region, socioeconomic status and years of education) were used to estimate the association between quintiles of the dietary share of ultra-processed foods and dietary nutrient content.

Results: In Chile and Colombia, 28.6% and 15.9% of total daily energy intake came from ultra-processed foods, respectively. In both countries, after adjustment for sociodemographic variables, a positive and statistically significant linear trend was found between quintiles of the dietary share of ultra-processed foods and the dietary content in total fat [β (95%CI): Chi: 1.2 (0.9, 1.5); Col: 0.7 (0.5, 0.9)], saturated fat [β: Chi: 0.5 (0.4, 0.6); Col: 0.5 (0.4, 0.6)], trans fat [β: Chi: 0.02 (0.005, 0.03)], free sugars [β: Chi: 2.8 (2.5, 3.1); Col: 1.1 (0.8, 1.3)], and the diet energy density [β: Chi: 0.09 (0.07, 0.1); Col: 0.07 (0.06, 0.07]. In contrast, a negative and statistically significant linear trend was observed for protein content [β: Chi: -1.1 (-1.2, -0.9); Col: -0.2 (-0.3, -0.1)] and fiber density [β: Chi: -0.9 (-1.0, -0.7); Col: -0.9 (-1.0, -0.8)].

Conclusions: Almost 30% of total calories consumed by the Chilean population were derived from ultra-processed foods while those foods represented less than 20% of energy intake in Colombia. However, in both countries, the consumption of ultra-processed foods was strongly associated with dietary nutrient profiles predictive of increased incidence of obesity and other diet-related NCDs. Actions aimed at reducing the intake of ultra-processed foods and increasing the consumption of unprocessed or minimally processed foods and freshly prepared home-cooked dishes made with these foods plus processed culinary ingredients and appropriately processed foods emerge as potentially effective to achieve a healthy diet.

Keywords: Chile, Colombia, ultra-processed foods, nutrients.

ULTRA-PROCESSED FOODS AND NUTRIENT PROFILE OF DIETS IN UK AND AUSTRALIA

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Background and Objective: A rapid simultaneous worldwide increase in sales of ultra-processed foods and obesity prevalence has been observed in the last decade. This study describes the consumption of ultra-processed foods and its association with the nutrient profile of diets in UK and Australia.

Methods: Data from national probabilistic samples studied by cross-sectional dietary studies carried out in UK in 2008-2012

(n=4,125 individuals ≥1.5y) and Australia (Aus) in 2011-2012 (n= 12,153 individuals ≥2 y) were analyzed. Food consumption data were obtained through 24-hour recall/unweighted food diary. Food items were classified into the four NOVA food groups. In each country, the mean dietary nutrient content in total fat, saturated fat, trans fat and free sugars (% of total energy intake), and the mean fiber density (g/1000 kcal), sodium density (mg/1000kcal) and potassium density (mg/1000kcal) were calculated across quintiles of the dietary share of ultra-processed foods (% of total energy intake). Gaussian regression analyses and regression coefficients (β) adjusted for potential confounding factors (sex, age, location, region, and socioeconomic status) were used to estimate the association between quintiles of the dietary share of ultra-processed foods and dietary nutrient content.

Results: In UK and Australia, 56.8% and 36.6% of total daily energy intake came from ultra-processed foods, respectively. In both countries, after adjustment for sociodemographic variables, a positive and statistically significant linear trend was found between quintiles of the dietary share of ultra-processed foods and the dietary content in total fat [β (95%CI): UK: 0.5 (0.3, 0.7); Aus: 0.6 (0.4, 0.7)], free sugars [UK: 1.0 (0.7, 1.2); Aus: 2.6 (2.5, 2.8)], and the sodium density [UK: 55 (46, 65); Aus: 70 (50, 71)]. Positive and statistically significant linear trend was observed only in Australia for saturated fat [β: 0.7 (0.6, 0.8)] and trans fat [0.03 (0.02, 0.35)]. In both countries, negative and statistically significant linear trend was observed for the dietary content in protein [β: UK: -0.8 (-0,9, -0.7); Aus: -1.2 (-1.3, -1.1)], fiber density [β: UK: -0.3 (-0.4, -0.2); Aus: -0.8 (-0.9, -0.7)], and potassium density [β: UK: -93 (-104, -83); Aus: -102 (-114, -88)].

Conclusions: Almost 60% of total calories consumed by the UK population came from ultra-processed foods while in Australia they represented about 40%. However, in both countries, the consumption of ultra-processed foods was strongly associated with dietary nutrient profiles predictive of increased incidence of epidemiologically relevant non-communicable diseases. Actions aimed at lowering the dietary share of ultra-processed foods and raising consumption of unprocessed or minimally processed foods and hand-made dishes made with these foods plus processed culinary ingredients and processed foods emerge as useful tools for achieving a healthy diet.

Keywords: UK, Australia, ultra-processed foods, nutrients

ULTRA-PROCESSED FOODS AND NUTRIENT PROFILE OF DIETS IN SEVEN COUNTRIES

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Background and Objective: Ultra-processed food and drink products, such as sugared beverages, sweet or savory packaged snacks, confectionery, reconstituted meat products, and pre-prepared frozen or shelf-stable dishes, are industrial formulations of refined sources of dietary energy and nutrients, additives and little if any intact food, using a series of processes (hence 'ultra-processed'). A rapid simultaneous increase in the sales of these products and in obesity prevalence has been observed in lower-middle, upper-middle, and high income countries. This study describes the consumption of ultra-processed food and drink products and its association with the overall nutrient profile of diets in Australia, Brazil, Canada, Chile, Colombia, UK and US.

Methods: Data from probabilistic samples studied by cross-sectional dietary studies carried out in Australia in 2011-2012 (n= 12,153 ≥2 y) , Brazil in 2008/9 (n= 34003; ≥10 y), Canada in 2004 (n= 33694; ≥2 y), Chile in 2010 (n=38643; 2-64 y), Colombia in 2005 (n= 38643; 2-64 y), UK in 2008-2012 (n= 4,125; ≥1.5 y), and US in 2009-2010 (n= 9317; ≥1 y) were analyzed. Food consumption data were obtained through 24-hour recalls/food diaries and food items were classified into the four NOVA food groups (unprocessed or minimal processed foods, processed culinary ingredients, processed foods and ultra-processed foods). In each country, the mean dietary nutrient content in total fat, saturated fat, trans fat and free sugars (% of total energy intake), and the mean diet energy density (kcal/g) and fiber density (g/1000 kcal) were calculated across quintiles of the dietary share of ultra-processed foods (% of total energy intake). Gaussian regression analyses and standardized regression coefficients (β) adjusted for sociodemographic variables were used to estimate the association between quintiles of the dietary share of ultra-processed foods and dietary nutrient content.

Results: The dietary share of ultra-processed foods ranged from 15.9% of total daily energy intake in Colombia to 57.9 % in the US. In Brazil, after adjustment for sociodemographic variables, a positive and statistically significant linear trend was found between quintiles of the dietary share of ultra-processed foods and the dietary content in total fat (β: 0.30), saturated fat (β: 0.31),

trans fat (β: 0.29), free sugars (β: 0.28), and the diet energy density (β: 0.39). Negative and statistically significant linear trend was observed for the dietary content in protein (β: -0.32) and the diet fiber density (β: -0.28). Similar findings were observed in each of the other six countries.

Conclusions: In the seven countries, the consumption of ultra-processed foods was strongly associated with dietary nutrient profiles predictive of increased incidence of obesity and other epidemiologically relevant non-communicable diseases. In these countries, actions aimed at reducing the intake of ultra-processed foods and raising the consumption of unprocessed or minimally processed foods and freshly-prepared dishes made with these foods plus processed culinary ingredients and processed foods emerge as useful tools for achieving a healthy diet.

Keywords: Food processing, ultra-processed foods, diet, nutrient profile, NOVA food classification

Further collaborators:

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WHO/CDC SYMPOSIUM ON NEW TOOLS AND RESOURCES FOR MONITORING AND EVALUATING MICRONUTRIENT PUBLIC HEALTH PROGRAMS

THE MICRONUTRIENT SURVEY ELECTRONIC MANUAL AND THE MICRONUTRIENT SURVEY TOOLKIT – NEW TOOLS TO IMPROVE THE DESIGN AND QUALITY OF MICRONUTRIENT SURVEYS

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High quality, representative data are needed to manage nutrition programs effectively and to make evidence based nutrition policies. Population-based cross-sectional surveys of micronutrient status and coverage of interventions within populations are important for designing and managing nutrition programs. Updated tools are available to support survey planning, implementation, analysis and dissemination.

The Micronutrient Survey Electronic Manual and Micronutrient Survey Toolkit are integrated tools that provide users with a set of resources to design and carry out micronutrient surveys. They are available for download at http://surveytoolkit.micronutrient.org/. The Toolkit includes 15 modules following the main phases of a survey from planning through dissemination. Each module contains a chapter of the e-Manual providing step-by-step instructions and key considerations, as well as useful tools, country examples and resources. The Toolkit provides a compilation of tools such as sample size calculators, lists of equipment and supplies, budget templates, specimen collection procedures, training materials, form templates, and report outlines.

The e-Manual and Toolkit provide practical information on how to plan and implement a cross-sectional micronutrient status and coverage survey. The updated tools, resources and e-manual chapters are revised and expanded to include new sections on topics such as the assessment of zinc and folate status and considerations for electronic data collection.

The e-Manual and Toolkit are based on practical field experience in a range of settings, expert group discussions and documents from a variety of organizations. Together, they can help survey managers improve the quality, validity and efficiency of micronutrient surveys.

Keywords: Survey, Micronutrients, Toolkit, e-manual

NEW RESOURCES FOR THE MONITORING AND EVALUATION OF PUBLIC HEALTH POGRAMMES TO IMPROVE MICRONUTRIENT STATUS

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The World Health Organization Vitamin and Mineral Nutrition Information System (VMNIS), previously known as the Micronutrient Deficiency Information System, is a collection of tools aimed at assisting WHO Member States and their partners in the assessment of micronutrient status and in the monitoring and evaluation of micronutrient intervention programmes in public health. This system has been in the process of undergoing expansion in the last several years. The main components of VMNIS include: 1) Micronutrients database; 2) summary documents of key clinical and biochemical indicators for assessing micronutrient status; 3) Global laboratory directory for the assessment of micronutrient status; and 4) eCatalogue of indicators for micronutrient programmes. The WHO Micronutrients database tracks the micronutrient status of populations at the national, regional or first administrative level . This database has expanded from collecting data on five key indicators of micronutrient status to over 40. Periodically, some of this data is used to develop global estimates of the prevalence of deficiency for key micronutrients. Summaries of WHO recommendations on the use of eight indicators of micronutrient status and one indicator of inflammation are currently available. These documents summarize the currently recognized cut-offs for defining deficiencies and severity of deficiencies at the population level, and the chronology of their establishment. The WHO Global laboratory directory for the assessment of micronutrient status has recently been developed to collect information on laboratories that are capable of assessing biomarkers of micronutrient status for health and nutrition surveys. The ultimate goal of

this directory is to help Member States and their partners identify laboratories measuring biomarkers of vitamin and mineral status at the population level so that they may be able to further evaluate the laboratory for possible participation in their nutrition surveys. Finally, the eCatalogue of indicators for micronutrient programmes contains a non-comprehensive register of standard process and impact indicators for tracking the performance of public health programmes implementing micronutrient interventions.

Keywords: Micronutrients, indicators, status, laboratories, monitoring and evaluation

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PS_144/107

INTEGRATING PREVENTIVE STRATEGIES INTO COMMUNITY-BASED MANAGEMENT OF ACUTE MALNUTRITION: WHAT WORKS?

THE IMPACT OF ADDING A HOUSEHOLD WASH PACKAGE TO CMAM PROGRAM: A CLUSTER–RANDOMIZED CONTROLLED TRIAL IN CHAD

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Water, Sanitation and Hygiene (WASH) interventions have been reported to have a small but measurable benefit on stunting, but not on wasting. In order to increase synergies in the fight against acute malnutrition, WASH and nutrition actors agreed in 2012 upon a "WASH in Nut" strategy for the Sahel region that includes the provision of a household WASH package (provision of chlorine, soap, water storage container and sensitisation on its use), designed to protect children against new episodes of diarrhoea and aiming at improving nutritional outcomes. The aim of our study was to assess the effectiveness of this household WASH package on the performance of an Outpatient Therapeutic feeding Programme (OTP) for severe acute malnutrition in Mao and Mondo health districts in Chad.

We conducted a cluster randomized controlled trial embedded in a routine OTP. The study population included 20 health centres (clusters). Both arms received the routine nutritional programme. The intervention arm received the additional household WASH package, delivered to the child's caretaker upon admission in the OTP. Primary outcomes were recovery and relapse rates.

Secondary outcome included time-to-recovery, daily weight gain and morbidity longitudinal prevalence. The trial is registered with ClinicalTrials.gov, number NCT02486523.

The recruitment phase lasted from April to December 2015 and the follow-up phase ended in May 2016. Among the 1603 recruited children, 845 were in the intervention group and 758 in the control group. The WASH package was well accepted and used. The intervention decreased infectious diseases longitudinal prevalence (-1·6%; 95% CI [-3·2; -0·05]; p=0·043), decreased the time-to-recovery (-4·4 days; 95% CI [-8·6; -0·2]; p=0·038), improved the recovery rate (10·5%; 95% CI [6·7; 19·8]; p=0.034) and decreased the non-responder rate (-9·7%; 95% CI [-16·9; -2·4]; p=0·009). No statistical difference was noticed between the groups in term of relapse rates, both at 2 and 6 months after discharge.

In the Sahel context, the provision of a household WASH package increased the recovery rate among children treated for non-complicated SAM and decreased their time-to-recovery. This study shows that the integrated wash-in-nut approach has the potential to increase programme performance. We recommend this strategy for the wider Sahel context.

Keywords: Severe Acute Malnutrition, Water and Hygiene

PS_144/137

NUTRITIONAL PROFILING – SCIENTIFIC BASIS, USES AND IMPACT ON PUBLIC HEALTH

RECENT DEVELOPMENTS IN NUTRIENT PROFILING

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In this presentation I first provide definitions of nutrient profiling and of a nutrient profile model. I set out the purposes of nutrient profiling: both general and specific. I give two examples of nutrient profile models that have been developed for the regulation of marketing of foods to children: by the Food Standards Agency in the United Kingdom and the World Health Organisation for its European Region – the UK FSA/Ofcom and the WHO-Euro models. I compare the way the models are constructed and function, how they have been developed and adapted for different regulatory uses. I examine the extent to which the models have been tested and validated. Finally I draw some conclusions about the future use of nutrient profiling. I argue that its full potential has yet to be realised and give some reasons why. I pose some urgent research questions with respect to nutrient profiling.

Keywords: Nutrient profiling, regulation, food marketing, food labelling

Conflict of Interest disclosure: The author was closely involved in the development of the UK FSA/Ofcom and WHO-Euro nutrient profile models and his research centre received funding from the UK Food Standards Agency to carry out analyses in connection with the development of the UK FSA/Ofcom model.

THE DEVELOPMENT OF THE NUTRIENT RICH FOODS (NRF) FAMILY OF NUTRIENT PROFILE MODELS AND THEIR APPLICATIONS

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The goal of nutrient profiling (NP) models is to distinguish foods that are energy-dense from those that are nutrient-rich. Typically, NP methods calculate the amount of nutrients per reference amount of food: 100 kcal, 100g, or serving size. Some NP models merely calculate energy density of foods: kcal/100g.

Originally intended as the scientific basis for nutrition and health claims, NP has been used for a variety of food taxation purposes. For example, Mexico has imposed a tax on nonessential snacks with energy density >275 kcal/100g. NP models have also been used to create front-of-pack (FOP) logos to convey nutrition information to the consumer at point of sale. Here, Chile has developed food warning labels based on excessive energy, sugar, or fat content. The food industry has also used NP tools to assess and (re)formulate product portfolios.

NP models can be based on nutrients to limit only (generally fat, sugar and salt) or they can also include some nutrients to encourage, usually protein, fiber, and selected vitamins and minerals. One methodological challenge is to ensure that NP models do not merely track energy density and do not favor the more expensive foods. The Nutrient Rich Foods (NRF 9.3) index used 9 positive or qualifying nutrients (protein, fiber, vitamins A, C, and E, calcium, iron, potassium and magnesium) and 3 nutrients to limit: saturated fat, added sugar, and sodium. The NRF algorithm was the sum of percentage daily values (DVs) for the 9 qualifying nutrients, minus the sum of %DVs for 3 disqualifying nutrients, each calculated per 100 kcal and capped at 100% DV. The NRF score was validated in regression models against the Healthy Eating Index, an independent measure of a healthy diet.

The French SAIN/LIM nutrient density score, was the mean of %DVs for five qualifying nutrients (protein, fiber, vitamin C, calcium and iron) minus the mean of percent daily values for the three disqualifying nutrients (saturated fat, added sugar, sodium). Unlike the continuous NRF score, SAIN/LIM has assigned foods into one of four categories [3]. A continuous version – Le SENS score was developed only recently. The SAIN/LIM score was validated using sophisticated linear programming. One advance in NP modeling has been at apply NP methods to complex meals, menus, or the total diet.

NP models can be adapted to assess nutrient cost, as obtained from different food groups. On a per calorie basis, vegetables, fruit and meat poultry and fish cost more, whereas grains and fats cost less. NP models can show that some food groups are very low cost sources of a particular nutrient: Milk and milk products were the lowest cost calcium source, whereas potatoes and beans delivered most fiber per penny. Analogous calculations have addressed the environmental cost of different nutrients as measured through lifecycle analysis and greenhouse gas emissions (GHGE). Although animal products did have a higher carbon footprint, their environmental cost had to be balanced against their higher nutritional value.

NUTRIENT PROFILING: SCIENTIFIC AIMS VS. ACTUAL IMPACT ON PUBLIC HEALTH

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Populations are constantly modifying their diet due to globalization, the access to food undergoing several technological processes, and the modification of our lifestyles. The Global Strategy on Diet, Physical Activity, and Health, published by WHO in 2004, included as a strategy the action of generating comprehensible, suitable, accurate and standardized information on the content of food products. In order to allow the consumer to make healthier choices, Nutrient Profiling was the response to this action request.

Nutrient Profiling has been described as a scientific method to classify foods and drinks based on their nutritional quality by national authorities of different countries to promote public health and to achieve the nutritional goals proposed for the population. The WHO has proposed, as recently as 2015, the definition of Nutrient Profiling as "the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health".

Nutrient Profiling Models using the threshold or scoring approaches, and based on food groups or for food in general, have been developed during the last 20 years; sometimes, with no clear conscience of that. The models have been used in regulation for nutritional claims, front-of-package food labeling, policies on subsides or taxation to different food groups, reformulation of processed foods, regulations for school cafeterias, etc. These models have been developed by more than 16 countries and more than 4 regions, with specific aims and according to the local or regional public health situation.

The nutrient profiling models represent useful tools for taking measures and making decisions, such as the regulation of marketing, front-of-package food labeling and policies on subsides or taxation to different food groups based on their role, positive or negative, in public health.

For the particular case of processed food, the main target of nutrient profiling, the continuous review of the nutrient profiling is justified by the emergence of new foods, new formulations and new processing techniques that affect their nutrients composition and bioavailability.

One of the main disadvantages of the Nutrient Profiling Models is the inconsistency found when the same product is analyzed under different models. Heterogeneity of individual responses and disagreement regarding basic foods has been found. The lack of standardized methods to validate Nutrient Profiling models represents another disadvantage.

There is still a long way to go regarding the definition, implementation and evaluation of nutrient profiling. The creation of nutrient profiling should respond to a systematic, transparent and logic methodological process, ideally agreed between the different sectors of each country or region involved (governmental organizations, public bodies, food industry and consumers' organizations).

Keywords: Nutrient Profiling. Public health. Nutrient information. Nutritional claims.

PS_144/28

SODIUM REDUCTION AND CONSIDERATIONS WITH MINERAL INTAKES

OVERVIEW OF ACTIVITIES TO REDUCE SODIUM INTAKE IN THE UNITED STATES

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Reduction in sodium intake has been a public health goal in the US for more than 40 years. Efforts to reduce intake have ranged from consumer education to calls for voluntary reduction on the part of the food industry. These activities have not proven very effective, and the average sodium intake in the US continues to be more than 3,400 mg of sodium per day.

In the past several years government agencies, public health professionals, the food industry, and consumer groups have focused on dialogues, public meetings and research to clarify and focus the key considerations in reducing sodium in the food supply. In June 2016 in response to a 2010 Institute of Medicine report as well as other factors, the US Food and Drug Administration (FDA) issued draft guidance for industry to support a voluntary sodium reduction in foods. The guidance specifies target mean and upper bound concentrations for sodium in commercially processed, packaged and prepared foods. Its goal is a small initial reduction as a first step in a long-term process to gradually lower intake levels consistent with current and future targets as they emerge. The activities are to be carried out concomitant with up-front research, special studies and technological exchanges and workshops. Change is to be introduced slowly and gradually. Approximately 200 comments were submitted concerning the FDA guidance. Topics included technical challenges, definitions for food categories, and strategies for measuring changes in sodium intake as well as sodium levels in the food supply. FDA is currently considering these comments in light of possible future revisions

to the guidance. As a voluntary program, a number of companies have begun implementation of activities consistent with the guidance. Monitoring industry participation and impact will be important.

Some scientists have questioned the goal of reducing sodium intake below 2,300 mg/day, arguing that data for benefit are unclear and expressing concern about possible harm. While these debates will need to be resolved, it is noteworthy that the US government has put in place a systematic evidence review – Effects of Dietary Sodium and Potassium Intake on Chronic Disease Outcomes and Related Risk Factors – to be completed in mid-2017 by the Agency for Healthcare Research and Quality. This report will be available for an anticipated review of Dietary Reference Intakes for sodium and potassium to be conducted by the National Academy of Medicine beginning in late-2017. In any case, sodium research should continue with particular focus on the interaction between sodium and taste preference, technological work-arounds for sodium's role in food, the impact of reduced sodium on food safety, and strategies for monitoring and quantifying sodium intake and presence in the food supply.

Keywords: Sodium; United States; Programs; Reduction

PROGRESS ON SODIUM REDUCTION IN CANADA AND IN LATIN AMERICA

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Reducing dietary salt is recommended by the 2011 United Nations Summit Declaration on Prevention of Non communicable Diseases and the World Health Organization Global Action plan for Prevention and Control of Noncommunicable Diseases, where one of the 9 global targets is a relative reduction of sodium intake by 30% by 2025. High blood pressure is a contributory factor in at least 40% of all heart disease and strokes which represent approximately 45% of NCDs. In the Americas, hypertension is a major health risk, as between 15-35% of the adult population has elevated blood pressure. This evidence led many governments in the Americas, including Argentina, Brazil, Canada, Chile, and the National Salt Reduction Initiative in the US to set salt reduction targets. These national level targets formed the basis of the Pan American Health Organization (PAHO) regional targets for the Americas for 12 major food categories and several sub-categories.

In Canada, the targets for salt reduction (for 2010-2016) were used to assess interim progress in monitoring changes in sodium levels in foods between 2010 and 2013. Overall, 58% of foods met at least 1 of the 3 phases of the sodium reduction benchmark targets and the proportion exceeding maximum benchmark levels decreased from 25.2% to 20.8%. The greatest reductions in sodium were seen in imitation seafood (26%), condiments (20%),

breakfast cereals (20%), canned vegetables/legumes (19%), plain chips (19%), hot cereals (15%), canned condensed soup (14%), and sausages and wieners (11%), (all p<0.01), although significant reductions were not yet seen in many food categories.

In 2015, PAHO in collaboration with representatives of the LatinFoods network in Argentina, Brazil, Barbados, Chile, Costa Rica, Cuba, Ecuador, Guatemala, Jamaica, Mexico, Paraguay, Panama, Peru and Trinidad and Tobago, conducted a baseline survey of packaged foods in 14 countries in the region in order to be able to assess progress in meeting the PAHO regional targets during the upcoming years for: 1) breads; 2) soups, wet and dry, noodles in broth; 3) mayonnaise; 4) cookies and biscuits; 5) cakes; 6) meat; 7) breakfast cereals; 8) dairy (cheese and processed cheese products); 9) butter/dairy spreads; 10) snacks; 11) pasta; 12) seasonings and condiments. These baseline results will be presented per food category and by country.

Together these results can help with monitoring progress to reduce sodium levels in packaged foods in the Americas and will also provide information for development of enhanced sodium reduction targets and in a broader range of foods in the upcoming years. Monitoring progress in sodium reduction is an important component of national and regional efforts to reach the sodium reduction goals set by the WHO.

Keywords: Sodium, levels, foods, reformulation

SODIUM AND POTASSIUM INTAKE AND THEIR RATIO IN THE U.S. DIET

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The dietary ratio of sodium to potassium (Na:K) has been more strongly associated with increased risk of cardiovascular (CVD) disease and CVD-mortality than either sodium or potassium alone.

Objective: To estimate the usual sodium and potassium intakes, the dietary Na:K ratio, energy-adjusted sodium and potassium intakes (per 1,000 kcal), and the percentage of individuals with a dietary Na:K ratio of <1.0 by age, sex, and race/ethnicity among non-pregnant, non-lactating U.S. adults ([3]20 y; 2,393 men and 2,337 women) from What We Eat In America, NHANES 2011-2012.

NHANES is a nationally representative, cross-sectional survey that samples noninstitutionalized, civilian U.S. residents using a complex, stratified, multistage probability cluster sampling design. Two 24-hour dietary recalls are collected, weighted for day of the week of collection to assure equal distribution across each day of the week, using the USDA's Automated Multiple-Pass Method. The National Cancer Institute method was used to estimate usual dietary intakes. Multiple pairwise t-tests were used for all comparisons between population groups, statistical significance was set at $P \leq 0.01$.

U.S. adults consumed approximately 2000 kcal/d, 3600 mg/d sodium, and 2800 mg/d potassium. Most adults (90% ± 0.8%) had sodium intakes of >2300 mg/d, whereas <3% had potassium intakes of > 4700 mg/d. Asians had the highest sodium intakes (per 1,000kcal) when compared to all other race/ethnic groups. Women had a significantly lower dietary Na:K ratio than men (1.32 ± 0.0 versus 1.45 ± 0.02). Non-Hispanic whites had a significantly lower Na:K ratio than non-Hispanic blacks and non-Hispanic Asians (1.34±0.02 compared with 1.54 ± 0.03 and 1.49 ± 0.04, respectively). Only 12.2% ± 1.5% of U.S. adults had an Na:K ratio of <1.0. More women (18%) than men (7%) met the recommended Na:K ratio. A significantly higher proportion of whites had an Na:K ratio of <1.0 than did all other racial/ethnic groups. Among men and women, the dietary Na:K ratio decreased linearly as age increased. Mixed dishes (e.g., combinations of foods consumed together) contributed the most sodium (34 ±1%) and potassium (19% ± 1%) to the American diet. However, grains and vegetables were among the highest contributors to sodium intakes of individuals with Na:K ratios of <1.0, compared with protein foods and grains for those with Na:K ratios of ≥1.0. Vegetables as well as milk and dairy products constituted the primary dietary sources of potassium for individuals with dietary Na:K ratios of <1.0, whereas mixed dishes and protein foods contributed the most potassium for individuals with dietary ratios of ≥1.0. Individuals with an Na:K <1.0 were less likely to consume mixed dishes and condiments and were more likely to consume vegetables, milk and dairy products, and fruit compared to those with a Na:K ≥ 1.0.

Only about one-tenth of U.S. adults have a dietary Na:K ratio consistent with the World Health Organization guidelines for reduced risk of mortality. Our data suggest that blacks and Asians have the most unfavorable dietary Na:K ratio in the U.S. Continued efforts to reduce sodium intake in tandem with novel strategies to increase potassium intake are warranted.

Keywords: Sodium, potassium, ratio, NHANES

MODELING THE RELATIONSHIP OF SODIUM, PO-TASSIUM, CALCIUM, AND MAGNESIUM INTAKES AND RATIOS TO BLOOD PRESSURE

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Background: Intakes of sodium, potassium, and their ratios have been associated with modifying systolic and diastolic blood pressure (SBP and DBP). Dietary patterns associated with blood pressure reduction are high in calcium and magnesium as well as potassium.

Methods: We estimated sodium, potassium, calcium, and magnesium intakes from food and dietary supplements including their ratios and evaluated the role of these nutrients in predicting blood pressure in U.S. adults from 2011-2014 NHANES (n=2266 men and n= 2454 women after excluding 5404 who were pregnant or lactating, taking hypertension medications, smoked, had GFR <30 mL/min, or had missing or implausible data). Non-normal data were transformed prior to analysis. Models were stratified by sex.

Results: The target mineral ratios for most adults based on recommended intakes of the single nutrients according to the NAM and (% adults achieving those) were less than 0.49 for Na:K (0.54%), less than 2.3 for Na:Ca (15.63%), less than 5.75 for women (7.23%) and 7.42 for men (13.63%) for Na:Mg, and 2.5 for women (31.02%) and 3.22 for men (53.69%) for Ca:Mg. Among women, age and race/ethnicity explained 20% of the variation in SBP. When added to this model, statistically significant positive relationships were found with Na, Na:K, Na:Mg, Ca:Mg, Na:Ca and statistically significant negative relationships were found with K and Mg. For each of these, the increase in the percent of variation explained was ≤ 2%. Addition of BMI and the Poverty-to-In-come-Ratio explained an additional 5%. Among females, age and race/ethnicity explained 8% of the variation in DBP. When added to this model, statistically significant positive relationships were found with Na:K, Na:Mg, and Ca:Mg and statistically significant negative relationships were found with K and Mg. For each of these, the increase in the percent of variation explained was 1% or less. Addition of BMI explained an additional 2%. For males, age, and race/ethnicity explained 10% of the variation in SBP. When added to this model statistically significant negative relationships were found with Ca and Mg. For each of these, the increase in the percent of variation explained was less than 1%. Addition of BMI explained an additional 8%. Among men, age , and race/ethnicity explained 11% of the variation in DBP with an additional 4% variance explained by BMI %. No statistically significant effects of minerals or their ratios were found in men for DBP.

Conclusions: Our findings suggest that dietary patterns, which favor lower intakes of sodium, higher intakes of K, and Mg, and lower Na:K, Na:Mg, Ca:Mg, Na:Ca should be encouraged for protection against hypertension, especially among women

Keywords: Blood pressure, sodium, potassium, calcium, magnesium

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PS_144/1050
ADDRESSING THE CHILDHOOD OBESITY CHALLENGE: WHERE ARE WE?

ADDRESSING SOCIAL AND ECONOMIC CONSEQUENCES OF CHILDHOOD OBESITY

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Childhood obesity is a key dimension of the global obesity epidemic, linked with a significant rise in metabolic disorders and detrimental long-term health and social outcomes. Tackling childhood obesity means addressing the complexity of behaviour change within an "obesogenic" environment (including the built environment and modes of transportation, the availability, prices and nutritional content of foods, the exposure to commercial advertising, the technology supporting children's study and play, as well as adults' work and leisure). This obesogenic environment, combined with a host of cognitive and behavioural biases, provides a powerful drive towards unhealthy behaviours with significant health and economic consequences.

Established links between child and adult obesity, and between these and non-communicable diseases, are such that detrimental health impacts and an increased demand for health care must be expected as new generations age. However, obesity can also have major consequences on children's psychology, social life, and school performance. Obesity is a hindrance to social capital formation through lower educational attainment, translating into reduced employment opportunities.

The presentation will explore the social and economic dimensions of childhood obesity and how governments can prevent and address these consequences through appropriate intersectoral policies. The presentation will also discuss the key outcomes of those policies In a range of settings at different levels of income and development.

Keywords: Childhood obesity; economics; social impacts; government policies

CHILDHOOD OBESITY IN MEXICO: PREVENTION PROGRAMS FOR SCHOOL AGE CHILDREN

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Childhood obesity is a public health problem in México. A 33.2% combined prevalence of obesity in school age children (5-11 years) was reported in the last national survey. The government of Nuevo León implemented a primary prevention obesity program for school age children through multiple components and adapted to the local context.

The aim of this lecture is to present the impact and strategies of an obesity prevention program for elementary school children in the state of Nuevo León México.

The primary intervention consisted in a structured public policy and a program based in evidence, with three components: nutrition education and health promotion; integrated resources from the ministries of health and education; assurance of safe and healthy environments. For the nutrition education and health promotion was elaborated a state catalog with food, beverages and snacks guidance. In addition, an intense training for teachers, parents and educative community was performed. Physical activity routines during the time in the schools (6000 elementary schools) were implemented (to assure 30 minutes during the school time). Weight and height were measured and body mass index (BMI) was interpreted by the WHO 2007 reference. During three consecutive years was recorded the measurements of three different cohorts of school children (year 1= 197, 586 children; year 2= 257,576 children; year 3 = 286, 238 children. Legal and standard measures that meet healthy nutrition guidelines for school stores (2100 establishments) were included.

The combined prevalence of obesity during the three consecutives school years was 32.5%, 30.1% (p value ≤ 0.02) and third year 30.9% (p value ≤ 0.01). More than 30,000 teachers were trained, and one million of food catalogs were distributed to the parents. A didactic collection for health promotion was delivered to school age children. The program was recognized as a successful practice in México because the significant decrease or containment of the obesity prevalence, the high level strategic leadership of the government authorities, the inclusion of health in education policies, the monitoring system (evolutionary chart of health), the coordination, the alliances with the food and beverages industry, and the implementation of a social marketing campaign.

Monitoring, evaluation and surveillance are key strategies related to obesity prevention. It is necessary to assure the sustainability of the childhood obesity programs in Mexico.

Keywords: Childhood obesity, prevention programs, school age children, food guidance, health promotion.
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PS_144/1046

AN INVESTMENT FRAMEWORK IN NUTRITION: CURRENT PROGRESS IN COSTING AND FINANCING THE SCALE-UP OF EVIDENCE-BASED NUTRITION INTERVENTIONS

AN INVESTMENT FRAMEWORK FOR NUTRITION

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World Bank.

The analytical framework established in Scaling Up Nutrition: What will it Cost? provided the foundation for the World Bank, with support from the Bill & Melinda Gates Foundation (BMGF), to undertake a series of country-level analyses to determine resources needed to scale up high-impact interventions to improve early childhood nutrition. These studies use country-level costs and other data to provide country-tailored guidance on resources needed to scale up cost-effective scenarios which depend on cost-effectiveness considerations, financing constraints and country-specific priorities. In 2016, the World Bank, Results for Development Institute, and 1,000 Days, with support from BMGF and the Children's Investment Fund Foundation (CIFF) released innovative, in-depth costing analyses and developed a global investment framework for achieving four of the six global nutrition targets. While the global and country-based findings are extremely useful in setting nutrition agendas, they are limited by the inability to identify the optimal allocation across intervention of a given 'purse' of resources. To address this constraint, a new optimization tool, Optima Nutrition, has been developed and piloted through a partnership between the World Bank and the Burnett Institute, with financing from BMGF. The tool allows the user to determine allocative efficiency across nutrition interventions within a given country and to better understand existing costing structures of nutrition interventions. These advances will help to catalyze domestic and external investments for nutrition results. This session will present analytical innovations, as described above, to determine the costing and financing needs for scaling up evidence-based nutrition interventions. The panel discussion will address issues of feasibility, smart scale-up and ways to leverage the additional financing needed.

Keywords: Maternal and child nutrition; health economics; health financing; benefit-cost analysis
Further collaborators:
Ellen Piwoz, the Bill and Melinda Gates Foundation; Susan Horton, University of Waterloo; Martin Short, Power of Nutrition;

LESSONS FROM INVESTMENT FRAMEWORKS FOR NUTRITION IN SELECTED COUNTRIES

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The World Bank, in the partnership with the Bill and Melinda Gates Foundation, has undertaken a series of country-level analyses to determine resources needed to scale up high-impact nutrition-specific interventions in countries with high burden of malnutrition in Sub-Saharan Africa and South Asia. These studies offer an analysis of the common trends as well as factors explaining the variation in estimated cost-effectiveness and economic benefits of different interventions and intervention packages. Estimates of the costs and benefits of scaling up a package of nutrition-specific interventions to improve nutrition outcomes during the critical 1,000 day window take into account country-specific factors such as the current coverage of interventions, the available delivery platforms, and the local costs for commodities, monitoring and evaluation, and capacity building. In addition, the studies provide policymakers with several context-specific scale-up scenarios, designed to maximize allocative efficiency in situations where available resources for investments in nutrition are limited. The proposed scale up scenarios are evaluated based on their cost-effectiveness (in terms of cost per DALY averted, life saved, and case of stunting averted), as well as their potential contribution to future economic productivity (estimated based on increases in adult wages resulting from childhood stunting averted and/or on improved IQ scores and consequent increases in wages resulting from reductions in other forms of malnutrition [e.g. iodine deficiency]). This presentation provides a synthesis of country studies and their potential to drive political commitment and action and to enhance allocative efficiency of nutrition resources.

Keywords: Stunting; cost-effectiveness; nutrition interventions; economic productivity

A TOOL FOR OPTIMIZING EFFICIENCY: OPTIMA FOR NUTRITION OPTIMA TOOL

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The recent increase in the attention given to issues related to nutrition has been precipitated partially by the growing body of knowledge related to the economic impact of malnutrition as well as the cost and benefits of scaling up key nutrition actions. One key and persistent question asked by policy makers and nutrition and health program managers which has not been addressed to-date is: what allocation of funding across different interventions would allow us to maximize nutrition and health impact while minimizing costs? The existing analytic tools do not address this critical question. A few existing ones, including LiST, OneHealth, Profiles, the World Breastfeeding Costing Initiative tool, and the FANTA CMAM costing tool, estimate either costs or impacts of different nutrition interventions. Each has its strengths but none offers the analytical capability to integrate all of the following features: (i) combine the estimates of cost, health impacts, and economic impacts of scaling up nutrition interventions; (ii) compare cost-effectiveness of different intervention and scale-up options; (iii) systematically assess allocative efficiency of different scale-up options (iv) use a formal mathematical optimization model to identify the optimal allocation of a given level of resources to reach specific nutrition and/or health outcomes. This session introduces Optima nutrition, a mathematical model that uses an integrated analysis of nutrition status, program, and cost data to determine an optimal distribution of investment at different funding levels to better serve the needs of decision-makers and planners. An initial pilot application for Optima nutrition has been developed through a partnership between the World Bank, the Bill and Melinda Gates Foundation, and the Burnett Institute. Currently, the application is focusing on child stunting and the plan is to incorporate other outcomes such as anemia and wasting over time. The application allows the user to 1) estimate the impact an intervention scale-up will have on stunting prevalence and child mortality; 2) calculate the cost of scale up under different cost function assumptions; 3) for a given budget, calculate the optimal allocation of resources among the seven interventions (that is, identify an allocation that will produce maximum reductions in stunting or/and mortality); 4) for a given budget, calculate the optimal allocation of resources among different geographic regions in a given country. This session presents the structure of the model, and illustrates how the model can be used with preliminary application in two countries.

Keywords: Allocative efficiency, Nutrition, Stunting, Cost-effectiveness, Optimization.

Further collaborators:
Bill & Melinda Gates Foundation

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EVIDENCE-BASED INTEGRATION OF NUTRITION ACROSS MULTIPLE SECTOR PROGRAMS: HOW CAN THIS BE DONE?

EFFECTIVE INTEGRATION OF NUTRITION INTO OTHER SECTORS – OPPORTUNITIES AND CHALLENGES

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Since the Lancet Series on Maternal and Child Nutrition was published in 2013, and the launch of the global Scaling Up Nutrition (SUN) movement, there has been a strong resurgence of multisectoral programming to improve nutrition outcomes. Multisectoral plans are being launched globally to address the multiple determinants of poor nutrition and across the globe, poli-

cymakers, program implementers and researchers are grappling with the complexity that multisectoral programs unleash. Many multisectoral programs, especially those planned as part of national programs, have focused on coordination of sectoral actions and identification of nutrition-focused actions that specific sectors can undertake. Smaller multisectoral programs, often designed and implemented by non-governmental organizations, may take a more focused approach of delivering multiple streams of programming to targeted households.

Ruel and Alderman (2013) laid out three approaches for actions in other sectors to strengthen impact on nutrition: improving nutrition by improving critical underlying determinants [e.g., sanitation, education, food security, poverty]; reframing sector-specific programs to incorporate nutrition goals and actions [e.g., incorporating nutrition goals and specific actions into social protection or other programs]; or delivering nutrition-specific interventions via other sectoral program platforms. It is important to inquire which of the three pathways to improving nutrition is most deployed in the current wave of multisectoral programs. It is also important to examine whether program planners are actively considering each of these potential approaches. Not doing so can run the risk of deploying actions in other sectors that are ineffective (in the best case) or have negative spillover effects (in the worst case).

Multisectoral programs can place a significant burden on program planners, implementers, evaluators, and potentially even on households. It is critical therefore, that program planners reflect adequately on whether interventions in other sectors do what they are ultimately tasked with – i.e., that they close gaps in the multiple determinants of poor nutrition in ways that support families most effectively and without negative side effects.

In this talk, I will draw on policy and program evaluation experiences in South Asia to reflect on some of the operating models of multisectoral programs, and the opportunities and challenges that face policymakers, program planners and researchers.

Keywords: Multisectoral programs, integration, learning

MAKING COLLABORATION THE DEFAULT TO ACHIEVE GENUINE MULTISECTOR NUTRITION PROGRAMMING – A NEW APPROACH IN TIMOR-LESTE

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Despite significant progress being made to combat malnutrition in Timor-Leste, preliminary data from the 2016 Demographic and Health Survey indicates that undernutrition (in particular, wasting, stunting and anaemia) in women and children continues to be a major development issue, across all municipalities and wealth quintiles and in urban and rural areas. On the contrary, the prevalence of overweight and obesity is increasing raising concerns of the emerging double burden of malnutrition.

Global evidence suggests that no single policy, approach or intervention can create sustained reductions in malnutrition. Instead, a mix of coordinated interventions, across sectors is required to address all causes of malnutrition across the lifecycle .

While integrated cross-sector programming presents great potential, the evidence-base on which to achieve this is still weak. In practice, poor program targeting, design, implementation and evaluation has limited the evidence of impact. Similarly as m nutrition interventions and mobile technology tools targeting behaviour change are still emerging, very few impact evaluations are available to draw lessons from. .

Building on a political commitment to combat malnutrition through the National Action Plan for a Hunger and Malnutrition Free Timor-Leste (2014- 2025), in partnership with the National Council for Food Security, Sovereignty and Nutrition (KONSSANTIL) the Australian Government is supporting partners to develop a cross-sector collective nutrition impact pilot 'Hamutuk'. Hamutuk is developing a mobile technology tools including a custom-made application to strengthen traditional behaviour change communication strategies, to ensure multi-sector collaboration is 'default' and existing delivery platforms are used effectively to target nutrition promoting messages to households.

End of program outcomes include improving household nutrition promoting behaviours improving active collaboration between partners and ensuring uptake of the model by the Government.

Hamutuk will allow the Government to measure the collective impact of nutrition specific and nutrition sensitive interventions and support their endeavors to end hunger and malnutrition through effective multisector nutrition programming

National Statistics Directorate (NSD) Timor-Leste, Ministry of Finance Timor-Leste and ICF Macro Timor-Leste Demographic and Health Survey 2016

WHO 2014. National Survey for Non-communicable disease risk factors and injuries: using WHO STEPS approach in Timor-Leste

Ruel M.T. and Alderman H. 2013. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? The Lancet 382(9891), 536–551

Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost?Prof Zulfiqar A Bhutta PhD,Jai K Das MBA,Arjumand Rizvi MSc,Michelle F Gaffey MSc,Neff Walker PhD,Prof Susan Horton PhD,Prof Patrick Webb PhD,Prof Anna Lartey PhD,Prof Robert E Black PhD, The Lancet - 3 August 2013 (Vol. 382, Issue 9890, Pages 452-477)

International Food Policy Research Institute. Global Nutrition Report 2014: Actions and Accountability to Accelerate the World's Progress on Nutrition. Washington, DC

Barnett, I., Scott, N., Batchelor, S. and Haddad, L. (2016). Dial 'N' for Nutrition? A Landscape Analysis of What We Know About m-Nutrition, m-Agriculture and m-Development. IDS Working Paper, 2016(481).

Keywords: Multi-sector , stunting, m-nutrition

LINKING AGRICULTURE, GENDER, NUTRITION AND MICROCREDIT INTERVENTIONS IN BANGLADESH: WHAT ARE WE LEARNING ABOUT CONVERGING AND INTEGRATING TO REACH HOUSEHOLDS WITH MULTIPLE INTERVENTION STREAMS

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It is recognized that leveraging agriculture to address nutrition must also address gender-related challenges. However, program experiences and the literature are limited on the types of integrated intervention models that can do this most effectively and efficiently. IFPRI, in collaboration with BRAC, launched the TRAIN (Targeting and Realigning Agriculture for Improved Nutrition) study in Bangladesh to test different combinations of interventions for strengthening agriculture-nutrition linkages. The four components combined in an additive manner across the intervention arms are (1) credit offered to women, (2) behaviour change communication related to health and nutrition, (3) nutrition-sensitive agriculture extension services and (4) gender sensitization and community mobilization.

In the context of designing the interventions to be tested, we identified several opportunities and challenges within existing platforms or specific programs implemented by BRAC.

Opportunities:

BRAC's existing microcredit platform 'Dabi' works through a unique 'credit plus' approach, addressing the special needs of poor populations. Dabi provides loan only to women for investment in any productive sector, thus bringing a gender-lens to the credit program by design

BRAC's Gender Quality Action Learning (GQAL) program has developed and implemented an established a set of interventions to target specific social issues, and was open to exploring opportunities to integrate nutrition-related gender concerns.

BRAC's vast experience in implementing intensive behaviour change counselling programs for infant feeding and maternal nutrition through their health worker network BRAC's experience in implementing large scale programs on crop cultivation, fisheries, and poultry & livestock for horizontal & vertical production

Challenges:

Different sector-specific BRAC programs deliver their interventions at scale and with focused intensity to deliver impact. While aiming to reach households with each stream in an integrated manner, it is unclear whether it will still be possible to ensure integration at the same intensity as is possible with more vertical programs. Identifying ways in which the delivery of the integrated package will be as effective as the individual streams is a key challenge, therefore.

The initial vision for the TRAIN interventions was that specific services would be offered free of cost to beneficiaries. At the same time, as BRAC moves towards a broader institutional entrepreneurship/business model, there are likely to be challenges to this initial vision.

The GQAL gender platform has not yet been used specifically to address issues of intrahousehold allocation of work, food and resources in relation to agriculture and nutrition. Although there are natural linkages between gender issues and nutrition, the integration of new specific topics into a gender platform that is focused on broader social issues may pose challenges.

Overall, however, our experience to date suggests that the vision for improving nutrition has high-level support in BRAC, as does the understanding that improving nutrition will take multiple streams of programming to come together on the same vulnerable households. Our study will examine the potential for integrating three significant streams – agriculture, gender and nutrition behaviour change communications, while other efforts at BRAC will also examine the integration of additional sectors.

Keywords: Agriculture, gender, nutrition, microcredit, integration

INTEGRATION AND SCALING UP NUTRITION WITHIN NGO PROGRAMS – CHALLENGES AND OPPORTUNITIES IN BANGLADESH

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BRAC, the largest non-governmental organization (NGO) in the world born in Bangladesh has been implementing interventions through multidimensional approach. Nutrition is one prime focus of BRAC along with micro-finance, agriculture, education, health care services, water, sanitation & hygiene, social protection, climate change, human rights, community empowerment and so on. Nutrition programme addresses improved infant and young child feeding (IYCF) practices of under-two children, enhances food diversity of pregnant and lactating women (PLW) and promotes healthy diets of adolescent girls including micro-nutrient

intake of under-five children, PLW and adolescents. Currently, nutrition interventions are being implemented in 233 rural sub-districts and 11 city corporations (nearly half of the country) reaching 7.2 million under two children, 3 million PLW and 9 million adolescent girls, and in 61 districts reaching 10 million under five children for micro-nutrient powder. The trained front-line community health workers demonstrate and counsel mothers of children and PLW, render health education to adolescents and sell micro-nutrients sachets for under-five children. Over the years, there has been significant improvement of behavior and practices in IYCF and maternal nutrition, and reduction of anemia among under-five children. Despite recognizing the importance of multi-sectoral approaches, BRAC is facing challenges of integrating all development programmes. Nutrition is integrated with health and population interventions with WASH being promoted. While designing all those development programmes (quite large in population and geographic coverage), integration is not considered due to different donors' requirements, and tendency to make direct and specific impact of individual programmes. With the support of Nutrition International (based in Canada) formerly Micro-Nutrient Initiative, BRAC is exploring pathways for integration in Bangladesh. The knowledge and evidence generated through this method will have wider impact not only on nutrition and health status but also on major socio-economic indicators if integration factored into design which will be easily usable.

Keywords: BRAC, Bangladesh, nutrition, integration, challenges

Further collaborators:
Nutrition International

EVIDENCE-INFORMED DESIGNING OF INTEGRATION OF NUTRITION INTO MULTIPLE-SECTOR BRAC PROGRAMS (INBP) – OVERVIEW OF THE RESEARCH DESIGN

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Establishing multi-sector, nutrition-specific and nutrition-sensitive interventions is critically important as a strategy to ensure sustainable interventions to improve nutrition of women, adolescents and children. Designing such strategies presents many challenges and, to date, there is insufficient evidence to provide guidance to the systematic design and integration of nutrition into multiple sectors. The Nutrition International has applied a series of interdependent research methods to identify these barriers particularly related to adolescent nutrition; understand in-depth the individual, household, and community factors affecting nutrition; and explore existing and potential service delivery options to inform the designing of integration of actionable nutrition packages (ANP) into multi-sector BRAC programs. BRAC is a Bang-

ladesh-based NGO known globally for its largest national-level programs. This presentation provides an example of systematic guidance on HOW nutrition can be integrated into at-scale multi-sector programs and HOW its application can further inform policy makers on their efforts directed to sustainably improve nutritional status of the vulnerable populations.

Keywords: Multi-sector, Integration, Program, Adolescent

STRATEGY FOR INTEGRATED LINKAGES BETWEEN SERVICE DELIVERY AND HOUSEHOLD UTILIZATION ACROSS PROGRAMS

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Large multi-sectoral service delivery platforms offer an opportunity to integrate nutrition across a broader range of activities than the Health sector alone. Yet identifying the optimum points for intervention in complex programmes presents a challenge. Using the example of rural Bangladesh, this presentation describes a sequence of project design research steps to map the contact points and interventions that could address anaemia in adolescent girls. Steps discussed include the mapping of Project Impact Pathways (PIPs) for existing services; formative research to describe the operational issues affecting household utilization of these same services; systematic data collection to identify nodes and networks through which health and nutrition information is routinely passed; and focused ethnographic investigation of adolescent consumption and common food proscriptions and prescriptions with a bearing on consumption of iron-rich foods. The presentation concludes by demonstrating the contribution of these steps to the identification of both a set of service "offerings" that can impact adolescent nutrition and the optimum means to deliver them.

Keywords: Adolescent, iron, integration, qualitative, Bangladesh.

Further collaborators:
Chowdhury Jalal, Muhammad Mahbub Bhuiyan, Jean-Pierre Habicht, Gretel Pelto

TRANSITION FOOD SYSTEMS AND SHIFTING DIETS IN LOW- AND MIDDLE-INCOME COUNTRIES: WHAT DO THEY LOOK LIKE NOW, AND WHERE ARE THEY HEADED?

THE CASE OF PASTORALISM IN NORTHERN KENYA: FOOD, WATER, LAND AND LIVELIHOODS

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Pastoralists in northeastern Kenya are experiencing significant difficulties in preserving their traditional livelihoods due to various factors including population pressures and environmental stresses induced by climate change. These challenges affect their ability to access key resources, such as food and water. Government policies promoting alternative livelihoods for pastoralists, including sedentarization and modernization, often diverge from traditional pastoralists' culture, values and practices. There are questions as to whether such policies should be embraced in the long-term. In this study, we identified the dilemmas and challenges faced by pastoralists in the context of sedentarisation, modernization, and traditional practices of transhumance. We also explored coping mechanisms pastoralists use to adapt to those challenges. We completed semi-structured interviews and a Photovoice project with nomadic and sedentarized pastoralists from the Borana Oromo and Turkana ethnic groups in Isiolo, Kenya. The interviews were coded for key themes using grounded theory. Both sedentarized and nomadic pastoralists lacked access to key resources essential for survival; lack of water and sanitation were highly salient themes. There was a disconnect between development plans and priorities of pastoralist communities, and sedentarization programs and policies often did not improve pastoralists' access to food or water. Additionally, sedentarized pastoralists indicated high levels of unemployment, and identified a number of microbusinesses that could be used as alternative livelihoods, such as charcoal burning, and fruit and vegetable stands. Nomadic pastoralists expressed concern of the reliability of these alternative livelihoods. Both nomadic and sedentarized pastoralists recognized the tradeoffs of alternative livelihoods to environmental degradation and deforestation. Traditional coping mechanisms were mentioned by both pastoralist groups, but were exceedingly hard to implement in the wake of more severe climate change and of increased conflict between ethnic groups (as a result of competition for scarce resources). As opposed to top-down strategies that assume modernization as an appropriate transition for pastoralist communities, integration of the traditional and cultural needs, knowledge and practices of pastoralist communities could be essential to informing how pastoralists transition their livelihoods in the future.

FROM MILITARY REGIME TO MARKET LIBERALIZATION: EXPLORING FOOD ENVIRONMENT TRANSFORMATIONS IN MYANMAR

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After decades of military rule, in 2011 Myanmar made significant reforms towards a demographic government. While the military still has a strong presence in the country, the reforms have led to the removal of sanctions and market liberalization including increased trade and foreign investment. These economic reforms have undoubtedly led to significant changes within Myanmar, including to the local food environment. This has implications for the burden of malnutrition in the country. Undernutrition continues to persist in the country with 8% of Burmese children acutely malnourished and 40% stunted. At the same time, overweight/obesity levels are increasing in the country – 30.8% of women are overweight/obese and 11.8% have been diagnosed with Type 2 Diabetes. The Burmese are experiencing both nutritional and epidemiological transitions. However, there are gaps in knowledge about how those transitions are related to the local food environment. To address this gap, this study uses food environment mapping, market and consumer surveys, as well as focus group discussions to describe the changing food environment in both urban and rural townships in Myanmar. The food environments in the study settings examined were dynamic and largely dominated by the informal food sector, particularly in rural settings. Urban food environments had greater diversity in the types of food outlets (e.g., supermarkets, street foods, etc.), as well as the types of foods sold, as compared to rural food environments. Although rural settings still have access to packaged processed foods, these foods are much more accessible in urban settings. By characterizing the food environment in rural and urban settings in Myanmar, this study will help inform the identification of potential points for intervening to simultaneously tackle the multiple burdens of malnutrition within the context of different food environment typologies. It is likely that different policy and programmatic approaches will be needed in rural and urban settings in the country.

HEALTH IMPACTS OF FOOD SYSTEMS: IDENTIFY-ING LEVERAGE POINTS FOR CHANGE

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The presentation discusses a recent report prepared by the International Panel of Experts on Sustainable Food Systems (IP-ES-Food). The report is primarily concerned with the political economy of evidence, where food systems intersect with health. It looks at how underlying dynamics and power relations shape the health impacts of those systems, and shape our understandings of those impacts. The report takes a public health perspective, which entails a focus on primary disease prevention, management of chronic conditions, and the general promotion of health, aiming to identify how the root causes of harm could be addressed. It therefore emphasizes the need for detecting social, structural, and environmental determinants of health associated with food systems, and interventions that can potentially benefit many people at a time, ensuring and enhancing conditions for population health. Furthermore, it is hoped that this report can contribute towards a better valuation of the health impacts of food systems and their consideration in policy making.

The discussion of health impacts in food systems is grouped into five channels of impact -- Occupational Hazards; Environmental Contamination, Compromised & Contaminated Foods; Unhealthy Dietary Patterns; and Insufficient Diets. The analysis is focused on health impacts which: a) appear to be most serious; b) have an impact on large numbers of people; and c) have the strongest associations with the food system. Compounding factors in the analysis include: i) systemic blind spots in the evidence base; ii) the ability of powerful actors (e.g., the food industry) to shape the evidence and frame the discussion; and iii) the complexity created by interconnected and mutually reinforcing problems. The report concludes with suggestions on systemic leverage points for change.

Keywords: Health impacts; food systems; food policy; food industry; public health.

Further collaborators:
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WHY SHOULD GOVERNMENTS FOCUS ON THE LINKAGES BETWEEN NUTRITION EDUCATION AND FOOD POLICIES?

IMPLEMENTING FOOD-BASED DIETARY GUIDE-LINES TO GUIDE POLICIES, PROGRAMMES AND CONSUMER FOOD AND NUTRITION EDUCATION

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The need for food-based dietary guidelines (FBDGs) to guide national food-related policies and programmes including food and nutrition education programmes is increasingly recognized. However, there has been a lack of information on how FBDGs are implemented by national entities, and a lack of guidance on carrying out implementation beyond dissemination. This presentation will describe the findings of a study conducted to obtain a snapshot of country actions of FBDGs implementation. A literature review and key informant interviews with staff and researchers in government ministries, national nutrition organizations and academia in 27 countries were used. The inquiry was based on the social-ecological model. Results obtained will be presented; and some preliminary recommendations on how to maximize the impact of FBDGs are given, which include the need for a consumer-centred approach; an implementation plan with built-in monitoring, evaluation, and funding; the need to target all policies/programmes that influence food, and the need to target policymakers as well as educators and the general public.

Keywords: Food-based dietary guidelines; implementation; food.

Further collaborators:

PS_144/99

STRENGTHENING CROSS–SECTORAL COUNTRY CAPACITY FOR EVIDENCE–INFORMED DECISION–MAKING TO SCALE

SUPPORTING POLICIES, PROGRAMS, AND ENABLING ACTION THROUGH RESEARCH: THE WAY FORWARD

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Strengthening cross-sectoral country capacity for evidence-informed decision-making to scale-up nutrition

Over the last decade, nutrition has moved from a neglected development challenge to one that is centre stage in many high-level speeches and country plans. This rise in political commitment has to be matched by large-scale and effective action on the ground that accelerates positive change. If not, the bubble will burst....or deflate slowly....as other development challenges come to the forefront. Within the nutrition community, the focus is now squarely on implementation and impact. Decision-makers, wherever they are, have to make judgements based on knowledge. Knowledge of the problem and potential solutions -- and the way it's framed and communicated -- is one of the fundamental drivers and pre-requisites of an "enabling environment" for nutrition. Knowledge derives from evidence and from experience. Evidence of what works, in different contexts, is growing and there's an increasing focus on why certain programs work or don't work; more and more evaluations are opening up the black box of implementation to shine a light on the pathways of impact. And increasing attention is being paid to "stories of change" which capture real-world experiences of decision-makers as they come to terms with the complex multi-sectorality of nutrition. This short presentation seeks to bring together lessons learnt in the management and development of large research programs or consortia which attempt to strengthen and expand the knowledge base on nutrition. Transform Nutrition, LANSA, Stories of Change and now the SPEAR (Supporting Policies, Programs and Enabling Actions through Research) flagship of the Agriculture for Nutrition and Health (A4NH) program have all operated in this knowledge arena in recent years. What has been learnt about the way in which evidential and experiential knowledge can be effectively brought to bear in different contexts. What types of evidence can turn keys, open doors, and change minds? Why is it so important to properly document experiences of nutrition champions and decision-makers in navigating real-world roadblocks and hurdles to drive an agenda forward? How do we learn from success, or from failure?

Keywords: Decision-makers, nutrition, research

THE STATE OF EVIDENCE GENERATION TO SUPPORT NUTRITION PROGRESS IN THE COMPREHENSIVE AFRICA AGRICULTURE DEVELOPMENT PROGRAMME (CAADP)

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The African Union's Comprehensive Africa Agriculture Development Programme (CAADP) seeks to accelerate economic development through agriculture in recognition of agriculture being a key economic livelihood for the continent. Over 75% of Africa's population depend on agriculture for their source of income and livelihoods. From inception of CAADP, through the Maputo Declaration in 2003, African Heads of State committed to spending at least 10% of national GDP on Agriculture and aim for at least 6% annual growth in the sector. Although addressing hunger was one of the goals there were no specific nutrition targets stated. In 2011 NEPAD and FAO commenced a capacity strengthening programme towards mainstreaming nutrition in national agriculture investment plans. In 2014 under the Malabo Declarations African Heads of State reaffirmed the 2003 commitments but in addition included specific nutrition targets within the broader objective of ending hunger and malnutrition. The Malabo targets are to reduce stunting to 10% and wasting to 5% by 2025. As a result, the CAADP results framework now has some nutrition related indicators: undernourishment, underweight, stunting, wasting, minimum acceptable diet for children 6-23 months, and Minimum Diet Diversity for women. There is now an agreed biennial review of CAADP starting in 2017. There is, therefore, an opportunity to address diet quality and nutrition within CAADP calling for greater attention to related evidence generation and the challenges this presents.

The CAADP monitoring platform is the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) led by IFPRI for the NEPAD Coordination Agency of the African Union. It is structured to take place through Joint Sector Reviews at country level with reporting at country, regional and continental levels through ReSAKSS structures. Like SUN, the country level process encourages multisectorality presenting opportunities for synergy if greater alignment takes place. There are significant challenges relating to generation of the needed data/evidence. For nutrition, most African countries have relied heavily on DHS and UNICEF MICS data but these are only collected every 3-5 years and limited resources and capacity may lead to some surveys not being administered timeously. Some countries are now implementing annual SMART surveys but these too have depended on external resources from development partners. An advantage of DHS data is that it is collected in collaboration with National Statistics Offices who also collect agriculture data but this needs to be better leveraged for nutrition. It is important to take cognisance that effectively monitoring nutrition to inform progress and policy decisions goes beyond tracking trends. It also requires continued generation of programme implementation data and evidence both quantitative and qualitative to improve programme contextualization and quality for subnational situations given the diverse contexts. It

further requires that evaluators and researchers can be candid in reporting and that decision makers become receptive to such reporting to develop genuine synergy among all relevant processes. The state of evidence, challenges and opportunities for evidence generation within CAADP will be presented.

Keywords: CAADP, nutrition evidence, agriculture and nutrition, Africa

STRENGTHENING CAPACITY FOR EVIDENCE–INFORMED DECISION–MAKING IN AFRICA: EVIDENT LESSONS AND OPPORTUNITIES

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Background and objectives: Unacceptably high rates of malnutrition in Africa persists, despite considerable knowledge and technology to address its determinants. A missing link is the access to and use of quality evidence. In the African context, there is disconnect between evidence generators and users, effectively limiting uptake of knowledge for better policies and programs. The EVIDENT (Evidence-informed Decision-making in Nutrition and Health) partnership was established in 2014 to address this gap. EVIDENT aims to enhance Evidence-informed Decision-making (EIDM) by bridging linking researchers and decision-makers and strengthening their capacity to co-create solutions to address local needs. EVIDENT's EIDM framework proposes to identify and prioritize information needs, systematically appraise existing evidence, and translate it into concrete recommendations actionable by responsible bodies. We present the findings of a project evaluation, conducted in 2016 to determine stakeholders' perception of the added value and quality of EVIDENT, and lessons learned regarding drivers, barriers, and opportunities for EIDM in Africa.

Methodology: The evaluation used mixed methods including in-depth interviews of EVIDENT partners and stakeholders; project documentation including partner meeting minutes, protocols, and annual reports; and an online survey administered to partners and stakeholders. The evaluation focused on i) the implementation of activities with regard to EVIDENT's goal, expected outputs, and milestones; ii) barriers, challenges and opportunities for a future EVIDENT; and iii) lessons learnt for EIDM.

Results: EVIDENT achieved the goals of championing EIDM in Africa through: capacity strengthening (delivering courses in evidence synthesis and contextualisation; n=70 persons), tool development (Evidence synthesis guidance and process tools devel-

oped), understanding EIDM landscape in different contexts (four country case-studies explored current country-specific EIDM procedures), and responded to local priorities (5 systematic reviews on various topics currently being conducted). EVIDENT has also recognized the need to ensure good Africa-based leadership and coordination; Ghana and South Africa are currently sharing coordination role in EVIDENT. EVIDENT's challenges included insufficient funding arrangements, leading to inadequate time commitment by partners, feeling of disconnectedness while working virtually, and initial lack of experience in EIDM. Despite these, EVIDENT was well received, globally. Lessons learnt from implementing EVIDENT includes: existence of high demand for EIDM at both regional and country levels, need to establish partnerships with existing regional/global platforms (e.g. SUN, CAADP, etc.) for sustainability, EIDM needs to adapt processes to individual settings rather than a one-size-fits-all approach, and realization that evidence synthesis (e.g. systematic reviews) takes more time to achieve results than often expected.

Conclusion and recommendations: EVIDENT has become a champion of EIDM in nutrition in Africa. Continued efforts focusing on leadership, creation of demand for evidence in nutrition policy and programming in Africa, are needed to capitalize on the investment made in capacity throughout EVIDENT's lifetime. The lessons from the evaluation can contribute to future perspectives on EIDM in Africa and elsewhere.

Keywords: Decision-making, lessons learnt, evaluation, Africa, evidence

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PS_144/29

THE CHANGING NUTRITION LANDSCAPE: IMPLICATIONS FOR RESEARCH

UNSCN TRACKING EMERGING ISSUES AND BROKERING KNOWLEDGE

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The United Nations Standing Committee on Nutrition was renewed in 2016, resulting in a new Strategic Plan for the period 2016-2020. Its main task is to maximize coherence of nutrition policy and advocacy in the UN system as well as to support the consistent and accountable delivery by the UN system at country level. The achievement of these objectives is supported by among others, the exploration of new and emerging nutrition related issues and the active brokerage of new knowledge and insights

Since early 2016 UNSCN has participated in several academic fora and conferences. It has inquired among its members about emerging issues that are related to their work or impacting on it. Also in 2016, the UN General Assembly launched the UN Decade of Action on Nutrition. The Decade is organized around 6 action areas:

• Sustainable and resilient food systems for healthy diets;

• Aligned health systems providing universal coverage of essential nutrition actions;

• Social protection and nutrition education;
• Trade and investment for improved nutrition;
• Safe and supportive environments for nutrition at all ages and;
• Strengthened governance and accountability for nutrition

Since the finalization of the work program for the Decade, governments have started to make SMART commitments to support the success of the Decade. In addition action networks are being formed and shaped in an organic way to support the delivery of results in the 6 action areas.

The current challenge is if we know enough to deliver sustainable results? Are the current areas of interest that are covered by knowledge platforms and current research by academia sufficient to support the intensification of sustainable actions and results, ultimately leading to the elimination of all forms of malnutrition in 2030? In addition: do we know enough about the large range of actors and their respective contributions? How do we ensure good governance for nutrition?

During this seminar UNSCN will present some emerging issues related to nutrition and explore how well they are being covered by current research as well as where questions remain to be answered.

Keywords: Emerging issues, research

SUSTAINABLE FOOD SYSTEMS? EXPLORING THE CROSS ROAD BETWEEN POLICIES AND RESEARCH IN THE COMMITTEE ON WORLD FOOD SECURITY

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The Committee on World Food Security (CFS) is the foremost inclusive and evidence-based international and intergovernmental platform for food security and nutrition (FSN), where policies can be designed, interventions can be coordinated, options can be shared and decisions at different levels can be prepared.

The High Level Panel of Experts on FSN (HLPE), science-policy interface of the CFS, was created in October 2009, as an essential element of the reform of the CFS, with three key functions: (i) assess and analyze the current state of FSN and its underlying causes; (ii) provide scientific analysis on specific policy-relevant issues; and (iii) identify critical and emerging issues for FSN. All the HLPE reports are available online: http://www.fao.org/cfs/cfs-hlpe/en/.

The HLPE organizes an inclusive scientific dialogue, building upon the diversity of disciplines, backgrounds and knowledge systems. It thrives to propose a common language, clarify contradictory information and knowledge, elicit the backgrounds and rationales of controversies: "One of the key roles of the HLPE reports is to help members and participants in CFS to understand why they disagree" (MS Swaminathan, 1st HLPE Chairperson).

In 2014, in its first note on critical and emerging issues for FSN, the HLPE highlighted the importance of healthy nutrition in changing food systems. Globally, one person in three today is malnourished. If current trends continue, this figure will reach one in two by 2030. The human health, environmental, economic and social consequences of malnutrition are crippling and the burdens created by malnutrition are transmitted across generations. Understanding the causes of this situation is key to any action to improve nutrition. It requires considering recent evolutions of diets and food systems and their drivers: how and why do diets change? What are the links between diets, consumption and consumer habits and food systems? How do changes in food systems affect changes of diets, and therefore health and nutritional outcomes?

Building on the momentum of the International Conference on Nutrition (ICN2) in 2014, the UN Decade of Action for Nutrition and the SDGs, the CFS requested the HLPE to produce a report on Nutrition and food systems. The purpose of this report is two-fold: (i) to analyse the ways in which food systems and dietary patterns interact and result in nutritional outcomes for individuals; and (ii) to highlight effective policies and programmes that shape food systems in order to contribute more effectively to improved nutrition and ensure the right to healthy food for all in a sustainable way.

The report identifies three main elements of food systems (food value chain, food environment, and consumer behaviour) on which policies can act to improve diets and nutrition outcomes. It provides examples of successful policies and programmes and concrete recommendations to different stakeholders on how to progress towards this objective. It also points out to the need for further interdisciplinary and inter-sectorial research covering all the aspects of food systems, from production to consumption, to help design more effective nutrition-sensitive policies and programmes adapted to different contexts.

Keywords: CFS, HLPE, nutrition, food systems

WHY AREN'T WE DOING MORE RESEARCH INTO THE ROLE OF BUSINESS IN NUTRITION?

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There is precious little research into the impacts of public private partnerships in nutrition. Is this due to the lack of such PPPs in nutrition or is it due to systemic factors in the research infrastructure? If the latter, what are they and how can they be transformed? The presentation addresses these questions.

Keywords: Business research

NUTRITION, RESEARCH AND THE SDGS: LESSONS GARNERED FROM THE GLOBAL NUTRITION REPORT ON CATALYZING PROGRESS TOWARDS 2030

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In 2015, UN Member States adopted 17 ambitious Sustainable Development Goals, with the aim of transforming our world. Countries are currently working out how to make progress on these goals a reality on the ground.

Two specific targets are directly relevant to nutrition: SDG Target 2.2. is to end malnutrition in all its forms; target 3.4 is to reduce by 30% premature mortality from NCDs, which includes obesity as an indicator. Decades of evidence show that ending malnutrition will take much more than just specific actions designed to prevent or treat it; it will take actions that address its underlying causes, such as poverty reduction, education, gender equality, and water and sanitation. At the same time, investing in nutrition can deliver dividends for these sectors. The potential exists for an integrated approach to deliver not just nutrition but other targets as well.

If we are to fully realise the ambition of the nutrition SDGs, research will play a critical role. The 2017 Global Nutrition Report (GNR) shows that all 189 countries for which data are available are off course to meet obesity targets if current trends in continue unabated. For the diabetes indicator, 8 countries had a probability of ≥0.50 of meeting the 2025 target among men, and 26 countries are likely to meet the target for women. 19 countries are on course to meet the stunting target, 30 for wasting, 31 for overweight, and 20 for exclusive breastfeeding. The figures highlight the lack of frequent data to make robust assessments of progress, and a lack of evidence on how interventions can integrate and work best to tackle multiple burdens of malnutrition.

The 2017 GNR will highlight a number of key research gaps which need to be filled, from adolescent nutrition to 'double duty' actions which tackle malnutrition and other development challenges simultaneously. In this symposium, Professor Jessica Fanzo will give a preview of some of the findings of the 2017 GNR, and how research can help countries accelerate progress and ensure accountability towards the SDGs – and improved nutrition outcomes.

Keywords: SDGs, double duty, burdens of malnutrition, accountability

SCALING UP, SUSTAINING, AND SPINNING OFF: ALIVE & THRIVE'S LESSONS ON INFANT AND YOUNG CHILD FEEDING IN THREE COUNTRIES, AND IMPLICATIONS FOR BEYOND

IMPACT: INTERVENTION RESULTS FROM ALIVE & THRIVE

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An evidence-based package of maternal, infant and young child nutrition (MIYCN) interventions can contribute to optimal maternal and child nutrition and long-term human capital benefits. Several MIYCN interventions recommended for global scale-up are dependent on successful behavior change to strengthen dietary practices and support the use of supplements. Although evidence exists that behavior change interventions (BCI) using interpersonal communications (IPC) work, lessons on effectiveness at large-scale are limited. In a set of impact and process evaluations of large-scale BCI that included IPC, mass media (MM) and policy advocacy (PA) in Bangladesh, Viet Nam, and Ethiopia, we examined impact on breastfeeding and complementary feeding practices (in all three countries) and maternal nutrition behaviors (in Bangladesh).

We used cluster-randomized impact evaluations in Bangladesh and Viet Nam, and a before-after adequacy evaluation design in Ethiopia. All evaluations used repeated cross-sectional surveys of women with children in the appropriate age-group for the results examined (0-6 months, 6-23 months). Statistical analyses examined differences in change over time between intervention and comparison areas, adjusting for clustering and confounders (as needed).

Intervention impacts on infant feeding were predominantly positive in all three countries. In Bangladesh, impacts were seen on breastfeeding and complementary feeding practices (exclusive breastfeeding, dietary diversity and minimum acceptable diet). In Vietnam, impacts were seen on breastfeeding practices (exclusive breastfeeding). In Ethiopia, although the adequacy evaluation design limits attribution, positive change was seen in several behaviors. The maternal nutrition study in Bangladesh found significant impacts on a range of maternal nutrition behaviors, including uptake of supplements and dietary diversity.

The type of delivery platform used for the IPC was related to the achieved exposure to interventions among client populations. Exposure was high in Bangladesh for the IYCF support interventions and the maternal nutrition interventions; both used a large-scale non-governmental outreach platform that included nutrition-focused workers. In Vietnam, where the delivery plat-

form was through government health facilities that clients had to access, exposure was moderate. In Ethiopia, exposure was lower given delivery through a government health system platform and multipurpose health workers.

Analyses of behaviour uptake in intervention areas in Bangladesh and Vietnam showed that Caesarian-section births, lack of breastfeeding support at birth, and poor knowledge were associated with lower early initiation of breastfeeding. Return to work before the child was 6 months old and maternal stress were associated with lower EBF in Vietnam; in both countries, low maternal knowledge made EBF less likely. In Bangladesh, babies of mothers in the lowest tertile of SES were less likely to achieve minimum dietary diversity.

In conclusion, we demonstrate the feasibility and impact of delivering a set of MIYCN behaviour change interventions in multiple contexts. Our results highlight the range of opportunities and challenges offered by diverse intervention delivery platforms and the contexts for intervention uptake. Looking forward, coupling high quality and large scale BCI interventions with policies and programs that address contextual behaviour-specific constraints can deliver further substantial impact.

Keywords: Program evaluation, behavior change, scaling up, breastfeeding, complementary feeding

ALIVE & THRIVE GENERATION 2: EXPANDING OUR LEARNINGS TO NEW GEOGRAPHIES; NEXT STEPS AND SUSTAINABILITY

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Delivering Maternal, Infant and Young Child (MIYCN) solutions sustainably and on a large scale remains a challenge. High intensity, short duration programs result in fewer lives saved than efforts that build MIYCN capacity and strengthen systems. Embedding programs and critical services within government policy and regulatory guidelines has been effective across development sectors, including MIYCN. Phase 1 (2009-2014) of A&T was designed as a proof of concept to illustrate whether infant feeding practices could be changed at scale, with sustainability incorporated to varying degrees. In phase 2, one of the key learning objectives was to gain a better understanding of the extent to which programs and behaviors are sustained after grant funding ends. A sustainability assessment is examining the determinants of phase 1 program sustainability in Bangladesh and Viet Nam. These determinants may be related to program activities or approaches A&T used during phase 1 operations, or the result of organizational or contextual factors. We will share preliminary results from these assessments. We will share implications on our current and future efforts.

Keywords: Sustainability, behavior change, replication, breastfeeding, complementary feeding

Track 4: Nutrition and Management of Diseases

PREVENTION OF TYPE-2 DIABETES IN OVERWEIGHT AND OBESE SUBJECTS. ACHIEVEMENTS AND RESULTS FROM THE LARGE EU-PROJECT, PREVIEW

THE PREVIEW INTERVENTION STUDY-PRELIMINARY RESULTS FROM > 2,000 SUBJECTS ON BODY WEIGHT AND RISK FACTORS FOR TYPE-2 DIABETES

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Type-2 diabetes (T2D) is one of the fastest growing chronic diseases worldwide. The relative risk of T2D rises exponentially with increasing body mass index (BMI) and people with diabetes have a 2-4 times higher risk of dying from heart disease compared to non-diabetics. Previous diabetes prevention studies have mainly used the officially recommend diet. However, the FP6 EU project "DiOGenes" showed that participants assigned to an ad libitum diet with higher protein and lower glycemic index (GI) had a significantly better weight maintenance and completion rate after an 8 weeks weight loss diet compared with the official dietary guidelines. Whether such a diet is also efficient in diabetes prevention has not yet been investigated.

The main objective of PREVIEW (PREVention of diabetes through lifestyle Intervention and population studies in Europe and around the World) is to determine if a high-protein, low-glycaemic index (GI) diet in combination with moderate or high intensity physical activity can prevent the development of type-2 diabetes in pre-diabetic, overweight individuals, compared with a moderate protein and GI diet. Furthermore, the interaction with the lifestyle factors, habitual stress and sleeping pattern as well as behavioural, environmental, cultural, and socioeconomic variables is also investigated.

The objectives are achieved from two lines of evidence: 1) A worldwide, multicentre, 3-y randomised controlled trial (RCT) in 2,500 overweight and obese pre-diabetic participants from 9 intervention centres and

2) Longitudinal population studies using data from 5 different cohorts (about 130,000 subjects). The RCT in adults starts with an 8-wk weight loss phase (Cambridge Weight Plan®) followed by a 4-arm weight maintenance phase.

In the randomized controlled trial 2,326 adults (2/3 women) were eligible after pre-screening > 15,600 and screening > 5,400 volunteers over a period of 1.5 years. A total of 1,856 (80%) participants completed the weight loss phase successfully ($\geq$ 8% weight loss). Mean (+/-SE) body weight decreased by 10.7 $\pm$ 0.4 kg (~11%), fasting glucose by 0.4 $\pm$ 0.1 mmol/L, HbA1c by 2.1 $\pm$ 0.2 mmol/

mol, and insulin by 4.5 ± 0.4 mU/L (p< 0.001). Based on fasting glucose >1/3 were no longer pre-diabetic after the weight loss phase. After 1.5 years of ad libitum diet and exercise programs, preliminary data analyses showed that weight loss was still ~10% of initial body weight (completer analyses, n ≈ 1,200).

The project is still in its active phase. In the RCT, large decreases in body weight, glucose and insulin were seen after the initial 8 wk weight loss. In those still participating after 1.5 y, weight loss was well maintained. The effect of changing protein, GI and exercise in the RCT will be disclosed when the 3 year intervention has been completed. The first results on sleep and stress from the RCT, as well as main analyses from the population studies are presented in the other PREVIEW conference abstracts.

Keywords: Weight loss, diabetes prevention, diet, exercise

Conflict of Interest disclosure: JBM is President of the not-for-profit Glycemic Index Foundation, director of a GI testing service and author of books about the GI.

THE PREVIEW POPULATION STUDIES: ROLE OF LIFESTYLE FACTORS (EG PROTEIN, GLYCEMIC INDEX) IN RELATION TO PRE-DIABETES AND DIABETES RISK

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Diabetes mellitus is one of the most common emerging diseases of the 21st century. A healthy lifestyle, including diet, physical activity and sleep, is a factor in a type 2-diabetes (T2D) prevention strategy. Within the PREVention of diabetes through lifestyle Intervention and population studies in Europe and around the World (PREVIEW) project, we studied cross-sectional and prospective associations between lifestyle factors and diabetes in five population studies.

From the Lifelines Cohort study (Netherlands), NQplus study (Netherlands), Cardiovascular Risk in Young Finns Study (YFS; Finland), New Zealand Adult Nutrition Survey 2008/09 (NZANS), and the Quebec Family Study (QFS; Canada), data of about 130,000 subjects were included. Follow-up information was available for almost 71,000 subjects. Diabetes at baseline and follow-up was ascertained using fasting glucose, HbA1c, and self-reported diagnosis or medication use. Dietary intake was assessed with food frequency questionnaires, 24-hour dietary recall, or a 3-day dietary record. Physical activity and sleep duration were assessed with a self-reported questionnaire or a 3-day activity record. Prevalence and Incidence Ratios (PR and IR) were estimated for abnormal glucose tolerance (AGT; pre-diabetes and diabetes combined) and diabetes by Cox regression. Risk estimates were pooled using random-effects meta-analysis. Multiple adjustments were made for energy, age, sex, education, medical history, and other lifestyle factors.

A higher energy-adjusted total protein intake (g/day) was associated with a higher prevalence of diabetes: pooled PR of 1-STD increase 1.39 (95%CI 1.15, 1.67). Total protein was also prospectively related to a higher risk of diabetes: pooled IR from four population studies for 1-STD increase was 1.13 (95%CI 1.05, 1.21). Total protein was not associated with AGT. Additional adjustment for BMI and waist attenuated the associations. A 1-STD higher GI was not related to diabetes prevalence, but to a higher diabetes incidence; pooled IR was 1.06 (95% CI 1.02-1.10). A 1-STD higher GL was associated with a lower diabetes prevalence, pooled PR was 0.53 (95% CI 0.35, 0.81), but not with AGT prevalence. Also, the protective association between GL and diabetes did not persist in the prospective analyses. Furthermore, higher levels of moderate and intense physical activity and a longer sleep duration were associated with a lower risk of diabetes.

These analyses of five global population studies, comprising >125,000 participants, showed that a higher protein intake was weakly related to a higher diabetes prevalence and incidence. High GI was related to diabetes incidence. Higher levels of physical activity as well as a longer sleep duration were related to a lower diabetes risk, independent of energy intake.

Keywords: Diet, protein, glycemic index, physical activity, sleep, pre-diabetes, diabetes

Conflict of Interest disclosure: JBM is President of the Glycemic Index Foundation, a not-for-profit food endorsement program, manager of a GI testing service at the University of Sydney, and the co-author of books about the glycaemic index of foods. All other authors declare no conflicts of interest.

THE ROLE OF SLEEP AND FOOD REWARD IN PREVENTION OF INSULIN RESISTANCE IN PRE–DIABETIC OVERWEIGHT SUBJECTS – RESULTS FROM THE PREVIEW INTERVENTION STUDY

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Lifestyle factors such as sleep, stress, diet and its rewarding value, and physical activity have been shown to be associated with insulin sensitivity. Within PREVIEW, the role of these factors in prevention of insulin resistance is being assessed. At baseline, i.e. Clinical Investigation Day 1 (CID1) the number of adult subjects was 2,224; mean (±SD) age was 51.6±11.6 years, BMI 35.3±6.5 kg/m. After weight loss, at CID2, their number was 1,856; BMI 31.40 ± 6.0 kg/m, and at CID3, six months after the start, their number was 1,571 BMI 30,67 ± 5,52 kg/m. Insulin resistance assessed by HOMA-IR (HOmeostasis Model Assessment; estimated Insulin Resistance) was determined as 3,75±2,43 at CID1, 2,27±1,61 at CID2, and 2,28±1,32 at CID3. At baseline, no associations with sleep assessment (Epworth Sleepiness Scale (ESS) and the Pittsburgh Sleep Quality Index (PSQI)), or with chronic stress perception (Perceived Stress Scale (PSS) were observed. Insulin resistance was related to perception of fatigue in women and vigour in men (Profile of Mood Status), possibly representing limited substrate availability, thus limiting glucose availability in the cells. The impact of insulin resistance, weight status, and lifestyle factors to brain reward activation in response to visual food cues was investigated in a sub-population of the PREVIEW study, at baseline. In 39 obese, pre-diabetic subjects (m22/f17; BMI: 32.3±0.6 kg/m2; fasting glucose: 6.3±0.1 mmol/l; fasting insulin: 13.6±1.0 mU/l; HOMA-IR: 3.9± 0.3) brain reward activity was assessed by functional magnetic resonance imaging while viewing randomized blocks of food and non-food images. Brain activation (food vs non-food) was extracted in a priori defined food reward regions-of-interest (ROIs). Contribution of eating behavior (TFEQ), habitual physical activity (Baecke), HOMA-IR, BMI or body fat percentage were determined utilizing multiple regression analysis. In the nucleus accumbens (R2=0.3; p=0.003), insula (R2=0.3; p=0.010), prefrontal cortex (R2=0.3; p=0.015) and putamen (R2=0.2; p=0.034), brain activation was predicted by HOMA-IR, independent of BMI and body fat percentage (P<0.05). Brain activation was inversely related to restraint scores and habitual physical activity in multiple food reward ROIs, after adjusting for HOMA-IR, BMI and body fat percentage (P<0.05). Six months after the start, in the complete group of subjects, at CID3, the increased magnitude of the behavioural factor cognitive restraint TFEQ (F1) contributed significantly to the reduction in insulin resistance, controlled for loss of body weight and body fat, and no further associations between changes in insulin resistance and in sleep, stress, or physical activity scores were observed. In conclusion, individuals with prediabetes showed at baseline, independently of BMI and body fat percentage more activity to food cues in brain reward regions. In addition, independently of insulin resistance, both dietary restraint and habitual physical activity appeared to be associated with decreased reactivity to food cues in brain reward regions. The intervention induced change in insulin resistance after six months was related to the behavioural factor cognitive restraint, independently of loss of body weight and body fat. No further associations between changes in insulin resistance and in sleep, stress, or physical activity scores were observed.

Keywords: Dietary restraint, physical activity, stress, brain signaling.

Conflict of Interest disclosure: JBM is President of the Glycemic Index Foundation, a not-for-profit food endorsement program, manager of a GI testing service at the University of Sydney, and the co-author of books about the glycemic index of foods. We have no further conflict of interest to disclose

HOW STARCH CHANGED OUR GENES: AMY1 COPY NUMBER VARIATION AMONG PEOPLE AT RISK OF DIABETES. A PREVIEW SUB-STUDY

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In humans, but not other primates, the salivary amylase gene (AMY1) shows remarkable variation in copy number. Like lactase enzyme persistence, it represents one of the best examples of gene expression adaptation due to diet during human evolution. Populations with traditionally low starch diets show lower average AMY1 CN compared to populations consuming starch-rich diets, independent of geographical region or shared ancestry. AMY1 copy number correlates with the amount of salivary alpha-amylase, but beyond this, the phenotypic and physiological significance is uncertain.

To test the hypothesis that AMY1 copy number increases the rate and extent of starch digestion in healthy subjects and influences risk factors for obesity and diabetes.

We used real-time quantitative PCR with AMY1-specific primers to estimate AMY1 copy number in 201 healthy individuals and

160 overweight and obese participants with pre-diabetes in the Sydney-based cohort of the PREVIEW intervention study.

Copy number (CN) varied from 1 – 16 copies (mean ± SD = 6.5 ± 2.6) in the healthy cohort, correlating positively with salivary amylase activity (r = 0.62, p < 0.0001) but not with BMI, glucose tolerance or insulin sensitivity. In individuals with pre-diabetes, mean CN was higher (7.4 ± 2.9, p = 0.005) and weakly related to measures of body fat. In a pool of 114 healthy individuals with the full range of variation, CN was a strong predictor of normalized glycemic responses to potato (n = 45, r = 0.78, p = 0.0001), white bread (n = 98, r = 0.67, p = 0.0001), rice (n = 56, r = 0.66, p = 0.0001), rolled oats (n = 42, r = 0.63, p = 0.0001), pasta (n = 95, r = 0.51, p = 0.0001) and a mixed meal (n = 24, r = 0.60, p = 0.0021), explaining 26-61% of the inter-individual variation in glycaemia. In contrast, CN was not significantly related to normalized glycemic responses to sucrose (table sugar, n = 60, r = 0.08, p = 0.54) or fruit (n = 29, r = 0.20, p = 0.30). Using genotype-based recall, healthy individuals in the highest vs lowest decile of CN produced modestly higher glycaemia (+15%) and substantially higher peak insulin responses (+38%) to starchy foods, suggesting earlier first phase insulin secretion. In the fasting state and in response to meals of white rice, with and without resistant starch, low CN individuals with and without pre-diabetes displayed 6-fold higher breath methane levels than high CN individuals (n = 30, p = 0.001) but similar levels of hydrogen.

Taken together, the findings imply that the ability to digest starch faster and more completely was a strong selective force during human evolution, with relevance to the risk of diabetes and obesity today. The distinct differences in breath methane in those with low vs high CN imply not only differences in the amount of carbohydrate reaching the large bowel, but also in the microbiome itself.

Keywords: AMY1 gene, starch digestion, diabetes, obesity.

Conflict of Interest disclosure: JBM and FA are directors of not-for-profit Glycemic Index Foundation, a GI testing service at the University of Sydney, and co-authors of books about the GI.

Further collaborators: Dale Hancock (University of Sydney AU), Anne Raben (University of Copenhagen, DK).

EXPLOITING PREVIEW FINDINGS: A FOOD INDUSTRY PERSPECTIVE

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Dissemination and exploitation of the findings of PREVIEW is the focus of a specific work package within the EU-funded PREVIEW project. Previous diabetes prevention studies have proven that type 2 diabetes can be prevented or delayed by lifestyle interventions that focus on diet, exercise and weight loss. However, the composition of the optimal diet for maintenance of weight loss is still debated. The PREVIEW project will determine whether a modestly higher protein-lower glycemic index (GI) improves weight maintenance compared with official dietary guidelines. The findings will have important implications for the food industry.

To communicate and exploit the findings of PREVIEW in order to convert new knowledge into socio-economic benefits, including more effective strategies in public health, products and services that reduce the risk of obesity and type 2 diabetes. A sub-objective is to secure and manage the transfer of exploitable knowledge and intellectual property generated by PREVIEW to the food industry and service providers in the area of health and diet.

PREVIEW's research programme is highly likely to produce outcomes which have the potential for commercial exploitation. This is especially true for the food industry and manufacturers, but also for other sectors delivering services and policies which can aim to treat and prevent overweight and obesity, and type-2 diabetes in people at risk. We have established a pro-active approach to identifying exploitable outputs, including training in basic IPR principles and creation of a patent advisory group. License agreements will be managed by the Consortium when the findings of the intervention study become available in the middle of 2018.

Potential agreements based on the work and findings of PREViEW include 1) professional software incorporating an international glycaemic index and glycaemic load database, 2) lifestyle change manuals for health professionals with new tools to reduce weight re-gain, 3) online weight loss and diabetes prevention programs, 4) identification of novel biomarkers (genomic/proteomic/metabolomics) to predict weight loss and improved insulin sensitivity taking into account the genetic and environmental background 5) identification of novel food ingredient systems to induce satiety without adverse sensory effects, 6) tools to randomise study participants into 2 or more study groups and 7) cookbooks based on different diet compositions.

Commercial slimming companies, weight loss providers, diabetes-suitable home delivery meal providers, members of the food industry, including food and health ingredient companies, food retailers, supermarkets, food and agriculture organisations, policy makers and obesity-related non-government organisations, individual scientists and their IPR advisors, are encouraged to investigate exploitable outcomes of the PREVIEW project.

PREVIEW (www.previewstudy.com) (2013-2018) is funded by EU FP7 grant # 312057 and national funds in NZ, AUS, and CAN. The Cambridge Weight Plan® generously donated the formula diets for all centres.

Keywords: Weight loss, diabetes prevention, obesity, diet, exercise

Conflict of Interest disclosure: JBM is President of not-for-profit Glycemic Index Foundation, director of a GI testing service at the University of Sydney, and co-author of books about the GI.

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MOODFOOD: PREVENTING DEPRESSION THROUGH FOOD

INFLAMMATORY DIETARY PATTERNS AND DEPRESSIVE SYMPTOMS IN ITALIAN OLDER ADULTS

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Background: Older adults are more susceptible to higher inflammatory levels and depression. Moreover, diet may influence inflammation as well as depression but no previous study examined whether inflammatory dietary patterns are related to depression in an older population. Objective: To investigate the longitudinal association between inflammatory dietary patterns (using reduced rank regression (RRR)) and depressive symptoms in Italian older adults. Methods: We included 827 participants (aged ≥65 years) at baseline in 1998. Follow-up measurements were collected after 3, 6 and 9 years. We used RRR to identify inflammatory dietary patterns at baseline. The Centre for Epidemiologic Studies Depression (CES-D) scale was used to assess depressive symptoms by using continuous scores and depression by using a cut-off point (CES-D ≥20). Results: We identified two inflammatory dietary patterns using different sets of response variables. Dietary pattern I was related to inflammatory markers C-reactive protein (CRP), interleukin (IL)-6, tumor necrosis factor α and was characterized by high intakes of refined grains, sweet snacks, pasta and rice. After full adjustment for confounders, no longitudinal association was found when comparing extreme quartiles of this dietary pattern and depressive symptoms (Q1 vs Q4, model 4: B=0.01, 95% CI: -0.06, 0.08) or depression (Q1 vs Q4, model 4: OR= 0.89, 95% CI: 0.59, 1.36). Dietary pattern II was related to inflammatory markers CRP, IL-18, IL-1β, IL-1 receptor antagonist and was characterized by high intakes of pasta, sugar-sweetened beverages, processed meat and chocolate and sweets. When comparing extreme quartiles, this dietary pattern was not longitudinally associated with depressive symptoms (Q1 vs Q4, model 4: B= -0.04, 95% CI: -0.10, 0.03) but an inverse association was found for depression (Q1 vs Q4, model 4: OR= 0.63, 95% CI: 0.40, 0.98). Conclusion: Our study does not support the hypothesis that dietary patterns linked to inflammatory markers are associated with higher depressive symptoms and higher depression incidence. However, dietary intake in our population of older adults was quite homogeneous which makes it difficult to show clear associations.

Keywords: Inflammatory dietary patterns, inflammation, reduced rank regression, depressive symptoms, older adults

Conflict of Interest disclosure: The analyses of the present study were entirely independent, with no industry association. None of the authors had a conflict of interest.

ROLE OF SUGAR INTAKE IN THE PREVENTION OF DEPRESSION: PROSPECTIVE FINDINGS FROM THE WHITEHALL II COHORT STUDY

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Reduction of sugar intake has become a key target in public health action across the world. Overconsumption of sweet food, sugar-sweetened drinks and added sugars has been linked with depressive symptoms in several populations. It remains unclear whether this association is causal. Such evidence is needed to support interventions to prevent disease.

The aim of this study is to investigate cross-sectional and prospective associations of sugar intake from sweet food/beverages with common mental disorder (CMD) and depression, and to examine the role of the reverse effect, of CMD on sugar intake, for the observed association.

We analysed repeated measures (23,245 person-observations) from the Whitehall II cohort study. Prospective analysis included 2-, 5- and 10-year follow-up periods. CMD was measured with the 30-item General Health Questionnaire and depression with the Center for Epidemiologic Studies Depression scale. Clinical depression was assessed once with the Revised Clinical Interview Schedule. Dietary assessment was based on food frequency questionnaires. We modelled associations using random effects regression.

Direct cross-sectional associations were confirmed. Prospective analyses revealed a direct association of sugar intake from sweet food/beverages with incident CMD in men and with recurrent depression for both sexes. Men in the highest tertile of sugar intake had increased odds of incident CMD after 5 years (OR=1.24; 95% CI: 1.02, 1.48) after multiple adjustment including adiposity. Odds of recurrent depression were increased when sugar intake from sweet food/beverages was modelled continuously (per 30g per day

increment, OR 1.18; 95% CI 1.01, 1.37) but not when analysed in thirds of intake. Notably, neither CMD nor depression predicted changes in sugar intake from sweet food/beverages.

An adverse effect of sugar intake from sweet food/beverages on long-term psychological health was confirmed in repeated measures follow-up data over 22 years in men and women. Our findings suggest public health interventions which promote reduced sugar intake could support primary and secondary prevention of mood disorders.

Keywords: Mood disorder; Depression; sugar; diet; cohort studies

Further collaborators

LONGITUDINAL ASSOCIATIONS BETWEEN VITAMIN D STATUS AND DEPRESSIVE SYMPTOMS IN OLDER ADULTS

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Depressive symptoms and low vitamin D status are common in older persons and may be associated, but findings are inconsistent. More prospective studies on the association between vitamin D status and depression are needed, as well as studies that use multiple intra-individual 25-hydroxyvitamin D (25(OH)D) measurements.

We investigated associations of serum 25(OH)D concentrations with the severity (cross-sectionally) and course (prospectively) of depressive symptoms in Dutch older adults. Furthermore, we investigated whether changes in 25(OH)D over time are associated with parallel changes in depressive symptoms.

In the Longitudinal Aging Study Amsterdam, serum 25(OH)D concentrations were determined at baseline in an older cohort in 1995/1996 (≥65 years, n=1282) and in a younger cohort in 2002/2003 (55-65 years, n=737). Depressive symptoms were measured at baseline, after three and after six years with the Center of Epidemiological Studies Depression scale (CES-D). Linear regression and linear mixed models analyses were used to examine the cross-sectional and prospective associations, respectively, between baseline 25(OH)D and depressive symptoms. Serum 25(OH)D and depressive symptoms were also measured 13 years after baseline in the older cohort (n=173) and 6 years after baseline in the younger cohort (n=450). Associations between change in 25(OH)D and change in CES-D score were analysed by linear regression analyses. All analyses were adjusted for relevant confounders, and effect modification by sex and baseline 25(OH)D was examined.

Cross-sectionally, associations between 25(OH)D and depressive symptoms were not statistically significant. Prospectively, women in the older cohort with baseline 25(OH)D concentrations up to 75 nmol/l experienced 17-26% more depressive symptoms in the following six years, compared to women with 25(OH)D concentrations >75 nmol/l (P=0.01 to 0.06). In older men and in the younger cohort, no significant associations were observed. In participants with two 25(OH)D measurements, serum 25(OH)D increased during follow-up in 32.4% of the older cohort and in 69.8% of the younger cohort. Change in 25(OH)D was not significantly associated with change in CES-D score in the older cohort or in participants of the younger cohort with higher baseline 25(OH)D concentrations (>58.6 nmol/l). However, in persons with lower baseline 25(OH)D concentrations, an increase in 25(OH)D was associated with a decrease in CES-D score (adjusted B: -0.62, 95% CI: -1.17, -0.07, P=0.028).

Older women showed an inverse relationship between serum 25(OH)D and depressive symptoms over time. In addition, an increase in serum 25(OH)D over six years was associated with a small decrease in depressive symptoms in young older adults with lower baseline 25(OH)D.

Keywords: Serum 25-hydroxyvitamin D, depression, intra-individual change, elderly, cohort study

Conflict of Interest disclosure: The analyses of the present study were entirely independent, with no industry association. None of the authors had a conflict of interest.

THE LINK BETWEEN MINDFUL EATING AND DE-PRESSIVE SYMPTOMS AND POSSIBLE UNDERLY-ING MECHANISMS

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Mindful eating is eating with attention and awareness. Mindful eating might be related to depression, both directly and indirectly. Possible underlying mechanisms are obesity-related eating styles.

Objective. To examine associations of mindful eating domains with depressive symptoms and depression cross-sectionally, and to examine whether eating styles (emotional, external and restrained eating) are mediating variables in these associations.

Data were collected in Denmark (n=1522), Spain (n=1512) and the Netherlands (n=1439) as part of the MooDFOOD project. The four mindful eating domains were measured by the Mindful Eating Behaviour Scale. Depressive symptoms was defined as the continuous score on the Center for Epidemiological Studies Depression Scale (CES-D) and depression as scoring above the clinically relevant cut-off score on the CES-D and/or current use of antidepressants and/or current psychological treatment. Eating styles were measured using the Dutch Eating Behaviour Questionnaire (DEBQ). Multiple linear and logistic regression analyses were used to test the associations of the mindful eating domains with depressive symptoms and depression for the three countries separately. Furthermore, in the Dutch sample, multiple mediation of the eating styles was tested with bias-corrected bootstrap confidence intervals using the Process macro of Hayes. All analyses were adjusted for socio-demographic characteristics and lifestyle factors.

The domains Focused Eating, Eating with Awareness and Eating without Distraction were all significantly negatively associated with depressive symptoms and depression in all three countries (e.g. Focused Eating Denmark: B=-0.71, 95%CI: -0.87, -0.54 and OR=0.89, 95%CI: 0.86, 0.93). Hunger and Satiety Cues (only measured in the Netherlands) was significantly positively associated with depressive symptoms (B=0.09, 95%CI: 0.02, 0.16), but not with depression (OR=1.01, 95%CI: 0.98, 1.05). No mediation by the eating styles was found for Hunger and Satiety Cues. Emotional eating was a mediator in the associations of Focused Eating, Eating with Awareness and Eating without Distraction with depression (e.g. Eating with Awareness: B=-0.03 (SE=0.01), 95%CI: -0.06, -0.008).

The results indicate that higher scores on three mindful eating domains are consistently associated with lower levels of depressive symptoms and a lower likelihood of having depression in three European countries. Emotional eating was found to be a mediator in the associations between these three mindful eating domains and depression. Mindful eating may benefit people's mental well-being both directly and indirectly through emotional eating.

Keywords: Mindful eating; depression; eating styles; emotional eating; European countries.

Conflict of Interest disclosure: Tatjana van Strien has a copyright and royalty interest in the Dutch Eating Behavior Questionnaire (DEBQ) and manual. There are no other conflicts of interest.

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BARIATRIC AND METABOLIC SURGERY. STRATEGIES FOR SUCCESS: AN INTEGRATED APPROACH TO OBESITY AND T2DM PATIENT MANAGEMENT

BARIATRIC AND METABOLIC SURGERY. STRATEGIES FOR SUCCESS: AN INTEGRATED APPROACH TO OBESITY AND T2DM PATIENT MANAGEMENT

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The alarming escalation in the incidence of obesity and diabetes presents significant challenges for healthcare practitioners, health systems, payer groups, and the government, not to mention the impact on the health of the individual. The epidemic increases in both of these chronic conditions requires the replacement of reactive management strategies that employ extreme diets, diets that do not work, minimalist pharmacologic support, and delayed or lack of implementation of bariatric surgery in patients who require it, with more proactive and assertive efforts that focus on the achievement of a new lifestyle to obtein weight management and in this way achieve glycemic targets, blood pressure and lipids control, cardiovascular risk reduction, and the multiple proven benefits of weight loss on health, including of course improvement in quality of life.

As healthcare practitioners, we should provide individualized and integrated medical care, assess therapeutic effectiveness, and provide the best options for each patient. We are challenged to stay current with the escalating volume of new therapies, devices, and lifestyle recommendations and to understand the nuances of treatment strategies while balancing the realities of the world within which we practice.

The approaches in which it is performed only recommendations result in very limited weight loss, which may frustrate both patients and their physicians. Healthcare practices must become more assertive, replacing generic directives to patients such as "eat less" and "exercise more" with more progressive interventions that combine lifestyle modifications, risk evaluation, risk reduction, and disease prevention, while attending to disease management. The morbidity associated with obesity, and the close association of obesity with diabetes and cardiovascular disease, necessitates the development and implementation of integrated treatment strategies.

The cornerstone for the treatment of an obese patient is an intervention with interdisciplinary strategies that involve multiple components, to achieve a better integral lifestyle. Within the treatment options available for obesity and type 2 diabetes, with the evidence currently available, bariatric surgery should be present.

Today we know that it is not about medical treatment versus surgery: the evidence shows that it is about medical treatment plus surgical treatment. Even in the field of metabolic surgery, today we talk about surgery more drugs for diabetes and not surgery to stop taking drugs for diabetes.

In patients with moderate obesity associated with comorbidities or morbid obesity, bariatric surgery is the only available therapeutic modality associated with clinically significant and relatively sustained weight loss. Well-performed bariatric surgery, in carefully selected patients and with a good multidisciplinary support team, substantially ameliorates the morbidities associated with obesity.

The use of bariatric surgery in the clinical management of type 2 diabetes in obese subjects has been included in the clinical practice recommendations released by the most influential diabetologic associations. However, the timing during the diabetic course in which this use may have the better benefit/risk ratio remains debated. Today we know that is better to use surgery very early in the course of the disease in order to anticipate clinical deterioration.

Keywords: Obesity ; type 2 Diabetes; Medical management; Bariatric Surgery; Metabolic surgery

FROM BARIATRIC TO METABOLIC SURGERY. DEFINITION OF A NEW DISCIPLINE

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It is well known the impact of bariatric surgery as the best treatment in morbid obese patients. These results and the increase of the epidemic did this procedure as one of the most common surgery worldwide. The obesity surgery beyond its effect on weight loss has entailed a change in the way of regarding it. But, success was defined only by excess weight loss. In spite of were reported others markers of resolutions of metabolic comorbidities, they were relegated to a secondary place. Meanwhile, type 2 Diabetes is accepted as a global world health crisis. Diabetes is one of the most common major diseases that impact the health, quality of life, costs, and survival of obese persons. Besides, several commu-

nications have reported that regardless of body mass index (BMI), complete or partial remission of type 2 diabetes mellitus (T2DM) is possible. Because of this, The American Diabetes Association's (ADA) Standards of Medical Care in Diabetes 2009 states, "Bariatric surgery should be considered for adults with BMI 35 kg/m2 and type 2 diabetes, especially whether the diabetes is difficult to control with lifestyle and pharmacologic therapy." This was the first time the ADA declared bariatric surgery as a treatment option that should be considered for a population of diabetic patients. The metabolic surgery effect over metabolic syndrome, mostly occur before weight loss, positioning metabolic surgery as a good tool for controlling the current T2DM epidemic. The term "metabolic surgery" has become more popular to designate those interventions focused mainly at resolving diseases as diabetes and not specifically weight loss. Metabolic surgery has been proven to be safe and effective. And, it is unquestionable that a new discipline has been founded. Metabolic surgery can effectively treat T2DM in individuals with any BMI, including that below 35 kg/m2. In patients with type 2 diabetes and obesity, metabolic surgery has a greater role in metabolic improvement, beyond the weight loss obtained. It is necessary to understand the objectives of each Surgery to indicate in each patient the best Surgery available.

Keywords: Obisity; Type 2 diabetes; Bariatric surgery; Metabolic Surgery

WHICH IS THE BEST TECHNIQUE FOR YOUR PATIENT?

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Metabolic surgery is a very efficient option to treat uncontrolled T2D patients in spite of the best medical treatment. The Diabetes Surgery Summitt 2, held in 2015, with the support from over 50 medical Societies worldwide did put gastrointestinal surgery in the algorithm for the treatment of T2D in patients with BMI from 30 kg/m2 and over. Among the surgical options, the Roux-en-Y gastric bypass (RYGB) has the best risk profile, with better-known mechanisms of action and good long term outcomes regarding weight loss and T2D control. The sleeve gastrectomy may be an option, but it carries a non-optimal weight and glycemic control in long term (10 years)prospective and randomized controlled trials with up to 5 years, besides the ongoing risk of gastroesophageal reflux and even Barret's esophagus. In uncontrolled T2D, it may be indicated when there is any RYGB contraindication. The malabsorptive operations have unquestionably better outcomes, glycemic and weight loss, but carry ongoing risks of malnutrition and its undesirable consequences. Currently, RYGB offers a safe, better known and powerful tool for obese patients with uncontrolled T2D.

Keywords: Roux-en-Y gastric bypass; metabolic surgery; type 2 diabetes

PS_144/123

BUILDING CAPACITY TO PREVENT AND TREAT MALNUTRITION

EXPERIENCE OF THE NEEP PROJECT IN GUATEMALA AND EL SALVADOR

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Severe Acute Malnutrition has a low prevalence among under 5 population in Central America; Guatemala has 0.7% and El Salvador 2%. Important nutrition-health politics have been implemented in the past years. Guatemala, the growth child survey system implemented in 2009 is capable of screening, assessing and treat, in the community, moderate acute malnourished children reducing inpatient treatment needs. El Salvador´s Health System improved overall health access decreasing stunting rate 13 percental points.

In this scenario, SAM treatment has dropped its importance, building skills in health personnel is out of sight; but for those that work with the poorest population is a necessity missed by the in-service and pre-service trainers. The aim of the project was to identify if the Malnutrition eLearning course could cover this training gap among health professionals and improve the quality of treatment of SAM children.

Nutrition Embedding Evaluation Program (NEEP), PATH supported a Malnutrition eLearning course evaluation in Guatemala, El Salvador, Ghana and online from overall world. We will describe Central America´s results. Using a mixed methods, evaluation was conducted for existing users and for new users and trainers. Online Malnutrition eLearning course is in English, contents include 3 units about screening, assessing, managing malnutrition

Phase 1

Participants were former users in Guatemala students and professionals. Online questionnaires, interviews and Focus groups were conducted.

Phase 2 new users

We enrolled 143 participants from 6 institutions: Rafael Landivar University, Nutrition Degree in Guatemala and Quetzaltenango; Juan Pablo II Hospital (paediatricians); Guatemala´s Health Ministry Nutritionist; University Evangelica de El Salvador (nutritionist); Hospital Nacional Zacamil (paediatricians). In June 2015 pre-test, questionnaires, focus groups, medical records (one year before) and hospital observations. eLearning was done in September to comply with the programme contents, post intervention evaluation was in October. 21 trainers were selected from institutional survey for a workshop where they made an action plan to implement the course.

A post-6-months test was conducted to verify knowledge gain in longer term. 6 and 12 months' interviews, focus groups and questionnaires were conducted for individuals and for the hospital's medical records and observations.

We had 47 participants, pre-test scores average percentage was 16.83 and post-test were 28.62. Despite the significant change, scores were low, but all the sample reported Language barrier as main reason they were not able to answer properly. Participants that reported skills gain compare course contents to national SAM managing guidelines while eLearning. Implementing the course with credit gains was more successful than the ones that didn´t, learning in English resulted a double burden. For Guatemala, course represented the technical background, that few had, for implementing the national SAM treating guidelines. At the 6 and 12 months' follow-up participants reported they use course contents in their daily work, particularly the assessment and 10 steps.

We generated two needs in SAM control: a tool to support science and technical background in managing SAM children available online for all health workers, and the need of Malnutrition eLearning course in Spanish.

Keywords: Malnutrition, eLearning, prevention, control, training

Further collaborators: As part of the International Malnutrition Task Force we will continue efforts for capacity building in malnutrition assessment, screening, managing, promotion and prevention. The next step is to translate course to Spanish.

PS_144/115

LOW-CALORIE SWEETENERS – UPDATE ON HEALTH & SAFETY

LOW-CALORIE SWEETENERS AND WEIGHT – A SYSTEMATIC REVIEW OF HUMAN AND ANIMAL STUDIES

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The major potential benefits for public health of low-calorie sweeteners (LCS) are a reduction in sugar intake and consequent reduction in overweight and obesity. However, the usefulness of LCS for weight management has been challenged on several grounds. First, there is the possibility that food intake increases to compensate for the energy dilution achieved with LCS, second is the suggestion that LCS weaken the relationship between sweet taste and food energy content and thereby disrupt the learned control of appetite, and third is the argument that exposure to sweetness increases desire for sweetness which escalates sweet food intake. There is partial but, importantly, not full energy intake compensation after consumption of LCS versus sugar. Separately, results of animal studies used to support the disruption of dietary learning by LCS hypothesis have been demonstrated to be explained by a procedural artefact. In any case, this hypoth-

esis is irrelevant to the human diet because sweetness and sugar content do not reliably predict energy density, even within and across categories of minimally processed foods. In relation to the 'sweet tooth' hypothesis, consumption of LCS versus water has not been found to increase energy intake in the short-term, with other evidence showing a decrease in sweet food intake when a LCS drink is consumed with a meal. The latter is consistent with the phenomenon of 'sensory-specific satiety.' There is rather little evidence on the effects of longer-term exposure to sweetness. In one recent study, consumption of a diet low in sweetness for 3 months increased perceived sweetness intensity of sucrose in a pudding and a drink, but it did not affect rated pleasantness of the same test products. Together, these various results largely refute claims about counterproductive effects of LCS and predict that consumption of LCS in place of (some) sugar in the diet should help reduce overall energy intake and body weight. Recent meta-analyses of intervention studies in adults and children, fully support this prediction. The duration of these studies ranged from 1-40 months. Furthermore, if anything, body weight was lower for LCS drinks compared with water, perhaps because, as suggested above, consumption of LCS may help satisfy the desire for sweetness within a meal. Overall, LCS appear to be helpful for weight management. There are nonetheless obviously limits to the extent to which dietary energy content can be reduced (diluted) by replacing sugar with LCS. These include consumers' current level of free sugars intake and their willingness to consume LCS, and technical constraints on how much sugar can be substituted, especially in foods.

Keywords: Low-calorie sweeteners, sugars, appetite, obesity, weight management.

Conflict of Interest disclosure: Peter Rogers has received funding for research from Sugar Nutrition UK, provided consultancy services for Coca-Cola Great Britain and received speaker's fees from the International Sweeteners Association and the Global Stevia Institute.

NON-CALORIC SWEETENERS AND GLYCEMIC RESPONSE

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Non-caloric artificial sweeteners (NAS) are widely used globally. Since they came on the market, they have generally been considered metabolically inactive and safe with regard to glucose homeostasis by the FDA and other regulatory agencies. Numerous safety trials with the various products in the market have been done through the years and most have shown little impact on glucose levels during both short-term and longer-term trials. However, there have been a few that have reported small alterations in glucose and insulin levels.

Recently, three new important issues have emerged: taste receptors in the gut, the impact of microbiota, and interference with learned ingestive responses.

It is evident now that taste receptors, once thought to reside only in the mouth, are also present in the intestinal lumen. NAS can therefore bind to these receptors and can initiate signals that may be relayed to the blood, brain, pancreas, liver, etc and could modify glucose homeostasis.

The importance of the gut microbiota in modifying the glucose homeostasis of an organism is unclear and is being explored. Most studies to date have been done in rodents generally utilizing high doses of NAS. With these models, perturbations in the microbiota have been shown and an impact on glucose has been reported.

It has been hypothesized that NAS can alter the ability to predict the energy ingested and evoke a learned response that is faulty, leading to metabolic changes in the organism..

The strength of the available evidence base regarding these three potential mechanisms for altering glucose homeostasis will be reviewed and evaluated.

Keywords: Non-caloric sweeteners, glucose homeostasis, microbiota, taste receptors, learner responses

SWEET TASTE AND IMPLICATIONS WITH LOW-CALORIE SWEETENER USE

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The World Health Organisation (WHO) recommends that adults and children reduce their intake of free sugars to less than 10% of the daily energy intake. This recommendation is based on the potential adverse effect of a high intake of sugar on body weight control and metabolic health. If dental health is taken into consideration, then the WHO recommends a further reduction of free sugar intake below 5% of the daily energy intake. Such recommendations are challenging for many individuals and more so in certain parts of the world where the culturally accepted levels of sweetness in the diet are high.

Sweetness is a potent psychobiological stimulus in many animal species, including humans of all ages. Human newborns display an innate attraction to sweet substances, manifested by eager acceptance and a stereotyped gusto-facial reflex of relaxation and smile. Such innate responses present a survival advantage in the context of Natural Selection, facilitating the acceptance of energy and nutrient sources by the young organism. Indeed, the appetite for sweetness is high in infants and children. As it does in other species, the human appetite for sweetness spontaneously decreases during growth. Adults vary largely in their preferred intensity of sweetness in a broad range of beverages and foods. Genetic influences and personal experiences with sweetness shape the adult responses. Cultures as well as individuals show large differences in the consumption of sweet tasting products.

Sugar brings 4 kcalories per gram and it is easy to see how its pleasant taste could stimulate overeating and weight gain, as suggested by the WHO. Observational studies in many countries, however, show little correlation between the body adiposity status and individual liking or consumption of sweet tasting products. Overweight and obese individuals often display an enhanced appetite for dietary fats (that bring 9 kcalories per gram) rather than sugar.

How can a reduction of sugar intake be achieved? Should all sweet tasting substances be limited or can low-calorie sweeteners (LCS) contribute to a decrease in sugar intake (and the associated energy load) while retaining the palatable sweet taste of many favorite foods and drinks? Numerous scientific studies have addressed this issue. Experimental reports confirm that the use of LCS is associated with lower energy and sugar intake in the context of weight loss programs. LCS also facilitate the maintenance of the reduced weight after the end of a diet. Disproving early suggestions that LCS may enhance the natural appetite for sweetness and paradoxically stimulate the consumption of other sweet (sugar-containing) products, experimental trials show that LCS satiate rather than enhance the appetite for sweet tasting products and facilitate the reduction of sugar intake. More research is needed to assess the role of LCS in the management of sweetness appetite over the life span, in the prevention of weight gain, particularly in individuals at risk of overweight and in cultures where the traditional level of sweetness in the diet is high.

Keywords: Sweetness, sugar, low-calorie sweeteners, appetite, satiety

PS_144/1018

STRATEGIES FOR INCORPORATION OF SUITABLE CARBOHYDRATES IN THE PREVENTION OF CHRONIC DISEASES

CARBOHYDRATES AND HEALTH

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Carbohydrates are ubiquitous in nature and fundamental to life. They include grains, legumes, vegetables and fruits; have diverse structures with different functions. This group of macronutrients contributes not only to the nutritional status but also to the pleasure and enjoyment of food. The percentage of carbohydrates established by important nutrition and health institutions varies. It is between 55–75% in the last document published by WHO in 2007. In the case of the Scientific Advisory Committee on Nutrition (UK), it proposed a lower limit of 50%. Finally the Dietary Guidelines for Americans (2015-2030) recommended the same amount as WHO but recommended that half of all carbohydrates be whole grains.

Unfortunately starting in the second half of the 1990s, carbohydrates became "bad". A strong carbophobia was born after a long stage of lipo phobia. Various theories halfway between science and ideology

led this phenomenon. In the first place, there was the high prevalence of dieting caused by the presence of a disease o a simple cultural obsession. Second, it was the insulin theory. Although science has tear down the apparent efficacy in the long term to produce sustainable weight loss, has pointed the hazards inherent to its use and there is strong evidence that de novo lipogenesis under normal conditions is not very relevant in humans, low carb/high protein diets became very popular to lose weight.

Simultaneously, to facilitate the process, it began a demonization process of carbohydrates based erroneously in part, by the confusion generated by dissemination of knowledge about celiac disease.

Fortunately, in the last years, the medical view of carbohydrates is becoming more balanced. The nature of dietary carbohydrates appears to be a more important determinant of health outcomes than the proportion of total energy intake. It began to be emphasized that a high content of dietary fiber is associated with low energy density, promotion of satiety and beneficial influences on the microbiota.

Finally an important pending debt of nutrition science is to redefine what constitutes a healthy diet. We propose it might be sufficient, complete, varied, balanced, adequate, shared, tasty and pleasant, suitable to be adopted as a lifestyle and sustainable for the planet and carbohydrates should be at least, half of it.

Keywords: Carbohydrates, carbophobia, healthy diet, nutrition, low carb/high protein diets

THE COLON MATTERS IN BLOOD SUGAR MANAGEMENT: HOW PREBIOTIC FIBERS CAN WORK IN GUT MICROBIOTA, GLUCOSE METABOLISM AND METABOLIC DISORDERS

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Obesity is characterized by a cluster of metabolic disorders involved in the development of cardiometabolic disorders such as insulin resistance, diabetes, hepatic steatosis and inflammation.

We and others have shown that gut microbes are dialoguing with the host cells via several mechanisms and thereby contribute to the regulation of energy, glucose and lipid homeostasis. Changes in the gut microbiota composition and/or the activity of specific microbes may be obtained by using specific dietary compounds such as prebiotics.

Over the last 20 years, we have contributed to the demonstration that prebiotics such as oligofructose and/or inulin modulate host metabolism in both pre-clinical and clinical studies. Their potential relevance in the management of obesity and related metabolic disturbances will be discussed.

Among the key mechanisms, it has been shown that the production of bioactive compounds (including short-chain fatty acids or lipid metabolites) directly interact with host cellular targets to control energy metabolism and immunity.

For example, prebiotic fibers increase satiety, reduce food intake, fat mass development and improve glucose metabolism. The prebiotic-induced microbiota modulation changes gut peptides involved in appetite regulation, glucose metabolism, energy homeostasis and gut barrier function (e.g., GLP-1, PYY, or GLP-2). Other mechanisms such as metabolic endotoxemia, changes in gut barrier function (e.g., antimicrobial peptides production, mucus layer thickness, immune system) or altered endocannabinoid system tone contribute to reduce inflammation.

Finally, the role of prebiotics on Akkermansia muciniphila, a key bacteria playing a major role upon obesity, diabetes and inflammation, will be discussed.

In conclusion, prebiotic fibers are useful tools with accumulating scientific evidence further supporting their use for human health.

Keywords: Prebiotics, gut microbiota, blood sugar management, obesity management

Conflict of Interest disclosure: Inventors on patent applications dealing with the use of A. muciniphila and its components in the treatment of obesity and related disorders. Consulting/conference fees: Tate & Lyle, Biocodex, Beneo, PileJe Group

CARBOHYDRATE QUALITY MATTERS: THE MEANING OF SLOWLY DIGESTIBLE CARBOHYDRATES FOR BLOOD SUGAR MANAGEMENT AND BEYOND

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Asia and the Middle East are in the grip of a pandemic in type 2 diabetes and metabolic syndrome. They are also the unenviable epicenters of type 2 diabetes. Of the 450 million type 2 diabetics diagnosed worldwide, approximately 50% live in this region. The prevalence of type 2 diabetes has been partly ascribed to the high carbohydrate (CHO) content of the diet that people in this region consume. Recent evidence also suggests that they are susceptible to type 2 diabetes due to their phenotype. The concept of the glycaemia index (GI) of food has emerged as an important nutritional concept. The GI is a classification of the blood glucose-raising potential of carbohydrates in foods. High GI foods are characterized by fast-release carbohydrates and higher blood glucose levels. Low GI foods are absorbed at slower rates which in turn results in a lower rise in blood glucose. Paradoxically, most CHO-rich foods

we consume notably bread, rice and noodles are high GI foods. Diet based interventions have been promoted as a complimentary strategy to manage, prevent and treat diabetes. One of the earliest food based ingredients used to reduce glycaemia was beta-glucan. Since then a series of natural ingredients have been identified and used to reduce the glycaemic impact of carbohydrates. This presentation will highlight the important role that isomaltulose may play in reducing and modulating the glycaemic excursion of carbohydrate rich foods. Using a series of studies the presentation will display how the addition of isomaltulose to a high GI meal can also reduce the glycaemic response over a 24hr period. Finally, the simultaneous measurement of 24hrs blood glucose using a continuous glucose monitor and measurement of energy expenditure demonstrated conclusively that the inclusion of isomaltulose can not only reduce glycaemia but also increase fat oxidation. In our "war on diabetes" the use of isomaltulose may be a useful weapon to combat this worldwide threat. The study also endorses the claim that food is the new medicine.

Keywords: Glycaemic index, glycaemic response, continuous glucose monitoring, substrate oxidation and whole body calorimeter

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PS_144/133

COMPREHENSIVE MANAGEMENT OF OBESE PATIENTS

RELATIONS BETWEEN THE UNDERWEIGHT OF CHILDREN FROM 6 TO 59 MONTHS AND THE FEEDING OF THEIR MOTHER, BAMAKO

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Abstract

Malnutrition is a public health problem in Mali. It is within this framework that the present study on the relationship between the nutritional status of children aged 6 to 59 months and the feeding of their mothers was carried out in a first level health facility in the Bamako district of Mali.

A cross-sectional study involving 151 children aged 6 to 59 months and 149 mothers using the Expanded Program on Immunization and the Consultation of Healthy Children was conducted at the Niamakoro Community Health Center (ANIASCO) in the District of Bamako, Mali from 28 September 2015 to 28 January 2016. Socio-demographic data, feeding patterns and anthropometric measurements of mothers and children were collected. Pearson's Chi2 was used for comparison of means with a significance level of 95%. The bi and multi varied logistic regression was used to calculate the OR.

The mean age of the children was 7.89 months [7.57 - 8.20] and that of the mothers of 24.79 years [23.87-25.56]. Among the children, the female sex predominated with 55%. Only 2.6% of the children were exclusively breastfed. The prevalence of underweight was 15.2%, and the chronic energy deficit rate for mothers was 6.7%. The dietary diversity score (SDA) was 27.5% for mothers and 86.1% for children.

Multivariate analysis revealed that underweight was significantly associated with mothers' dietary diversity (SDA) score (p-value = 0.03). The nutritional status of mothers, on the other hand, had no influence on that of children. A statistically significant relationship was observed between maternal nutrition and underweight children.

Adequate feeding of mothers would improve their nutritional status, which could reduce the prevalence of underweight.

Keywords: Underweight, feeding, mothers, children, Bamako

PS_144/77
MEDICAL MANAGEMENT OF OBESITY

MEDICAL MANAGEMENT OF OBESITY

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Obesity is a chronic disease, most chronic illnesses require treatment based on the pyramid of treatment of chronic diseases: balanced diet based on guidelines, physical activity, cognitive and behavioral changes, medications and at the apex of the pyramid is surgery or other procedure more intensive. Chronic diseases are almost always treated with diet, physical activity and behavior modification , drugs and drug combinations and bariatric surgery. Obesity drugs are generally safe.Average weight loss with current obesity drugs is modest (5%-10% of initial weight).Some people respond to drugs with great weight loss.If a drug doesn't work, stop it!Drugs must be used long term – if you stop an effective treatment, it stops working. Drugs are generally a lot cheaper than behavior modification programs.Drugs are the future of obesity treatment. Combinations of treatments are generally more successful in producing weight loss and maintaining weight loss than single treatments. Drug combinations are the future of obesity treatment. Obesity surgery is the most effective single treatment, but weight regain may be treated with obestiy drugs. Thus the focus of my presentation will be based on antiobesity pharmacology therapy showing the different antiobesity medications and the

challenges in their use in function of popular and scientific myths related to the medical prescription of antiobesity drugs.

Keywords: Obesity. Drugs. Mith. Treatment. Weight loss

UPGRADE IN DIETS FOR OBESITY

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Obesity is a significant medical and social problem due to its severity and high and growing worldwide prevalence. The medical management of obesity includes lifestyle modification, with/without support from medications. A variety of dietary approaches that can produce weight loss are described, such as limiting the daily calorie intake to 800-1500 kcal/day or reducing the daily caloric intake by 500-750 kcal/day. With respect to pharmacotherapy, it is indicated as an adjunct to a reduced-calorie diet and increased activity for long-term weight management. Results from a meta-analysis showed that the weight loss with orlistat, lorcaserin, and liraglutide used as monotherapy ranged from 5.8 to 8.8 kg (5.8 to 8.8%) of initial body weight. The weight loss with placebo ranged from 2.6 to 5.3 kg. It is important to note that a moderate weight loss can result in improved health and quality of life. Besides, a high-intensity behavioral counseling during the medical treatment with regular recording of food intake and physical activity is of utmost importance to increase patient´s adherence to treatment. However, the greatest challenge of obesity treatment is the long-term maintenance of the reduced weight. There is an urgent need to develop new strategies for weight loss maintenance in the long-term.

Keywords: Obesity, diet therapy, pharmacotherapy,weight loss maintenance

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PHARMACOTHERAPY ANTI OBESITY: PRESENT AND FUTURE

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The authors will show the Brazil's experience with the anti obesity drugs like Diethylpropion, Fenproporex and Mazindol and they will present their research with the Diethylpropion's use in 3800 obesity patients. They will discuss about the impact of the

banishment of these medicine drugs in Brazil's public health, with the increase of the obesity's patients in Brazil.

At the same time, we will show the aggravation of the comorbidities of obesity in Brazil's population after the banishment of these anti obesity drugs.

They will show the current Brazil's scenario of anti obesity drugs with Orlistate, Sibutramine, Liraglutide and Lorcaserin.

Finally we will discuss about the use of off-label medicine drugs in the obesity's treatment in Brazil

Keywords: Pharmacotherapy of Obesity, Diethylpropion, Liraglutide, Lorcaserin.

HEALTH CONSEQUENCES OF OBESITY IN CHILDHOOD

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In Brazil, nowadays, almost 50% of boys and girls with ages between 5 and 9 years old are overweight or obese. And these children frequently have one or more comorbidities. We have been studying some of these comorbidities from the last 5 years. First of all, we studied dyslipidemia and insulin resistance. We found that 69.4% of the children had high cholesterol, 45.2% high LDL, 54.8% low HDL and 53.2% high triglycerides. It is consensual that we have a vicious circle including obesity and insulin resistance and we evaluated 383 children with ages between 7 and 10 years using fasting insulinemia and Homa as indicators of insulin resistance. The prevalence was very high, independently of the method: 33.1% using fasting insulin > 15 and 37.8% using HOMA > 3.5. We also looked at blood pressure and we showed high blood pressure values among obese children, when compared to eutrophic children. Regarding the heart, we investigated if obese children, with ages between 6 and 9 years, has detectable modifications of the heart anatomy, specially regarding to the left ventricle, and we found that, among 5 index evaluated, two of then (the LV mass and the LV3 index) showed differences, with greater thickness of the ventricle among obese children. The intima-media complex of common carotid artery can be accessed using ultrasonography. This is a very safe and accurate method to evaluate the onset appearance of atherosclerosis. We evaluated 59 children of both genders, between 7 and 10 years old. The average thickness of the intima-media complex in the group overweight / obese was 0.49mm; in the non-obese group, the measurement was 0.41mm. There was a significant difference between groups (p <0.01). And, also, we showed a correlation between the increase of the z-score of BMI and the increase of the intima-media complex. We evaluated the abdominal adiposity distribution. Results from 59 children of both genders, between 7 and 10 years old showed high correlation of fat deposits between each other and the two compartments of abdominal fat deposition increased together. And, even more important, both subcutaneous fat and visceral fat showed almost the same correlation with abdominal circumference. This means

that, at this age, when we measure the abdomen, we are measuring both visceral and subcutaneous fat and this two measurements increase together with the increase of the abdominal circumference. At this same study, we evaluated the liver and an hiperechoic image is an indicator of the presence of Non Alcoholic fat Liver Disease (NAFLD). Children with normal liver tend to have less subcutaneous fat then children with more echoic liver. And, similarly, children with normal liver tend to have less visceral fat then children with more echoic liver. In conclusion, even among school children, we could find a lot of obesity comorbidities, as: dyslipidemia, insulin resistance, high blood pressure, left ventricle hypertrophy, carotid intima hypertrophy, visceral fat accumulation and NAFLD.

Keywords: Obesity, Children, Insulin Resistance.

EATING BEHAVIORS DISORDERS OF OBESE PATIENTS

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Eating behavior disorders appeared more often in patients with overweight and obesity than patients with normal weight. Binge eating and other disordered eating patterns are also more commoom in overweight youth.

Binge eating disorder (BED) recognized as a formal diagnosis in Feeding and Eating Disorders in the last version of Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5) and Night eating syndrome (NES) are associate with obesity.

Research has shown eating pathology is commonly seen in bariatric surgery patients before surgery, and may persist or emerge after surgery. BED and other eating disorders that NES have been fairly consistently linked to greater weight regain post-surgery

Behavioral modification, nutritional education and cognitive behavioral therapy (CBT) are necessary in .eating behaviors disorders of obese patients. Binge eating and other disordered eating patterns are important to asses because they may directly contribute to overweight and addressing these behaviors will directly affect weight management goals. CBT is effective in reducing eating episodes in patients with BED but is not sufficiently effective for reduction of excess body weight..Nutritional deficiênces, therapies and drugs are also discussed

Keywords: Eating Behavior Disorder Obesity Patients

SARCOPENIC OBESITY

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The world's population is aging. One of the most dramatic body changes with aging is the loss of muscle mass. Although the peak of muscle mass and the beginning and the intensity of the loss all

varies among people, this loss may reach a state called sarcopenia, which compromises the function, quality of life and life itself. Although there is no agreement on the definition of sarcopenia, its concept is well established. In addition, the world increase incidence of obesity also has reached the elderly people , with aggravating factors pertinent to this age group like metabolic disorders and other. The confluence of these two phenomena , called sarcopenic obesity, results in individuals with fragility, greater vulnerability and increased mortality from all causes. Efforts should be concentrated to prevent and treat individuals of these conditions. Adequate food intake, with the provision of energy and protein for weight adjustment and optimize muscle synthesis, in addition to the micronutrientes, is essential. This, along with the regular practice of exercises are the basis of this approach. Some supplementation may be necessary.

Keywords: Aging. Sarcopenia. Sarcopenic obesity. Prevention. Treatment.

PS_144/116
NEW STRATEGIES IN THE CONTROL OF ENERGY BALANCE

GENOMICS OF BODY COMPOSITION, FROM SEVERE OBESITY TO EXTREME THINNESS: LEPTIN-MELANOCORTIN SYSTEM

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Although near to eighty obesity genetic syndromes have been described, most cases diagnosed with monogenic obesity are caused by disruption of genes belonging to the leptin-melanocortin pathway such as LEP (encoding leptin), LEPR (leptin receptor), MC4R (melanocortin-4 receptor), POMC (proopiomelanocortin) and PCSK1 (proprotein convertase subtilisin/kexin type 1), among others. Mutations of MC4R are considered as the most frequent cause of rare monogenic forms of human obesity, which may be responsible of up to 5% of severe childhood obesity and approximately to 1% of adult cases of severe obesity. Apart from the roles of MC4R in the regulation of food intake, this receptor also regulates blood pressure, lipolysis and insulin secretion through its reciprocal action on the two divisions of the autonomic nervous system (sympathetic and parasympathetic). The use of MC4R agonists has been proposed as a therapeutic strategy for treating obesity. However, most of the reported MC4R agonists show the undesirable property of increasing blood pressure, although a new MC4R agonist lacking such side-effects (setmelanotide) leads to reduction in body weight and energy intake in patients with mutations in POMC gene. After the identification of the genetic leptin deficiency in mice and humans, it was reported that subcutaneous leptin ad-

ministration to obese patients carrying mutations in the leptin gene reduced dramatically their energy intake and body weight. However, administration of human recombinant leptin as a monotherapy to patients with common obesity (with high circulating leptin and insulin levels) does not seem to reduce energy intake or body fat, indicating a resistance to leptin action in multifactorial obesity. Recently, it has been shown that the administration of leptin-sensitizers such as celastrol to mice with diet-induce obesity generated a reduction in body weight and energy intake, leading also to improved indexes of glucose homeostasis. On the other hand, the study of human leanness represents a complementary approach for ascertaining genes related to body weight regulation. Obesity/leanness are not only opposite phenotypes but also may behave as mirror traits. An interesting example of this phenomenon is provided by structural variations of chromosome 16p11.2, in which large deletions in this region containing SH2B1 gene (involved in leptin and insulin signalling) are strongly associated with obesity, while duplications are associated with leanness. Another example is Type 1 Generalised Congenital Lipodystrophy which is caused by mutations in AGPAT2 gene. Affected patients are characterised by extreme leanness, very low leptin and adiponectin plasma levels, as well as severe insulin resistance. In patients affected with this disease, administration of human recombinant leptin results in a remarkable improvement of glycaemic control, indicating the insulin-sensitizing effects of this hormone. The evaluation of obesity/leanness as opposite phenotypes remarks the usefulness of assessing the role of leptin in different pathophysiological contexts, revealing new aspects of adipose tissue biology.

Keywords: Obesity, thinness, leptin, melanocortin, lipodystrophy.

BROWN ADIPOSE TISSUE AND BROWNING OF WHITE ADIPOSE TISSUE

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Adipose tissue is composed of various cell types, which include adipocytes and other cells of the stromal vascular fraction such as preadipocytes, blood cells, endothelial cells and macrophages. Mammals have two main types of adipose tissue: white adipose tissue (WAT), and brown adipose tissue (BAT), each of which possesses unique cell autonomous properties. WAT and BAT differ at the functional, as well as the morphological and molecular levels. Brown adipocytes have a primary function in heat generation as they uniquely express the uncoupling protein 1 (UCP1) and were considered to be at most a minor component of human adipose tissue. However, he presence of BAT close to the neck and supraclavicular areas in adult humans was discovered in 2007, and later there has been an explosion of knowledge about BAT, both at the molecular, cell and clinical levels.

While the function of BAT located in discrete depots in the thorax is well-established, recent findings suggests that brown adipocyte progenitor cells, and possibly differentiated brown adipocytes, exist as scattered individual cells and small cell clusters distributed diffusely within WAT and possibly skeletal muscle tissue. Indeed, a new kind of adipocytes called BRITE (BRown-like adipocytes in whITE adipose tissue) or beige adipocytes has been identified within WAT; these cells arise from the same origin as white adipocytes, but they also share characteristics with those of brown adipocytes as the expression of UCP-1. Overexpression of the PRDM16 in white fat depots induces the formation of brown adipocytes, a process called "browning". The presence of brown adipocyte progenitor cells in WAT and the ability to induce brown adipocyte differentiation both in vitro and in vivo, suggest the possibility of a therapeutic approach for obesity based on brown adipocyte-mediated energy expenditure.

As BAT dissipates energy, due to its ability to oxidize glucose and lipids, recruitment and activation of BAT i.e. browning might be a therapeutic target for treating metabolic disorders such as obesity and type 2 diabetes. BAT is stimulated by the sympathetic nervous system (SNS); however, there are some novel BAT activators, some of them myokines, which act independently of the SNS, such as cardiac natriuretic peptides, irisin, interleukin-6, β-aminoisobutyric acid and fibroblast growth factor 21, that could influence BAT metabolism. Recently, we have postulated that exercise might activate and recruit human BAT through activation of SNS, heart and skeletal muscle. Thus, exercise could induce browning of the WAT and activate BAT, which in turn would results in increased thermogenesis and energy expenditure with concomitant loss of fat mass. We are currently carrying out a study (ACTIBATE) to evaluate the effect of long-term exercise training (24 weeks) on BAT activity and quantity in young overweight and obese adults.

Keywords: Adipose tissue. Brown adipose tissue. White adipose tissue. UCP-1

MICROBIOTA AND OBESITY

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Both the microbiota and the human host maintain a symbiotic association. Nowadays, metagenomic analyses are providing valuable knowledge on the diversity and functionality of the gut microbiota. However, with regard to the definition of a "healthy microbiota" and the characterization of the dysbiosis linked to obesity or other metabolism and inflammation-related disorders, there is still not a clear answer. Obviously, genes have an important role on the microbiota characteristics of an individual, but also lifestyle habits, such as diet, eating behaviour, body composition, physical activity, stress, as well as sleep profile, have been shown to be responsible of the type and diversity of bacteria in the gut. In addition, a new association has been recently discovered, such as the gut microbiota-brain axis that opens the perception that microbiota can act not only at an intestinal level, but also at several sites of the organism, no matter how far they are from. Therefore, attempts have been made to counteract obesity through including different foods to be consumed into the diet. To this end, prebiotic and probiotic supplementation have been the former compounds used with the purpose to ameliorate and achieve a healthy microbiota. In the scientific literature, there are several experimental studies in animal models relevant to this topic. So far, evidence of an anti-obesity effect of different lactobacilli and bifidobacteria has been mainly obtained from animal models submitted to dietary-induced obesity. Using these experimental models, a substantial number of studies have reported reductions in weight gain and, particularly, in fat tissue mass at different locations following administration of beneficial bacteria, as compared with controls. Antiatherogenic and anti-inflammatory effects—including regulation of expression of lipogenic and lipolytic genes in the liver, reduction in liver steatosis, improvement of blood lipid profile and glucose tolerance, decreased endotoxemia, and regulation of inflammatory pathways—are also reported in many studies. The number of human studies focused on prebiotic or probiotic administration for obesity management is still very scarce, and it is too soon to judge their potential efficacy, especially when considering the fact that the actions of prebiotics and probiotics depend on the doses, the time and the period of administration, as well as the metabolism of the subject. In addition, the efficacy of probiotics is always strain-specific and the individual response varies according to intrinsic factors, the overall composition of the diet, and the interactions with the rest of lifestyle-related factors.

Keywords: Microbiota, obesity, lifestyle factors

PS_144/109
INTEGRATION TO IMPLEMENTATION (I TO I) ON VITAMIN A INTERVENTIONS

RELATIVE STRENGTHS AND WEAKNESSES OF AVAILABLE INTERVENTIONS/PROGRAM STRATEGIES TO PREVENT DEFICIENCY OR IMPROVE VITAMIN A STATUS IN INDIVIDUALS OR POPULATIONS

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Addressing vitamin A deficiency (VAD) as a public health problem in developing countries requires a mix of interventions. The most widely-implemented program is the universal vitamin A supplementation (VAS) among children 6-59 months of age which began in 1990s in response to the evidence of risk reduction of childhood mortality, primarily due to

infectious diseases. The program can be scaled nationwide and achieved desirable coverage cost-effectively through joint implementation with existing child health services. However, VAS is not able to sustain improvement of VA status beyond 3 months

and, therefore, requires complementary interventions to effectively control VAD. Over the past decade, large-scale fortification of VA in sugar (success story in Central America), vegetable oil and staple grains expanded across Africa and Asia. While the approach is efficacious and cost-effective, monitoring quality production to consumption as well as evaluating public health impact remains a challenge in many settings. For dietary diversification to promote consumption of VA foods, data are scarce on efficacy and effectiveness of such interventions. Of interest, provitamin A carotenoids in foods offer a double opportunity to fill the gap of VA intake as well as enhance functional benefits within the healthy diet scheme. Recently, studies on bio-fortified crops especially orange-fleshed sweet potato and maize showed improvement on VA intake and status. Further efforts are required to scale up bio-fortification in target areas. Other VA containing programs include home-fortification micronutrient powder and lipid-based multi-nutrient supplements. In countries where VAS is implemented together with one or more other VA interventions, data gap exists regarding assessment of intakes for inadequate or excess levels as well as program impact on VAD control. For the past two decades, the global progress of nearly 50% reduction in the under-5 mortality, marked decline in undernutrition and burden of infection coupled with emerging data on no effect of VAS on child mortality, raises questions on the relevance and proper scaling of VAS to fit the country profile. Recent reviews identified the need to update magnitude and severity of VAD at national and sub-national levels to guide policy decision. With a co-existence of undernutrition, obesity and non-communicable diseases in low- and middle-income countries, the time is right to redesign the next generation of interventions that address VAD together with other nutritional targets.

Keywords: Vitamin A deficiency, supplementation, food fortification, dietary diversity, program impact

Guatemala is the first country in the world to implement and maintain sugar fortification with vitamin A as a successful public health intervention for decades, with monitoring and surveillance systems in place. Monitoring activities have provided information on the quality and coverage of the program and epidemiological surveillance confirms that universal sugar fortification with vitamin A has been a sustainable cost-effective strategy to drastically reduce vitamin A deficiency. Other strategies implemented in Guatemala include mega dose supplements for children and micronutrient powder provision, but with variable coverage. Efforts to adjust supplementation program according to a sufficient amount of VA provided by sugar have resulted in reducing the age group targeted by supplementation, from 6-59 months-old children to the 6-23 months-old.

Recent national health and nutritional surveys and local nutritional surveillance systems have evidenced that in Guatemala there is also availability of additional dietary sources of VA that can be provided by focal nutritional interventions, bought, as well as voluntarily fortified foods such as cereals, milk and juices. This suggests that a potential excess of VA intake is possible in the Guatemalan context. The lessons learned through has been useful to guide public policies and establish inter-sectoral alliances as in the National Commission of Food Fortification.

This presentation will present data available on national level and how those have influenced national policies. Discussion will be issued on how national food fortification programs can achieve sustainable adequate levels of Vitamin A without carrying out excessive intakes in vulnerable groups.

Keywords: Vitamin A status, National Fortification Programs, Guatemala

Further collaborators:
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COUNTRY PERSPECTIVE. WHAT ARE THE IMPLICATIONS OF THE CURRENT CONCERN/DEBATE ON NATIONAL EFFORTS TO PREVENT VITAMIN A DEFICIENCY IN GUATEMALA

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During the 1960s the vitamin A deficiency (VAD) in Guatemala was consequence of a cereal-based diet poor in both animal and vegetable sources of vitamin A. After designing and implementing a program to fortify sugar with cold-water soluble retinyl palmitate, a longitudinal evaluation demonstrated the effectiveness of the strategy. Follow-up biochemical assessments based on national health and micronutrient surveys showed a decline of VAD from 26.0% to 15.8% during 1965—1995 in children aged 0-59 months, and in 2008, the prevalence of low serum retinol values was 0.3%.

WHAT DOES IT ALL MEAN AND HOW MIGHT WE MOVE AN AGENDA FORWARD TO ADDRESS THESE CHALLENGES? C. ENABLING AGENCIES

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At the World Summit for Children in 1990, it was agreed to 'virtually eliminate vitamin A deficiency (VAD) and its consequences.' However, VAD indicated by serum retinol levels <0.70 µmol/L still affects approximately 190 million preschool-age children. VAD is the most prominent cause of preventable childhood blindness, and increases the risk of childhood death from diseases such as diarrhea and measles. Biannual high-dose vitamin A supplementation (VAS) has been the most successful child survival intervention, which can reduce all-cause mortality rate by 12-24%, and is implemented by 84 countries. In 2014, 17 sub-Saharan countries reached effective coverage >80%. The integration of VAS in national polio campaigns allowed countries to reach high coverage rates. With progress towards the eradication of polio and im-

proved access to vitamin A-rich food, there has been considerable discussion about phasing out VAS. It is conceivable that effective VAS coverage is likely to decline once VAS is solely under the control of the health system. Nonetheless, a successful public health intervention such as VAS cannot be abandoned without assurance that vulnerable groups have access to and consume sufficient vitamin A-rich foods, such as liver, eggs, milk, fruit, vegetables, and fortified foods. Sugar fortification in Guatemala and Nicaragua, for instance, could demonstrate a continuous decline in VAD in different population groups, including preschool-age children. In a recent assessment of sugar fortification with vitamin A in Zambia, however, almost 90% of retail sugar samples analyzed did not meet the legal requirements of 10 mg/kg. This clearly indicates that, before scale-back of VAS can be justified, effective regulatory monitoring of fortification programs and regular assessment of the vitamin A status of the target population must be in place.

Multiple exposures from VAS, micronutrient powder, and fortification have raised concerns about preschool-age children exceeding the Tolerable Upper Intake Level (UL) for vitamin A. However, the UL is not a threshold for adverse effects, and for this age group it is even extrapolated from adults. In addition, vitamin A plasma concentration is not suitable for monitoring, as it is homeostatically controlled and influenced by inflammation. There is a need for reliable biomarkers of excess, because the narrow margin between the Estimated Average Requirement (EAR) and UL could, most notably, disenfranchise vulnerable children. Recent developments addressing the limitations of intake and plasma vitamin A for monitoring for both fortification and supplementation include the application of stable isotope dilution techniques.

Neonatal vitamin A supplementation (NVAS) in the first few days of life has been proposed as an intervention to reduce infant mortality. The evidence for mortality reduction from NVAS in South Asia is overwhelming and, if implemented adequately, could save the lives of as many as 250,000 children annually. No effect of NVAS on mortality was found in studies from Africa in areas with little vitamin A deficiency and low mortality, however. We therefore need policies that support NVAS in settings with high vitamin A deficiency and early infant mortality, including South Asian countries.

Keywords: Vitamin A, supplementation, fortification, preschool-age children, neonatal children

Conflict of Interest disclosure: Klaus Kraemer is the Managing Director of the Sight and Life Foundation, a nutrition think tank primarily funded by the vitamin A manufacturer DSM.

NEW ADVANCES ON KETOGENIC THERAPIES

DIETARY VARIATIONS: CLASSICAL KETOGENIC DIET, MODIFIED ATKINS DIET, LOW GLYCEMIC INDEX TREATMENT

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Dietary therapies have been utilized as treatment modalities of epilepsy for centuries. The classic ketogenic diet (KD) has been used in clinical practice since the 1920s. Although it has been proven to be an efficacious treatment option, compliance with the rigidity of this treatment has led to continued elevated discontinuation rates. Therefore over the past few decades more liberalized versions of the KD such as the the low glycemic index treatment (LGIT) and the modified Atkins diet (MAD) were developed. These liberalized diets do not require the exact weighing and measuring of foods consumed as is required by the classic diet, allowing for a more flexibility in meal planning, including the ability to eat out at restaurants.

The LGIT and MAD are being utilized globally and are demonstrating similar efficacy rates to the classic KD. The backgrounds of the diets are similar in that they contain higher amounts of fat and limit the amount of carbohydrate consumed daily to transition the body to utilizing fat as it's primary energy source. Due to the metabolic changes occurring during treatment it remains important for those utilizing these treatments to be monitored closely for any untoward side effects by a team familiar with intricacies of dietary therapies.

Keywords: Classic Ketogenic diet, Modified Atkins Diet, Low Glycemic Index Treatment, Dietary Therapy, Epilepsy

Track 5: Nutrients and Nutritional Assessment

PS_144/146
NOVEL FUNCTIONS AND USES OF AMINO ACIDS

THE INFLUENCE OF NUTRITION ON TUMOR METABOLISM AND GROWTH

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Cells adapt metabolism to meet distinct physiological needs, and metabolic regulation influences tumor initiation and progression. To proliferate, cancer cells must adapt metabolism to support anabolic processes that allow the accumulation of biomass. This includes producing those metabolites that are most limiting for tumor growth in physiological tissue contexts. We find that nucleotide synthesis is often limiting, and how cells generate nucleotides is influenced by diet, tissue environment, and tumor type. For many tumors, access to oxygen or other electron acceptors limits the production of purines and pyrimidines. Analysis of metabolism in animal cancer models suggests that tumors can use different nutrients to allow tumor growth. Diet and whole body metabolism affects nutrient availability and influence tumor progression, and also contributes to tissue wasting that this commonly observed in cancer.

Keywords: Cancer metabolism, Diet and cancer, Cachexia

Conflict of Interest disclosure: M.G.V.H. is a consultant and SAB member for Agios Pharmaceuticals and Aeglea Biotherapeutics

BCAA FUNCTION AND INSULIN RESISTANCE FROM THE STUDIES USING GENETICALLY ENGINEERED MICE IN BCAA CATABOLISM

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Branched-chain amino acids (BCAAs) (leucine, isoleucine, and valine) are essential amino acids as ingredients for proteins in mammals. BCAAs also play as a nutrient signal for protein synthesis, and recently, their concentrations in blood are highly correlated with insulin resistance. So far, however, whether increased BCAAs would be responsible for insulin resistance or consequences of insulin resistance remains unclear. In fact, impaired BCAA catabolism that leads to increase BCAAs have been associated with insulin resistance, so that the genes related with BCAA catab-

olism are thought to be potential targets for the treatment of insulin resistance. The first two steps of BCAA catabolism are common for these three amino acids. The first reversible transamination reaction is catalyzed by BCAA aminotransferase (BCAT) isozymes, BCATm (mitochondria-type) and BCATc (cytosol-type), which form branched-chain alpha-keto acids (BCKAs) from BCAAs. The second step is an irreversible oxidative decarboxylation reaction by BCKA dehydrogenase (BCKDH) to produce branched-chain acyl-CoAs, which are eventually catalyzed to either acetyl-CoA or succinyl-CoA by each three individual pathways. The BCKDH activity is suppressed by phosphorylation of the dehydrogenase by BCKDH kinase (BDK) and activated by dephosphorylation by PP2Cm. BCATm-deficient mice with blocked BCAA catabolism at the first step showed high BCAA levels in blood, increased energy expenditure and improved insulin resistance by diet-induced obesity, however low exercise capacity. On the other hand, BDK-deficient mice with defect in negative regulation of the second step of BCAA catabolism showed low BCAA concentrations in blood and developed neurological disorder, however the insulin sensitivity of BDK-deficient mice are still unknown. Recently, we have generated the mice with BDK defect either in whole body (BDK-KO mice) or specifically in skeletal muscle and heart (BDK-mKO mice). Although BDK-KO mice showed the phenotype with neurological defects as the previous report, BDK-mKO mice were healthy without any obvious defects when feeding a protein-rich diet, and the concentration of myofibrillar protein was significantly decreased during protein undernutrition. We will discuss the role of BCAAs in insulin resistance with the results we observed using our animal models. This tissue-specific BDK deficient mouse model is very useful for further investigation to find out the importance of BCAAs in any interest tissues or cells.

Keywords: BCAA, insulin resistance, animal model

QUANTITATIVE PROTEOMICS REVEAL OVERALL AMINO ACID TRANSPORT SYSTEMS AND THE RELATED SIGNALING

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Amino acids are known as building blocks of proteins and substrates of metabolic and biosynthetic reactions. However amino acids are also recognized as the signaling molecules to regulate cellular metabolism and cell growth. Among amino acids, leucine is the most effective signaling molecule to regulate cell growth and metabolism by activating mechanistic target of rapamycin complex 1 (mTORC1) which is one of the well-recognized cellular signaling pathways mobilized by amino acids. Since leucine is one of essential amino acids, cell needs to take it up from outside by using transporters. It has been reported that Na+-dependent or Na+-independent plasma membrane transporters are able to transport leucine.

Normal cells control nutrient uptake and metabolic activities to prevent aberrant cell proliferation. On the other hand, in cancer cells, nutrient transporters are constitutively activated to facilitate the nutrient uptake for robust cell growth. Several studies have reported the overexpression of some amino acid transporters. However, there have been no report about comprehensive expression profile of amino acid transporters in cancer cells due to the problematic nature of transporter proteins. Thus, we have exploited comprehensive and quantitative proteomics to review the functional profiles of amino acid transporters in many cell lines. In our study, we found that cancer cell lines selectively expressed one transporter from each transporter family. Expressions of SLC1A5, LAT1/SLC7A5, SLC7A1 and SLC7A6 were conserved in most cell lines. These results strongly indicate that these transporters are the common transporters to supply amino acids for cancer cells.

Of the transporters, LAT1/SLC7A5 transports several large neutral essential amino acids including leucine. By addition of an LAT1-inhibitor BCH, leucine uptake by LAT1 was blocked, and then the phosphorylation of mTORC1 pathway was also suppressed. Therefore, we have applied quantitative phosphoproteomics to analyze the cellular responses to leucine transported via LAT1 comprehensively. Cells were stimulated by leucine in the presence or absence of BCH. Thus, the phosphorylation induced by LAT1-mediated leucine uptake was able to be distinguished. Our result shows that leucine-uptake by LAT1 regulated phosphoproteins involved in multiple cellular processes and revealed the linkage of signaling pathways and cellular responses. These data open a door let us explore the whole picture of signaling stimulated by leucine uptake. Moreover, this approach is not limited to investigate a particular amino acid or a cell type but applicable to various cases of studies.

Keywords: Amino acid, transporter, proteomics, phosphoproteomics

Further collaborators:
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METHIONINE METABOLISM REGULATES THE FUNCTIONS OF HUMAN PLURIPOTENT STEM CELLS

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Recent evidence suggests that metabolic pathways are important for the establishment of pluripotency as well as the regulation of cell proliferation and differentiation in pluripotent stem cells (PSCs). Embryonic stem cells (ESCs) and induced pluripotent stem cells (iPSCs) have an unlimited ability to replicate and the potential to differentiate into any cell type. PSCs constitute a promising model for self-renewal and differentiation and may facilitate research about early development. They possess a unique transcriptional circuit that sustains the pluripotent state. These cells are in a specific epigenetic state that enables rapid cell fate decisions.

Furthermore, PSCs possess a characteristically high rate of proliferation as well as an abbreviated G1 phase. Recent reports have shown that metabolism is tightly linked to cellular signaling, and these two processes reciprocally regulate each other to modulate cell activities, such as survival, proliferation, and stem cell function. We and other groups have demonstrated that the universal methyl donor S-adenosyl methionine (SAM) is a key regulator for the maintaining undifferentiated PSCs and regulating their differentiation. In mouse PSCs, SAM is dependent on glycine converted from threonine by threonine dehydrogenase (Tdh). Threonine uptake and Tdh activity are required to maintain high levels of SAM. The human TDH gene is a nonfunctional pseudogene; accordingly, threonine cannot be used for SAM production in human cells. Therefore, human PSCs depend on extracellular methionine for SAM synthesis, and short-term methionine deprivation results in a loss of histone methylation, triggering the reducing NANOG expression, and promoting human PSC differentiation into all three germ layers (Shiraki et al., Cell metabolism 2014). Based on a gene expression analysis and the quantification of methionine metabolites, undifferentiated human PSCs are in a high-flux methionine metabolic state. In contrast, differentiated endoderm cells require a low amount of methionine for growth and are therefore not affected by methionine deprivation. This metabolic difference between undifferentiated PSCs and differentiated cells prompted us to test whether methionine deprivation eliminates the remaining undifferentiated cells. After prolonged (48 hr) methionine deprivation during mid-stage endoderm differentiation, residual undifferentiated cells were eliminated, and the overall differentiation efficiency increased. These results have implications for the elimination of variability in differentiation efficiency among cell lines and for the promotion of differentiation into specific cell lineages. Here I show methionine metabolism, which regulates the maintenance and differentiation of human PSCs, summarize the roles of SAM and epigenetic crosstalk in these processes, and compare these mechanisms in mouse and human PSCs.

Keywords: Methionine. Amino acid. iPS cells. ES cells. Differentiation

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PS_144/143
FOOD CONSUMPTION SURVEYS: RESULTS AND USES

LATIN AMERICAN SURVEY OF NUTRITION AND HEALTH (ELANS). PRELIMINARY RESULTS

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Determinations of total energy intake, diets nutrient composition and dietary patterns of Latin American countries are critical to address the epidemic of non-communicable diseases and the health consequences of physical inactivity. This information

would be of the greatest actionable value for developing dietary recommendations and policies for governments, and scientists

ELANS Protocol

The Latin American Study of Nutrition and Health/Estudio Latinoamericano de Nutrición y Salud (ELANS), is a randomized cross-sectional multicenter research designed to address the nutritional profile of Latin American (LA) people in eight LA countries (Argentina, Brazil, Peru, Colombia, Costa Rica, Ecuador and Venezuela),. The study provides comparable data of dietary intake, physical activity, and anthropometric profile among representative urban populations of the eight countries; analyzed by socioeconomic status, age and gender. A sample of 9218 adolescents and adults aged 15.0-65.0 years, stratified by geographical location, gender, age and socioeconomic status was performed. The ELANS standardized protocol was followed by the eight countries and performed simultaneously. Intake data was collected by two 24 hs recall and physical activity information by both the Mexican (Spanish) version of International Physical Activity Questionnaire (IPAQ) and accelerometers in 2 household visits. Five anthropometric measurements were performed by the exact methods and instruments.

ELANS included 9,218 individuals (48% men and 52% women) with validated data. The age distribution of the sample was 13%, 38%, 28% and 21% for 15-19, 20-34, 35-49 and 50-65 years old, respectively. Mean body mass index (BMI) was 26 kg/m2 with higher values from women (27.5 kg/m2) than men (26.3 kg/m2). Overall, only 37% of the ELANS sample had normal body weight, while 3% exhibited underweight, 34% were overweight and 26% were obese. ELANS results show high rates of overweight and obesity in the region, coexistent with high prevalence of inadequate micro-nutrients intake. Despite different rates between countries were found, a shared pattern where the vulnerable age groups are mainly the adolescents and older adults, was found. Analyzing LA diets distribution of macro-nutrients but they are well balanced, differences in food sources, culture and meal habits were observed from one country to another expressing the cultural imprinting of each diet composition. The ELANS overall sample reported a higher level of active people at the transport dimension of IPAQ for men than for women. Men in 20-34 age range reported the highest (59%) level of active PA at leisure time while for female adolescents it was the lowest (29%). This is congruent with the sedentary time (hours/week) collected with the accelerometers where the highest levels were reported by adolescents 10 hours/ week for both genders.

ELANS provides a unique dataset for Latin America, enabling cross-country comparisons of energy, macro- and micro-nutrients intake and physical activity as well as establishing associations between these lifestyle components and nutritional status within this region. In this symposium, the main results obtained in this study will be reported.

Keywords: Survey, Nutrition, Physical Activity, Latin America.

PS_144/105
NUTRITION SCIENCE AT A CROSS-ROAD

BEST PRACTICES FROM THE ASN COMMITTEE ON PUBLIC TRUST

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The American Society for Nutrition (ASN) created an Advisory Committee on Ensuring Trust in Nutrition Science. The ASN charged the committee with recommending best practices for sustaining public trust in all of ASN's collaborative undertakings with stakeholders across sectors and disciplines. Assuring transparency and rigor in those activities was stressed. Implementation of best practices is expected to uphold trust in nutritional science among all stakeholders, i.e., the public, industry, government, academia, and other nonprofit, nongovernmental organizations pertinent to the field of nutrition science. Their implementation also should help ensure objectivity, and comprehensiveness, achieve the best nutrition science, and assure required accountability and the realization of anticipated benefits to public and individual health.

Keywords: American Society for Nutrition; Nutrition Research; Public Trust; Rigor and Reproducibility; Best practices

REDUCTIONIST VERSUS HOLISTIC PARADIGMS IN NUTRITION SCIENCE

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Up today nutrition science, in Western countries, has been mainly experimented according to the reductionist paradigm. Reductionism is based on the assumption that since reality is too complex to be studied as such it needs to be fragmented into isolated entities that are studied according to the view that the whole is equal to the sum of the part (2 = 1+1) on the basis of a linear

cause-effect relationship. As a result foods are considered as only sums of nutrients and calories ; and one nutrient is generally associated with one deregulated metabolism then one chronic disease (e.g., relationship between saturated fats, dyslipidemia and atherosclerosis whereas it is a reducing association). Reductionism can be considered as the main deep cause at the roots of diet-related chronic diseases that are encountered in populations consuming the most fractionated/recombined and refined ultra-processed foods, the ultimate consequence of reductionism. Indeed, if foods are only sums of nutrients why not cracking them in a multitude of nutrients and to recombine them. Nutritional supplements, functional foods and ultra-processed foods are therefore the consequences of our modern reductionist science. They are also based on the assumption that food health potential is based on its composition only.

On the contrary, holism views whole foods as more than a sum of nutrients because of synergy of action of nutrients and food matrix effect. Holistic nutrition science defines food health potential as combination of both matrix and compositional effects. Food is more than the only sum of nutrients (2 > 1+1). Matrix effect is crucial because it impacts satiety potential and nutrient bioavailability, both playing a crucial role to maintain a good health. Therefore two foods of identical composition but with a different matrix have not the same health potential.

Therefore to fight against the increasing prevalence of diet-related chronic diseases we need today to base more nutrition science on the holistic paradigm. Whereas recombined/refined ultra-processed foods are the fruit of reductionism whole and complex foods participate more of the holistic paradigm which should encourage technologists to less process foods to preserve their matrix, and public authorities to lay emphasis on minimally-processed foods as a basis of a healthy diet.

In addition to food science and technology the holistic paradigm may find other important applications in the study of diets on human health. Randomized controlled studies are coming from reductionist and pharmacologist designs, very far from real life, and cannot yield long-term and effective applicable results. Nutrition science is not pharmacology and foods are not drugs: therefore application of holism should prompt nutritionists to carry out intervention studies in complex real life conditions (taking into account all aspects of dietary lifestyles), and not to control only one.

Finally reductionist and holistic paradigms are both necessary: however more importance to holism should be given. Reductionism only becomes meaningful when it is embedded and circumscribed in a thorough and holistic reflection. If not, reductionism turns around, and only produces partial scientific truths devoted to agro food industry benefits.

Keywords: Holism, Reductionism, Nutrition, Food matrix, Processing

IS THE RCT THE BEST WE CAN DO?

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Large randomized controlled trials (RCTs) are apparently the only way to circumventing the methodological problems of observational research, such as misclassification, reverse causation and residual confounding.

But small, short-term RCTs with surrogate markers of disease as the outcome are clearly not the solution. To give a high value to changes in any single surrogate biomarker is a mistaken approach, given that there are multiple pathways leading from diet to disease. Moreover, the induction period can vary for the different pathways in which diverse biomarkers are involved, thus limiting the possibility of assessing multiple biomarker combinations at any time point. Furthermore, other lesser-known pathways could account for a substantial proportion of clinical events. Therefore, the gold standard should be long-term RCTs with hard clinical events. In them, participants should be willing for a long period (usually at least 5-6 years) to eat what the investigators decided that they should eat, not what they like to eat. This is very problematic.

A highly prevalent tenet in the current nutrition literature is that "prospective cohort studies provide evidence only of statistical associations ("mere correlations") but not causation whatsoever, because only RCTs can answer causal questions". Under that assertion, most of the current practices and policies in public health would lack sufficient scientific foundation. The truth is that sound and effective public health actions have been based in well-designed, conducted and analyzed observational epidemiologic studies. They do provide valid answers to causal questions in nutrition.

The criteria for causality established by Bradford Hill long time ago are the leading principles to obtain causal inferences from observational studies. They keep their validity nowadays. Cause and effect associations can be drawn when most of these criteria are met, especially when there is consistency among many well conducted observational studies.

Conversely, methodological challenges in designing RCTs in nutrition can frequently induce biases. They speak against any "fundamentalism" for the RCTs. They include the intensity of the "intervention" to be delivered to the control group, selection biases due to selective attritions, deficient adherence to the prescribed diet (suboptimal compliance is the rule and not the exception), contamination of the control group with the intervention protocol, erroneous assumptions about the induction period or potential effect modifiers, and, very especially a small and insufficient contrast in the diets of the intervention and control groups. These biases tend to operate towards the null and several RCTs in nutrition ended as non-informative, after astronomic expenses and many years of work. The PREDIMED trial, showing the benefits of the Mediterranean diet was an exception. But the results of PREDIMED were highly consistent with those of observational cohorts.

Therefore, very often, RCTs are not the best design to answer causal questions regarding long-term effects of dietary exposures. Because a well-conducted cohort study can simulate an RCT when the most important confounders have been controlled for, the

combination of RCTs with well-conducted and analyzed cohort studies should be the optimal approach to draw causal inferences in nutrition.

Keywords: Randomized clinical trials, Mediterranea diet, intervention, cardiovascular disease

NUTRITION IN TRANSITION, THOUGHTS AND ACTIONS OF A MULTIDISCIPLINARY WORKING GROUP

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In the past decades valuable knowledge has been produced about the interaction of nutrients, food and the human body. The mostly multidisciplinary approach in nutrition science has accomplished a lot, both scientifically and socially. Despite this, nutrition sciences appear to be in a crisis. Public reluctance to trust nutritional insights creates space for many authors with nutrition messages that are not aligned with general views of nutrition and health.

In the Netherlands, recently a multidisciplinary discussion group was formed to start a structured discussion about the capabilities and credibility of nutrition sciences. The group consists of scientists with a background in nutrition, epidemiology, physiology, medical sciences, behavioral sciences, philosophy, ethics and statistics. Since 2015 we organized several discussions about the limitations recognized in nutrition sciences, such as discussions about "health", causation", "evidence" etc. In 2016 we organized a dedicated workshop with scientists from a diversity of disciplines invited on a personal title.

We diagnosed that nutrition science is meeting its inherent boundaries, which hampers conceptual and methodological progress and the translation of novel insights into societal benefit and trust. The methods in nutrition sciences need to change to accommodate the questions that arise from the major upcoming societal challenges.

The benefits of nutrition interventions aiming at prevention of chronic diseases cannot be related to one single cause. Despite the multifactorial causation of chronic diseases the pharmacological model of double blind placebo controlled intervention studies, usually called clinical studies, is considered as the method to prove causation. We think that this approach to prove causation needs to be reconsidered.

Ingestion of complex molecular foods interact with complex body function aiming at life-long prevention. In general a reductionist approach cannot be translated into benefits. Medicinal interventions readdress an unhealthy to a healthy condition in the shortest time span possible. The different employments of nutrition and medicines make the paradigms of sciences almost oppositional.

Nutrition sciences is strongly influenced by a reductionist focus. Due to political choices scientists need to search for private funding. That research focusses on products and nutrients instead of food patterns, generating beliefs of quick wins. These myths need objective evaluation.

Such critical assessment is not the first. Concerns have been raised immediately after the landmark publication on Evidence Based Medicine in 1992. We have not been able to identify a structured discussion about the limitations of the capability and credibility of nutrition sciences.

The evidence we seek, the questions we ask, the funding and organisation threaten our credibility. A discussion is needed to agree on different ways of working and knowing. A new nutrition science agenda may provide plenty of potential for excitement and includes reaching out to multiple disciplines that are important to create answers needed on future questions. In parallel to and based on the outcomes of our discussions we aim at developing research projects creating new generation nutrition sciences that is incorporating as many as possible scientific disciplines. New partnerships, activities and agendas are the cornerstones for a more capable and credible nutrition science.

Keywords: Credibility, Magic bullets and myths, paradigms, Multidisciplinary science.

LINKING AGRICULTURE AND NUTRITION EDUCATION TO IMPROVE ACCESS TO QUALITY FOODS FOR YOUNG CHILDREN

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Agriculture has a central role to play in nutrition by supplying nutritious, healthy and affordable foods in a sustainable manner. When integrated with nutrition education for behaviour change, agricultural interventions have the ability to improve young child and family diets. Process reviews were conducted in Cambodia and Malawi of food security projects carried out by the Food and Agriculture Organization of the United Nations (FAO) that provided agricultural support and community-based nutrition education on improved infant and young child feeding (IYCF). In both countries, household visits were carried out with mothers/caregivers, and interviews and Focus Group Discussions (FGD) were conducted with purposively selected project stakeholders (53 in Cambodia, 170 in Malawi). Results showed that adoption of improved IYCF practices

were facilitated by participation in nutrition education and practical cooking sessions, with supportive family and community structures playing an important role. Barriers faced by families and caregivers included women's workload and lack of access to high quality foods, such as fruits, vegetables, legumes, nuts and animal source foods. Implementation challenges included coordination issues in regard to cross-sectoral targeting strategies and ineffective capacities of extension services to deliver a community-based IYCF nutrition education programme. Lessons learned from the project can guide future integrated agriculture-IYCF nutrition education programmes to help ensure better young child nutrition outcomes.

Keywords: Infant and young child feeding, complementary food, nutrition education, agriculture, Cambodia, Malawi

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PS_144/140

TRENDS AND PRACTICE IN CLINICAL NUTRITION

EFFECT OF PROBIOTICS ON HUMAN BLOOD UREA LEVELS IN PATIENTS WITH CHRONIC RENAL FAILURE

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Chronic Kidney Disease (CKD) accelerates cardiovascular disease (CVD), predisposes to infectious diseases and numerous other morbidities that increase mortality, that shortens the life span and impairs the patient's quality of life. Most of these abnormalities are mediated by systemic inflammation, that is common in CKD. Uremic toxins retained as a result of altered kidney function contribute significantly to this inflammatory state and the derangement in many body organs. Dysbiosis (a aquantitative and qualitative alteration of intestinal microflora), is a consecuence of changes in intestinal transit, decreased protein absorption, decrease in dietary fibre intake, treatment with oral iron and frequent use of antibiotics that are very common in CKD.

The human gastrointestinal microbiota represents the largest body microbial load. This bacterial load and its products have been shown to contribute to both the progression of CKD and activation of the inflammatory cascade in CKD. Thus, gut dysbiosis characterized by a disruption of the homeostatic balance in gastrointestinal tract in CKD is associated with the production of nephrotoxins (mainly urea, indoxyl sulfate, p-cresil sulfate, etc), which are introduced to the systemic circulation, contributing to systemic inflammation, and possibly to the progression of CKD

Systemic inflammation and uraemic toxins play a central role in the pathophysiology of atherosclerosis, as well as in other complications associated with CKD, and it is suggested a role of bacterial metabolites (from probiotics) in the gut, as potential uremic toxins modulators, reducing the progression of CKD and associated uremia.

Probiotics are defined as "living micro-organisms" that, being administered in adequate amounts, provide a health benefit to the host. Recently, it has ben demostranted the potential benefits of probiotics in CKD. They have been shown to be associated with a change in small bowel pathobiology by modifying the metabolic actions of small bowel bacterial overgrowth, reducing the generation of toxins and carcinogens and promoting nutrition with no adverse side effects

The efficacy of using different types of probiotics at different doses with the aim to reduce levels of uraemic toxins and to delay the progression of CKD has been investigated in in vitro models, animal models and in patients with CKD. However, to date, there are no large-scale intervention studies and studies on clinical events to support their widespread use. There are only small studies, most of which, observe a decrease in uraemic toxin levels like urea.

We recently demonstrated in a randomised trial in 30 patients KDIGO 3 and 4 stages of CKD, that there was a decrease in serum urea level greater than 10% after a conventional dietetic treatment plus a probiotic (lactobacillus casei shirota) in a dose of 6 x 109 CFU.

Based on the results obtained to date, it can be concluded that further investigations on the effects and adequate doses are necessary to prevent and help minimize the production of uremic toxins in CKD patients.

Keywords: Urea, probiotics, doses, chronic kidney disease, inflammation

FODMAP, SIBO and gut microbiome

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The gut ecosystem is complex and contingent upon multiple factors, diet is of relevance because it can induce rapid changes within 1-2 weeks in gut microbiota composition and function. Production of gut derived metabolites from diet is limited by the composition of the gut microbiota. Fermentable oligosaccharides, disaccharides, monosaccharides and polyols (FODMAPs), short-chain carbohydrates that are poorly absorbed by the small intestines. An increasing body of research shows that these food molecules trigger symptoms of IBS and some other digestive disorders such as small intestine bacterial overgrowth (SIBO). Because these food molecules are not properly absorbed, they transpire in the large intestine, where bacteria that live in the gut feed on them and then produce gas byproducts, namely hydrogen and methane. However, a diet low in FODMAPs appears to alleviate many of these problems. Plant based fiber, undigested protein, fat and carbohydrates influence the composition and metabolic activity of the microbiome. Agrarian diets high in fruit/legume fiber associated with increase in microbial diversity, whereas Western diet is associated with a decrease of beneficial Firmucutes and increase of Proteobacteria. Diet plays a role in microbiota but may be constrained by other factors: Gut microbiota likely differs in globally distinct populations. Low-FODMAP diet reduces beneficial probiotic microbiota and increases fecal pH, long-term impact is unknown.

Keywords: Gut microbiome, Small intestinal bacterial overgrowth, Irritable bowel syndrome, Low-FODMAP diet, probiotics.

PRACTICAL ISSUES IN NUTRITION INTERVENTION IN CANCER PATIENTS

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Cancer is a public health problem that leads to malnutrition. There is enough evidence to show that 40% of hospitalized patients with cancer are malnourished or with high risk of becoming malnourished, because of the tumor itself and symptoms like nausea, vomiting, decreased appetite, and early satiety that leads to unintentional weight loss.

This specific type of malnutrition is known as cancer-cachexia. This is a concept that has evolved over the years, however it is not until 2011 that K Fearon et al. published an expert consensus that standardized the definition and classification of this condition. The consensus defined cachexia as a "multifactorial syndrome defined by an ongoing loss of skeletal muscle mass (with or without loss of fat mass) that cannot be reversed by conventional nutritional support and leads to progressive functional impairment".

Cachexia was divided also into stages ranging from the early weight loss to death. These stages are known as precachexia. Cachexia and refractory cachexia. It is necessary to know the definitions of each stage because it has been observed in recent studies that if nutritional support is provided until advanced stages of cachexia, there is no nutritional therapy. On the other hand, early nutritional interventions are the best choice of nutritional support in cancer patients. Because of this, early nutritional risk detection is required at the time of cancer diagnosis or from hospital admission to prevent the development of cachexia.

With this background, we have developed many research studies in Mexico City General Hospital, that are aimed to: determining nutritional and body composition in cancer patients at the diagnosis, before and after surgical treatments; to detect patients at nutritional risk; to know the effect of some specific nutrient therapies on inflammatory processes and oxidative stress in cancer patients; as well as the effects of standardized and specialized nutritional therapies and its effect on survival. All the strategies above are daily focused on the detection of nutritional risk and nutritional treatment of patients with cancer in the clinical nutrition service that we have also developed tertiary level in a public hospital in Mexico City.

More specifically, our studies showed that malnutrition is still highly prevalent in oncology patients. We found that cancer patients that started nutritional treatment on time had better outcomes and tolerance to oncology treatments. Supplementation with antioxidants in cervical cancer patients showed a significant effect on hemoglobin levels conservation, quality of life and it had not effect cancer recurrence. On the other hand, omega-3 fatty acids supplementation with EPA can regulate inflammation in head and neck cancer patients and leads to maintain their body composition and weight until the end of the antineoplastic treatment.

Keywords: Cancer, clinical trials, nutrition

ADVANCES IN DIABETES NUTRITION THERAPY

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Medical nutrition therapy (MNT) is essential for the optimal management of people living with diabetes (PWD). MNT is associated with the improvement of values of HbA1c 0.3-1% for patients with type 1 diabetes and 0.5-2% for type 2 diabetes, particularly in newly diagnosed patients or those who had HbA1c levels greater than 8%.

Different percentages of macronutrient distribution have been evaluated for diabetes prevention and treatment, however, there is

no consensus of an ideal percentage for PWD. Therefore macronutrient distribution should be individualized, based on preferences, weight and metabolic goals. In a systematic review, non-significant differences were found in HbA1c and other metabolic parameters between a different amount of carbohydrate (from 39% to 57%), protein (0.8-2.0 g/kg/d) and fat (from 27% to 40%) intake. PWD taking MNT alone or those who do not follow an intensive insulin therapy should be encouraged to comply to a consistent pattern of carbohydate intake with respect to time and amount (basic carbohydrate counting). On the other hand, patients on intensive insulin therapy or with insulin pump therapy should be trained on advanced carbohydrate counting, since this strategy has been effective for lowering HbA1c levels on a long-term follow-up (12 months), besides increasing the quality of life despite more insulin injections. Refined carbohydrates and added sugars should be replaced with whole grains, vegetables, legumes, fruits and non-fat dairy. Non-nutritive sweeteners could be utilized instead of caloric sweeteners to reduce overall calories, as long as the total daily intake is not affected. Regarding protein intake, there was a non-significant difference in the glomerular filtration rate reduction with an ingestion of 0.7 to 2 g/kg/day in PWD. In terms of fat intake, a diet rich in monounsaturated fats may reduce cardiovascular risk on a long term basis, replacing a low fat/high carbohydrate diet. N-3 fatty acids showed nonsignificant benefits on metabolic levels, particulary on glucose, however there was a significant reduction in tryglycerides in patients with hypertrygliceridemia. The promotion of adequate eating patterns, like Mediterranean, DASH or plant-based diets, has a greater impact than the prescription of particular food or nutrients.

Nutritional strategies, such as portion control, the plate method, sample menus, carbohydrate counting, exchange list, food lists, simplify plan and goal establishment should be used based on patient´s needs, preferences, food access, health literacy and numeracy, motivation and barriers to change. Identifying and reducing this barriers is essential for the implementation of a more accurate educational strategy. At the Center for Comprehensive Care of the Patient with Diabetes (CAIPaDi) the identification of barriers to MNT adherence at baseline, the use of a nutritional simplified plan and baby steps strategies based on the identified barriers have shown statistical significance in the reduction of calorie consumption, weight and waist circumference after 3 months.

Keywords: Diabetes, medical nutrition therapy, CAIPaDi, barriers

TRENDS AND PRACTICE IN CLINICAL NUTRITION

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Nutritional Sciences include nutrition processes as well as food components, their actions, interaction and balance in conjunction with health and disease. The applications of nutrition science relate to integrated human biology systems that gradually become adjusted in the way a person changes qualitatively or quantitatively over time.

The advance in the knowledge about the role of nutrients in different clinical pictures is continuous and not exempt from controversies (glutamine, arginine, fatty acids, antioxidants), which opens an enriching debate in search of a closer approximation to its functions, beyond the solely fact of offering a nutrition approach. This situation forces the professional in nutrition sciences to be prepared in depth in various fields such as modulation of inflammation and immunity, control of oxidative stress, and aging among others.

If we focus our knowledge on metabolic diseases related to nutrition, it is necessary to take into account the environment to provide a specific and individualized nutritional therapy. It has been insufficient to only intervene on the main conventional environmental factors that contribute to the development of these chronic diseases (obesity, type 2 diabetes, many cancers) which include lack of physical activity, a sedentary lifestyle, unhealthy eating habits, availability of very cheap foods, large portion sizes, high levels of refined carbohydrates, calorically dense foods, and consumption of saturated fats.

A broader view of environmental exposure is needed beyond conventional risk behaviors to discover the main causes of chronic diseases, not only the ones occurring in the external environment, but also those that impact internally, integrating a conceptual framework of a series of measurable biological events secondary to the environment, which directly cause inflammation, oxidative stress, lipid peroxidation, infections, alterations in the gut microbiota, causally associated with prominent classes of endocrine disruptors, immune response modulators, and agents that bind to cellular receptors.

Exposures to these agents can be monitored in the blood either by direct measurement or by looking for their effects on physiological processes such as metabolism. These processes influenced by the external environment generate products that serve as molecular signatures and biomarkers in the blood. Therefore, an extension of the current generation of biomarkers could have a crucial role to play in a specific diagnostic profile from the internal environment that would be causally associated with the external environment.

On the other hand, the functional components of foods may have a great impact on the incidence and treatment of multiple diseases. The nutritional message must be widely communicated: we need extensive research on phytochemicals and chemoprotective functional food ingredients that can regulate inflammation, oxidative stress and lipid peroxidation.

In conclusion, it is our responsibility to deepen the knowledge of areas related to nutrition in order to offer in the near future a more precise and individualized preventive care.

Keywords: Nutritional Sciences, Trends, Evidence-Based Practice, Clinical medicine

VITAMIN C – ARE CURRENT RECOMMENDATIONS SUFFICIENT?

WHAT IS THE OPTIMUM INTAKE OF VITAMIN C?

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Historically, recommended dietary allowances (RDAs) for vitamin C were based on prevention of the deficiency disease scurvy. Now, more countries are basing their recommended intakes on antioxidant and other putative health effects of vitamin C as well as on biochemical markers of these. However, whether these recommendations provide optimal intakes of vitamin C is uncertain because of the difficulty in defining the 'optimal intake'. Vitamin C intakes which provide plasma saturation (i.e. ~200 mg/d) are considered optimal by some researchers. Although intakes of ~100 mg/d are sufficient to saturate white blood cells, we have found that muscle tissue vitamin C levels continue to rise with increasing intakes up to plasma saturation. Large population-based surveys in Europe and North America have provided insights into the normal dietary intakes and plasma levels of these cohorts, as well as the prevalence of hypovitaminosis C (i.e. <23 μmol/L) and deficiency (i.e. <11 μmol/L). Some countries have higher recommended dietary intakes for smokers and pregnant women due to their increased requirements for vitamin C. We, and others, have also shown that individuals with hypovitaminosis C have higher requirements for vitamin C, likely due to depleted tissue status. Clearly a 'one size fits all' intake recommendation is complicated by numerous confounding factors. This talk outlines various ways of determining the optimum intake of vitamin C.

Keywords: Vitamin C, hypovitaminosis C, dietary intakes, plasma status, RDAs

BIOMARKERS FOR VITAMIN C REQUIREMENT

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Intake recommendations for vitamin C are currently defined using markers for status, as no suitable functional biomarker has as yet been identified. There are different functional biomarkers for Vitamin C but up to now, no one was identified that could be used as a basis to define dietary intake recommendations for vitamin C. Emerging evidence support neutrophil motility as such a functional biomarker. A recent in vitro study showed that adequate levels of vitamin C were needed for this function to work optimally when measured as chemotaxis and chemokinesis. Furthermore, in a human intervention study with healthy subjects, neutrophil motility was optimal at intakes at ~250 mg/d.

These findings are supported by established knowledge including a Cochrane review which showed a significant reduction in the duration of episodes of common cold in children as well as in adults with regular vitamin C intakes in a similar range. This is in line with human kinetic studies where plasma saturation was reached with 200 mg/ day and also the related vitamin C transporters reached their maximum at this dose. Additionally, in observational studies it was shown that at plasma level of 75 μmol/L, which can be reached with vitamin C intakes of ≥200 mg/d, incidences of cardiovascular disease were lowest. A relationship between vitamin C concentration, severity of atherosclerosis and inflammation in peripheral artery disease patients could be shown.

However, additional studies are needed to investigate further the reliability and accuracy of neutrophil motility as a functional marker of vitamin C dependent immune function. Given the number of people affected by common cold, cardiovascular disease and others, defining recommendations with the highest risk reduction for these diseases is of paramount importance.

The evidence would suggest that daily intakes of 200 mg vitamin C might be advisable for the general adult population, which can be achieved by means of a diverse diet.

Keywords: Vitamin C; ascorbic acid; dietary reference value; immune function; neutrophil motility

Conflict of Interest disclosure: All authors are employed by DSM Nutritional Products Ltd., a bulk producer of vitamins.

THE PHARMACOKINETICS OF VITAMIN C

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Vitamin C is a low molecular weight water soluble antioxidant vital to human health. Vitamin C homeostasis is tightly controlled by the body and sophisticated ways of preserving and allocating the body's ascorbate resources to organs in need has evolved including ascorbate recycling and tissue specific accumulation and retainment. Vitamin C pharmacokinetics differs markedly from that of an average drug in that vitamin C e.g. follows complex saturation kinetics and is subjected to active reabsorption in the kidneys at physiological levels. The lack of acknowledgment of these and other factors have led to poorly designed and misinterpreted human intervention studies that expectedly have shown no effect of vitamin C supplementation. The present talk outlines the pharmacokinetics of vitamin C and how it impacts the proper design of intervention studies with vitamin C.

Keywords: Vitamin C; distribution; pharmacokinetics; trials

VITAMIN C RECOMMENDATIONS: PHARMACOKINETICS AND FUNCTION

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Vitamin C (ascorbic acid) Recommended Dietary Allowances have two foundations: pharmacokinetics, and function in relation to in vivo concentration. Human pharmacokinetics data for ascorbic acid are more detailed than for nearly all other vitamins. Such pharmacokinetics data have substantial value. For ascorbic acid, pharmacokinetics data reveal that with oral dosing ascorbic acid plasma concentrations are tightly controlled. At least four mechanisms are responsible: intestinal absorption, or bioavailability; tissue transport: renal reabsorption/excretion; and utilization in vivo. At doses between 100-200 mg daily: intestinal absorption is near maximum; tissue transport is close to saturation; and renal excretion is close to estimated threshold. Utilization data, though often indirect, suggest that accelerated ascorbate utilization occurs in some diseases such as sepsis or in critically ill patients. Pharmacokinetics data also show that tight control is by-passed with intravenous administration of ascorbic acid as a drug. Intravenous ascorbic acid administration, as a function of dose given, produces pharmacologic concentrations. These concentrations have promising efficacy in cancer treatment, including studies in humans, with minimal side effects. Applicability of pharmacologic ascorbate in cancer therapy and in critically ill patients would not have been apparent without the foundation of pharmacokinetics. To date, there are few datasets linking ascorbate function in vivo to its concentration in vivo. For this reason, in vitro functional data with human neutrophils are used to characterize ascorbate function in relation to its concentration. These data have limitations. In vivo functional assessments, endpoints, or validated biomarkers are needed to improve accuracy of recommended dietary allowance recommendations for ascorbate, and for other vitamins.

Keywords: Vitamin C, ascorbic acid, recommendations, pharmacokinetics

MEANING OF LINEAR GROWTH: APPROPRIATE USE OF GROWTH AS A MEASURE IN DEVELOPMENT

BIOLOGY OF LINEAR GROWTH: PROCESSES AND NUTRITIONAL, HORMONAL, AND INFLAMMATORY DETERMINANTS

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Longitudinal studies of humans document that suboptimal nutrition during early life has long-term consequences on skeletal size. This outcome is highly dependent on the developmental age when the insult is experienced. Nutrition acts at the individual's cellular level: individuals consume nutrients and these translate to growth through a system of cell-level processes. Understanding the specific cellular events responsible for skeletal growth and development is essential in order to identify the critical periods during which the organism is at- risk for growth perturbation and intervention. Skeletal growth regulation takes place within distinctive anatomical sites during individually-specific time frames. This involves molecular mechanisms acting at sequential life cycle stages of the cells responsible for bone elongation at the site of long bone growth, the endochondral growth plate. Extracellular cues regarding energetic status and constituent availability are translated by intracellular signaling pathways to influence regulatory networks at cellular control points governing bone elongation and maturation. Nutrients influence this cascade as the source of both the necessary substrates and extracellular cues which regulate the signal transduction pathways that control anabolic processes. Moreover, while the limiting resource for growth is generally viewed to be a direct reflection of energy availability, other mechanisms that reflect nutritional influences include the allocation of common precursor cells to the chondrocytic lineage, osteoblast-specific cellular bioenergetics, and downstream hormonal and cytokine effects. When these developmental phases are perturbed, skeletal growth deficits occur that may or may not be entirely recoverable.

Keywords: Bone growth, endochondral bone, critical period

HISTORY OF USING OF GROWTH AS A MEASURE OF HEALTHY CHILD DEVELOPMENT

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The growth curve is a fundamental tool that allows length and height measures to be used to ascertain whether healthy child growth and thus development is occurring at an individual or population level. The growth curve displays the size of a child over time while also visualizing how the growth velocity varies at different stages based on the steepness of the curve along different parts of

the trajectory. The first child height curve was published in the 18th century in George Buffon's Histoire Naturelle, using a chart developed by Count Philibert de Montbeillard who plotted his son's height every six months from birth to age 18 years. Since then, growth charts have expanded in scope to cover growth patterns of groups of children, becoming an important tool in child health screening. The United States developed growth reference charts using data from their National Health and Nutrition Examination Surveys that could be used to establish whether the growth of other individuals or groups of individuals were typical of the reference group. This growth reference was adopted by WHO in 1977 and used to monitor child growth and health globally for the next 30 years at regional, sub-regional, and national levels. As the US-based growth reference had a number of technical and biological limitations, including a large percentage of non-breastfed and formula-fed infants, WHO embarked on development of growth standards of children 0-5 years of age which represents how children should grow if exposed to optimal conditions while in utero and after birth. Data were collected from 6 countries (Brazil, Ghana, India, Norway, Oman, and the United States), for the development of the sex-specific growth standards and were published in 2006.

Since their publication, over 150 countries have adopted the WHO Growth Standards and use them as the basis for clinical screening of an individual child's growth and also to summarize the proportion of children in a population suffering from suboptimal growth. The use of one set of standards helps compare prevalence of malnutrition across countries, highlight populations at greatest need of intervention, and assess progress towards global goals such as the Sustainable Development Goals. The availability of standards for growth velocity has provided an additional way of assessing how well children are growing.

The standard tool for measuring child length and height has been a stadiometer, and while it serves the purpose of a calibrated piece of equipment, measurement error has been found in both clinical- and population-based applications, largely related to the proper positioning of small children who can be reluctant subjects. Looking forward, as various groups are working on the development of alternative tools to assess length and height, many of which are tablet-based and do not require any specific positioning of the child, there is potential for minimizing error and also for improved usability of the data.

Keywords: Height, length, measurement, growth standards
Further collaborators: Edward Frongillo Jr.

THE MEANING OF LINEAR GROWTH: DIFFERENTIATING GROWTH AS A CAUSE VS. A MARKER OF OTHER OUTCOMES

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The prevention of undernutrition is receiving unprecedented global attention. Undernutrition during early life has severe con-sequences, not only in infancy and childhood, but also during adulthood. Malnourished infants and young children are at increased risk of illness and death, and are also more likely to experience physical, cognitive, educational, and productivity deficits as adults. Much of the focus of this global effort is on reducing the prevalence of stunted linear growth (target 2.2 of the Sustainable Development Goals). Linear growth retardation is associated with a number of undesirable short-term (such as delays in cognitive development), medium-term (lower school achievement), and long-term outcomes (lower earnings and a higher probability of non-communicable chronic diseases at adulthood).

Our presentation will explain how these associations in combination with the focus on linear growth as a development target has created the impression that short stature is causally linked to these physical, cognitive, educational, and productivity outcomes and how it has created the false expectation that any intervention aimed at improving linear growth retardation (or reducing stunting) will subsequently lead to improvements in these outcomes. We will show how this misunderstanding appears to have contributed to two recent developments: the focus on aflatoxin exposure as a determinant of linear growth retardation and the renewed interest in catch-up growth. We will conclude with a framework that clearly differentiates between two key uses of linear growth: as an indicator or marker (reflective of the past or predicting future outcomes) and as an outcome in its own right.

Keywords: Child growth; stunting; marker; catch-up; aflatoxin

APPROPRIATE USE OF LINEAR GROWTH AS A MEASURE IN DEVELOPMENT

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Early undernutrition results in risk of illness and death as well as physical, cognitive, educational, and productivity deficits later in life. Much of the current attention on undernutrition focuses on reducing stunting. This focus on linear growth in development reinforces the view that short stature is causally linked to both short- and long-term physical, cognitive, educational, and productivity outcomes, leading in turn to expectations that interventions aimed at reducing stunting through prevention of linear growth deficits will lead to improvements in negative consequences of undernutrition.

The nutrition development community has been confronting two related challenges. First, many studies report small or no intervention effects on reducing stunting, while sometimes reporting noticeable secular changes in linear growth over time. Second, the emphasis on nutrition-sensitive as well as nutrition-specific interventions leads to questioning whether linear growth is an appropriate primary outcome to measure.

About forty years ago it was established that well-nourished children throughout the world grew similarly on average. This equivalence provided a basis for using the assessment of children's

growth status for global and national monitoring of population well-being. The 1987 First Report of the World Nutrition Situation by the United Nations Subcommittee on Nutrition used child underweight prevalence, and ten years later sufficient data were available for the Third Report to use stunting prevalence. Use of stunting prevalence is appropriate for the purpose of monitoring changes in child growth status at the population level, but not necessarily for other purposes such as assessing whether interventions have made a difference. Nutrition interventions may reach and impact children, but may not impact length growth deficits in a short period.

Child linear growth depends on both the prenatal and post-natal environment, with the post-natal environment influencing growth through nutritional intake and exposure to infection, which in turn result from food security, care of children, and health services and environment. Child growth status is thus associated with child nutritional status, but it is not the same as nutritional status. That is, length growth is a marker of nutrition useful for some purposes, but is not nutrition. Furthermore, children grow through complex biological mechanisms that unfold daily and are only partially understood. Partial restoration of lost growth is sometimes possible when constraints are removed, but it is not clear if this is important. Some claims made that catch-up growth of children can occur are based on misunderstanding of both the concept of catch-up growth and analytic inference.

Interventions intended to have impact on one domain may have positive or negative impact on others, so impact evaluations should use a broad set of health, nutrition, and development measures and indicators. Furthermore, measures for immediate and underlying determinants should be included, e.g., breastfeeding, complementary feeding, and food processing; caregiving; and hygiene and home health. There is need to develop, refine, and validate measures and indicators for evaluation purposes, e.g., validation of child-development measures in low- and middle-income countries and development of innovative markers of child development.

Keywords: Growth, children, nutrition, interventions, evaluation

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PS_144/120
IMMUNONUTRITION IN HEALTH AND DISEASE: ROLE OF BIOACTIVE COMPOUNDS

FATTY ACIDS: MASTER CONTROLLERS OF INFLAMMATION

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Inflammation is a normal response being part of host defence and initiating tissue repair. However, where inflammation is excessive or uncontrolled, tissue damage, metabolic changes and pathology can result. Indeed, chronic inflammation is the central component of many human diseases including rheumatoid arthritis, inflammatory bowel disease and asthma. Chronic low grade inflammation is now recognised to be a component of lifestyle diseases like obesity, type 2 diabetes and atherosclerosis. Both high and low grade inflammation may result from failure of resolution mechanisms. Fatty acids can regulate inflammatory processes, including resolution. Some saturated fatty acids have been shown to trigger inflammation by stimulating known pro-inflammatory receptors like toll-like receptor 4. Cells involved in inflammation typically contain a relatively high amount of the omega-6 fatty acid arachidonic acid, which is a precursor of pro-inflammatory eicosanoids like prostaglandin E2 and leukotriene B4. The omega-3 fatty acids EPA and DHA are readily incorporated into inflammatory cells in a dose dependent manner. They can modify the function of inflammatory cells through multiple mechanisms that ultimately involve altered patterns of gene expression and altered patterns of production of lipid and peptide mediators. These include decreased production of pro-inflammatory eicosanoids and cytokines and increased production of pro-resolving mediators like resolvins and protectins. Through these effects, EPA and DHA can affect inflammatory cell responses and inflammatory processes and they act to counter the effects of saturated fatty acids, omega-6 fatty acids, and classic inflammatory stimuli (e.g. LPS). The anti-inflammatory and inflammation resolving effects of EPA and DHA are clinically relevant.

Keywords: Omega-3, Inflammation, Lipid mediator, Cytokine

INMUNOMODULATION BY PROBIOTICS AND FERMENTED MILKS IN HEALTHY AND SICK SUBJECTS

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The immune stimulation by probiotics and fermented milk containing probiotic bacteria(PFM) administered to healthy host, induce a network of signals: a) stimulation of the intestinal epithelial cells(IEC) and the immune cells associated to the lamina propria, these facts are, induced by bacteria adhesion or by their cell wall fragments stimulating the epithelial and the immune cells to activate mainly the innate response b) The IEC induce the production of different cytokines and chemokines able to send signals to the immune cells of the lamina propria inducing an increase in different markers of activation with the release of cytokines, which will contribute to the Mucosal Immune System(MIS) activation c) induce also activation of the adaptative response at local and systemic levels, with an increase in the specific secretory IgA (S-IgA) and specific IgG antibody respectively .

In sick host we demonstrated their effectiveness in the anti-inflammatory process such as enteric infections, and in allergy. In malnutrition models (under nutrition and obesity) we observed an improvement in the histology of intestine and thymus with an improvements in the Immune System functionality. We demon-

strated the anti-inflammatory effect of yogurt in IBD model, where we observed a decrease mainly in the inflammatory cytokine IL17. We also analyze the effect of yogurt in another model of chronic inflammation as obesity .In this study, we compared the effect of conventional yogurt and one containing probiotic bifidobacteria. We demonstrate the anti-inflammatory effect of both yogurts by decreasing of proinflammatory cytokines

What would be the biological significance of these observations: 1) that the innate response that is key in host defense is able to be influenced by probiotics and fermented milk 2) that probiotic strains, LFP or yogurt have an important role in the mechanisms of the immune surveillance

We conclude that probiotic strains, PFM and yogurt have an important role in the functionality of the MIS and in the immune surveillance, through the mechanisms of immunoregulation

Keywords: Immunomodulation , Probiotic ,Fermented Milk

DO DIETARY PATTERNS INFLUENCE PRO-INFLAMMATORY-DERIVED CYTOKINES LEVELS IN HEALTHY ADOLESCENTS? FINDINGS FROM A POPULATION-BASED STUDY OF ADOLESCENTS IN MALAYSIA

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Background and objectives: The aims of the present study was to investigate the influence of dietary patterns on blood pro-Inflammatory-derived cytokines of tumor necrosis factor-alpha levels (TNF-a) and also to examine whether such influence was mediated by adiposity levels, assessed by anthropometry and dual-energy X-ray absorptiometry (DXA) device assessments, among 413 apparently healthy adolescent boys and girls aged 12 to 19 y. Methods: A validated food frequency questionnaire was used to assess dietary food patterns, in which three dietary food patterns were identified based on the principal component analysis method. Blood pro-inflammatory-derived cytokines of TNF-a was assessed by the ELISA assay method. Results: Three dietary patterns were identified namely, healthy-based food pattern, western-based and local-based food pattern. Higher scores of healthy-based dietary pattern, characterised by high intakes of vegetables, fruit, dairy products, nut and cereal-based foods, was significantly associated with lower concentrations of serum TNF-a after adjustment for age, race, gender, pubertal growth status, and moderate-to-vigorous physical activity levels. Even further adjustment for DXA-derived adiposity indices in the analysis models, adolescents with higher intakes of healthy-based food pattern had significantly lower serum blood pro-Inflammatory of TNF-a levels. On the contrary, neither western-based food pattern nor local-based food pattern was significantly associated with serum TNF-a levels. Conclusion: Intakes of healthy-based food pattern that is characterised by higher levels of vegetables, fruit, dairy products, nut and cereal-based foods was independently associated with lowering pro-inflammatory marker of TNF-a levels in the blood. This find-ing suggests that lower intakes of healthy-based food pattern may contribute directly to the development of low-grade inflammation in these adolescents during these critical years of growth.

Keywords: Dietary patterns, pro-Inflammatory-derived cytokines, inflammation, Adolescents

PS_144/147
THE IMPORTANCE OF PROTEIN FOR SUPPORTING HEALTH IN AN AGING SOCIETY

HOW TO TACKLE PROTEIN AND ENERGY MALNUTRITION IN THE ELDERLY

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Now in Japan, we have seen an increase in the life expectancy, and the number of aged citizens is still increasing. In order to promote a society where the citizens can maintain an independent lifestyle even at an advanced age and expect a healthy life expectancy, without the need for nursing care due to physical dysfunction, attention has been focused recently on the importance of the relationship between physical dysfunction in the future and the prevention of frailty and sarcopenia. The target of these preventive measures is the skeletal muscle, and the goal is the maintenance of the skeletal muscle and structure. Due to the strong relationship between the skeletal muscle mass, muscular strength and physical functions with protein intake, attention has been drawn to the importance of protein. Compared with normal adults, in the elderly the protein synthesis in the skeletal muscle induced after a meal (after protein intake), shows a relatively reduced reactivity and some reports have indicated the presence of synthesis-resistant properties. Furthermore, some reports have indicated that, even if the essential amino acids required by the skeletal muscle in the elderly existed in the blood stream, the mammalian/mechanistic target of the rapamycin complex (mTORC) and the downstream signal activation were suppressed. In addition, some recent reports have indicated that the actual situation in the elderly is that the intake of protein is insufficient to maintain health.

Up to the present, estimates of the protein requirement have been obtained using the nitrogen balance method, which derives the final estimate of the protein requirement through a step by step method where the intake of protein in changed in each step. However, the estimates of the protein requirement calculated using the nitrogen balance method showed a tendency for underestimated values. In 2007, a new method for estimates of the protein requirement was reported, called the indicator amino acid oxidation method. According to this new estimation method, the estimated protein requirement was 1.3 - 1.5 times that obtained by the previous method. Especially, for the elderly, the new estimates were almost the same as the estimates for the protein requirement for schoolchildren. Thus, for the elderly, we consider that it is im-

portant to promote "more protein intake and the intake of good protein."

Keywords: Protein requirement, nitrogen balance method, indicator amino acid oxidation method, frailty, elderly

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DELICIOUSNESS, A STRATEGY FOR COMPLIANCE OF HIGH PROTEIN DIETS

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It is well known that there are more than 10, 000 kinds of proteins in our body which are parts of tissues such as muscle, liver, heart, bone, hair, skin and brain, and lots of enzymes and hormones and so on. These body proteins are periodically renewed as protein metabolism to keep our health. Food proteins are resources for the newly synthesized protein in metabolism. Therefore, the taking food protein in daily meal plays an important role in keeping our health. In Japan, 60 grams and 50 grams of proteins are recommended to take from foods every day for male and female in adults (over 18 years old), respectively. Recently, old people over 65 years old are also recommended to take the same amount of proteins as young adults to prevent from sarcopenia caused by deficiency of muscle proteins. Especially, the essential amino acids are required for protein syntheses in body. Since these amino acids are not able to be synthesized in our body, they are supplied from food proteins.

It is well known that meats, fishes, milk products, eggs and soy bean in foods contains high amount of proteins. For example, roast beef loin, roast pork loin, roast chicken breast meat, and boiled soy bean 20.4, 26.7, 34.7 and 14.8 grams of protein in 100 grams of foods, respectively. Furthermore, these foods also have the well-balanced essential amino acids. Therefore, these stuffs should be supplied in daily meal.

Among these foods, meats are very popular as a delicious food. Although there are many factors to decide deliciousness of foods, taste, aroma and texture play a very important role in deliciousness of meats. In general, more-flavored and tender meats are recommended to be delicious ones. These qualities of meats are generated during post-mortem aging after slaughter. The meats immediately after slaughter are tough because of rigor mortis, and have less meat flavor. However, during storage, meats become tenderer, because structure of meats has loose by the action of proteases such as calpain and cathepsins. The more flavor in stored meats is generated by Maillard reaction between free amino acids and sugars, leading that in general, the conditioned meats are more delicious. Recently, it has been found that umami substances such as glutamic acid and inosinate that increase during storage of meats play an important role in improvement of deliciousness in meats. They can enhance the intensity of retronasal aroma sensation of meats after putting meats into mouth. This effect leads to the deliciousness of the conditioned meats. The fat of meat has also been found to play an important role in deliciousness, because fats can hold aroma compounds of meats and give us continuity of aroma sensation. This is one of the reasons why the meat of Japanese black cattle is so delicious.

In this presentation, I would like to explain the importance of taking meats in daily meal to keep health and the deliciousness of meats.

Keywords: Meat, protein, health, deliciousness

LIFE STAGE MANAGEMENT OF AMINO ACID NUTRITION

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Amino acids (AA) are structural and functional units of proteins. Based on nitrogen balance and growth, AAs have been classified into 9 indispensable (IAA) and 11 dispensable AAs which can be synthesized from IAA via various metabolic pathways. The latest FAO/WHO/UNU Expert's report in 2007 on protein and AA in human nutrition has estimated AAs requirement for infants during the first six months of life based on breast milk contents of protein and AAs. For older infants up to adolescents the AA requirements are based on the combination of AAs required for maintenance and for growth. For adults, the main criteria used is the AA oxidation resulting in higher requirement recommendations for all indispensable AAs with noticeable 2-3 times higher in lysine, threonine, isoleucine, leucine and valine requirements compared to the previous recommendation in 1985 which was based on N-balance criteria. It is recommended that the AA requirement pattern and also protein need of 0.8 g protein kg/day for elderly people are the same as that for adults.

Protein intake to fulfil requirement and de novo formation of AAs will provide adequate "Amino acid pool" for metabolic and other functions of AAs for good nutrition and wellbeing. Those functions include: protein synthesis and maintenance of protein synthesis machinery, DNA and RNA synthesis, taste and appetite, hormonal functions, neurological and immune functions, regulations of various metabolic functions, and source of energy such as branch chain AAs and alanine. With better understanding of AA requirements, roles of AAs in metabolism and body functions in both normal and illness conditions and the ability to produce industrially of various AAs, the AAs have been used for enteral and parenteral products for treatment of several inherited metabolic diseases and seriously ill patients who need nutritional support. Specific AA has been used for food fortification such as lysine and threonine to improve protein quality in food and feed, glutamate

for taste enhancement, BCAA for athlete and sport. Nutritionally it is quite remarkable to witness the progress in AA science, metabolism, production and utilization to fulfil AA requirements and functions in human life course.

Keywords: Amino acid nutrition

THE ROLE OF LEUCINE IN OBESITY-INDUCED METABOLIC DISORDERS

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The prevalence of obesity (body mass index ≥30 kg/m2) has increased in many regions of the world over the past decade because of multiple factors, including individual genotypes, excessive energy intake, sedentary lifestyles, and reduced energy expenditure. Obesity, especially the central or visceral type, is a predisposing factor for the development of type 2 diabetes mellitus. This disease manifests as insulin resistance and multiple metabolic disorders, including hyperinsulinemia, impaired glucose tolerance, and dyslipidemia as risk factors for the development of cardiovascular diseases. In both humans and animals, a common characteristic of obesity is a marked elevation in the concentrations of leucine, one of the branched-chain amino acids (BCAAs), in plasma. Of interest, a 22% increase in the concentration of leucine in plasma is associated with insulin resistance and cardiovascular dysfunction in obese subjects. Reduced rates of leucine degradation via multiple organs including skeletal muscle, heart, adipose tissue and kidneys, may contribute to hyperleucinemia in obesity. Leucine is an activator of glutamine:fructose-6-phosphate aminotransferase (GFAT), which is the first and a rate-controlling enzyme in catalyzing the synthesis of glucosamine (an inhibitor of endothelial NO synthesis) in endothelial cells. In addition, through stimulating the mammalian target of rapamycin signaling pathway and thus protein synthesis, leucine may enhance GFAT protein expression. Thus, among BCAAs, leucine is unique in inhibiting the synthesis of nitric oxide (NO, a major vasodilator and a mediator of insulin actions in skeletal muscle) from arginine in endothelial cells, and may modulate cardiovascular homeostasis via insulin resistance. In support of this view, dietary supplementation with BCAAs has been reported to promote the development of insulin resistance in both rats and humans. Conversely, reducing the circulating levels of L-leucine or endothelial GFAT activity may provide a potentially novel strategy for preventing and/or treating cardiovascular disease in obese and diabetic subjects. Such means may include: (1) dietary supplementation with (a) α-ketoglutarate to enhance BCAA catabolism in the small intestine and other tissues, (b) N-ethyl-L-glutamine to inhibit GFAT activity in endothelial cells, and (c) arginine to overcome the inhibitory effect of leucine on endothelial NO synthesis; and (2) oral administration of interferon tau, an inhibitor of oxidative stress. Preventing leucine-induced activation and expression of GFAT by nutritional supplements or pharmaceutical drugs may help to ameliorate the metabolic syndrome in obese subjects. In conclusion, leucine is a biomarker of metabolic defects in obesity, and lowering its concentrations in blood may improve NO generation by the vasculature and enhance the sensitivity of tissues (such as skeletal muscle, heart, liver, and adipose tissue) to insulin. (Supported by AHA and NIH grants).

Keywords: Branched-chain amino acids, nitric oxide, obesity

PS_144/114
NEW TOOLS FOR NUTRITIONAL ASSESSMENT IN EARLY LIFE: HOW TO MANAGE THEM

GESTATIONAL WEIGHT GAIN STANDARDS IN THE INTERGROWTH 21ST PROJECT: IMPLICATION TO POLICY MAKERS

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The aim of this abstract is to describe the methodology of the INTERGROWTH-21st gestational weight gain (GWG) standard implementation on the Brazilian Health Unified System. This is a work in progress. The Intergrowth 21st GWG standard was constructed based on a prospective, longitudinal, multi-center study. The study was conducted on eight diverse urban regions in Brazil, China, India, Italy, Kenya, Oman, United Kingdom and United States. The sample comprised healthy, well-nourished women, enrolled in the Fetal Growth Longitudinal Study, a component of the INTERGROWTH-21st Study. Maternal weight was measured every 5 weeks starting with <14 weeks of gestation until delivery. A multi-level, mixed effect, linear regression analysis for repeated measures, adjusted for gestational age was employed to produce the GWG values. The standard was constructed for women with normal weight (body mass index (BMI) ≥18.50-24.99 kg/m2 at the first trimester. doi: https://doi.org/10.1136/bmj.i555. BMJ 2016;352:i555). A reference was also constructed for overweight women (25.0-29.99 kg/m2, not published yet). Smoothed GWG centiles were fitted for the 3rd, 10th, 25th, 50th, 75th, 90th, and 97th for each week of gestation. Additionally, equations for the mean and standard deviation to calculate any desired centiles according to gestational age can be found on the INTERGROWTH-21st dedicated website. The implementation of the INTERGROWTH-21st GWG standard on the Brazilian Health Unified System will be conducted in steps and has been organized as several sub-studies aimed to surpass several difficulties initially identified when the INTERGROWTH-21st GWG standard was released. The main technical issues comprise the lack of GWG data for the first trimester and for the extremes of the pre-gestational weight gain BMI distribution (<18.5 and ≥30 kg/m2). The first sub-study will comprise an extensive literature review dealing with (i) manuscripts that have tested the use of the INTERGROWTH-21st

GWG standard; (ii) manuscripts that have compared measured versus reported pre-gestational weight and (iii) manuscripts that discusses the first trimester GWG estimates. The second sub-study will comprise the validation of the INTERGROWTH-21st GWG standard. This component will focus on testing different cut-off points and ranges of GWG to predict selected maternal and infant outcomes, such as small for gestational age; large for gestational age, postpartum weight retention among others. A third sub-study will seek strategies to evaluate GWG on the extremes of the body mass index distribution. This component will look into for particular prospective cohort studies during pregnancy that may be meta-analyzed to produce GWG estimated for those BMIs not included on the INTERGROWTH-21st. A fourth sub-study will have as objective a reliability study between reported and measured pre-gestational weight. Finally, a fifth sub-study will deal with issues related to the first trimester GWG gain estimates. As a final product, we expect to be able to evaluate INTERGROWTH-21st validity and to assess how useful it can be as a tool to monitor GWG at the Brazilian Health Unified System and if this standard can be used as a substitute of the actual GWG monitoring system in place.

Keywords: Gestational weight gain; Intergrowth 21st; Policy makers; Standard; Surveillance

INTERGROWTH 21 ST PROJECT: WHAT IS NEW FOR NEWBORN ANTHROPOMETRIC ASSESSMENT?

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The impact of different situations in the early stages of life on infant development, cognitive development and the consequences of life, which is not enough to consider only the size of the child, but requires a broader assessment of the result of pregnancy. According to the need to optimize fetal development, the concept encompasses a broad set of considerations, such as: maternal health before and during pregnancy, duration of this, size of the neonate for gestational age and The possibility that fetal development has been disturbed or that the nutritional, physical and emotional factors of the infant's environment exist that maximize their ability to grow, develop and have a healthy life (WHO 2006)

INTERGROWTH-21st is an international, multicentre, population-based project consisting of a number of components, including the Fetal Growth Longitudinal Study (FGLS) and INTER-BIO- 21st Fetal Study (FS).

The INTERGROWTH-21st Project provides standards for early human growth based on populations that conform to the prescriptive approach recommended by WHO 21,52. By prescriptive, we mean we have observed a cohort of prospectively enrolled women whose risk of adverse maternal and perinatal outcomes (including fetal growth restriction) was low based on their individual clinical profiles and the socioeconomic and demographic characteristics of the underlying geographically diverse popula-

tions. In fact, the INTERGROWTH-21st Project is unique because it has produced, for the first time, fetal ultrasound, newborn size and preterm postnatal growth data set that have all been collected from the same underlying populations using the same rigorously applied methodologies.

Objective:To evaluate the birth weight of the Uruguayan children who participated in the National Survey of health, nutrition and development(ENDIS) in 2011 with Intergrowth project.

The information on weight and height of newborns in Uruguay extracted from a representative sample of 3000 children under 4 years old was processed by the information from the 21 st intergrowth Project. This project used information from the same countries of the new anthropometric references of children under 6 years of WHO. And the exclusion criteria in that Project were :

- women under 18 and over 35 y.o
- Mother´s height under 1,53 m.
- BMI < 18.5 ó >30
- Somokers
- History of children with <2500 g. Ó> 4500 g., Or children born dead.
- Less than 14 weeks gestation

Birth weight was analyzed below the 10th percentile with a lower than expected value of 4.5%, while children born with a weight above the 90th percentile exceeded 9% (19%), As for birth size, children below the 10th percentile were 11.5% and above the 90th percentile, 7.8%

The difference in gramas terms were from 100 to 220 gs. < P10, and > P90 from 130 to 300 gs. All evaluated by the gestational age.

The difference in centimeters of heigth were from 110 to 225 cm. < P10, and > P90 from 120 to 350 cm, all evaluated by the gestational age.

Keywords: Birth weight, birht height, intergrowth Project.
Further collaborators:

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EPIDEMIOLOGICAL IMPLICATIONS OF THE NEW WHO ANTHROPOMETRIC REFERENCES AND THEIR LIMIT VALUES AND THE IMPLEMENTATION PROCESS IN ARGENTINE

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Since 1982 in Argentina, Ministry of Health used local references to evaluate children growth, to select food programs beneficiaries and estimate prevalences of malnutrition (stunting and ematiation). In 2007, Ministry of Health adopted the Multicenter Growth Reference Study curves (launched by WHO in 2006) for weight for age, length/height for age, head circumference for age and body mass index for age for all children less than five years replacing local references. By September 2012 all 23 country prov-

inces and Buenos Aires Autonomous City had adopted the WHO standards (10 before 2009; 9 from September 2009 to March 2010; 3 from April 2010 to September 2010; 2 from October 2010 to September 2012). Time delay from adoption to implementation was partially due to existing stock of printed material (mainly, growth charts and sanitary booklets).

Implementation of new curves was performed in coordination with Sociedad Argentina de Pediatría through local seminars and training workshops. This process was supported by providing an ad-hoc handbook and growth charts.

Ministry of Health selected 8 graph: weight for age (first semester, birth to 24 months and birth to 5 years), height for age (birth to 24 months and birth to 5 years), BMI for age (1 to 5 years), head circumference (first trimester and birth to 5 years). All curves are for percentiles 3, 10, 25, 50, 75, 90 y 97 except BMI for percentiles 85 instead of 90. Also it were included three tables of weight increments for first two years.

The weakness of the MGRS is that all programs include children up to 6 years, therefore it was necessary to include a handed curve for this temporal segment from WHO growth curves not included in MGRS.

Keywords: Children Growth, Implementation, Argentina, Nutrition Policy, MGRS WHO

PS_144/45

ADVANCEMENT OF GLOBAL FOOD COMPOSITION DATABASES

FOOD COMPOSITION DATABASES ACROSS THE GLOBE: AN OVERVIEW

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In 2017, the ILSI Research Foundation launched the Catalogue of Food Composition Databases and Tables (or CatFCDB), a curated clearinghouse of information about food composition databases and tables. Designed with researchers, dietitians, students, government officials, and database managers in mind, CatFCDB serves to aide users in their initial assessment of the scope and depth of nutritional composition data available for certain countries and regions. It is displayed as an interactive map that enables users to explore, analyze and filter 90 FCDBs from 92 countries and regions. CatFCDB is meant to be a starting platform for users to learn about available food composition databases and tables to determine which may suit their needs, and it provides hyperlinks to direct the user to the source databases and tables (when these are available). An overview of CatFCDB demonstrating its functionality will be provided.

The ILSI Research Foundation also maintains the ILSI Crop Composition Database (ILSI-CCDB), an open-access source of comprehensive nutritional composition data for eight conventionally bred crops: canola, cotton, field corn, potato, rice, sorghum, soybean, and sweet corn. Data in the CCDB are derived from numerous samples of hybrids and/or varieties cultivated in controlled field trials using standard commercial cultivation practices at various locations throughout the world. Representative plant samples are obtained from field-grown crops with known production locations and dates. The analytical methods used to generate the composition data must be indicated, validated, and use certified or historically verified standards. Users can query the database to generate mean levels and ranges of nutritional components in various crop species. Environmental factors such as soil type and temperature can impact the levels of important nutrients in plants, and the moisture content can vary based on field conditions at harvest and when samples are handled. The database includes features that allow the user to retrieve a subset of data for samples produced in a specific year or location, and the analyte search filter can be applied to retrieve a pre-determined subset of data. Version 6 of the ILSI-CCDB was released in October 2016, and Version 7, which will include apple for the first time, is targeted for release before the end of 2017.

One of the strengths of the ILSI-CCDB is the completeness and quality of the data sets for each crop. However, the analytical rigor required for data submitted to the ILSI-CCDB means that sample testing is expensive, and so it is not surprising that most data have been donated by the private sector, and for a very limited range of crops. The ILSI Research Foundation is committed to including data for other crop species, particularly important staple foods. For such data to become available, public sector breeding programs, as well as breeding programs run by small and medium enterprises, must be able to submit data, but it is also essential to ensure that data for new crops are verifiable and robust. Resolving how to balance these imperatives remains a significant challenge.

Keywords: Food composition, crop composition, open data

NEW DEVELOPMENTS IN FOOD COMPOSITION PROGRAMMES IN SOUTH-EAST ASIA: ASEANFOODS

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The Association of Southeast Asian Network of Food Data systems (ASEANFOODS) was established in 1986 consisting of 10 member countries, namely Brunei Darussalam, Cambodia,

Indonesia, Laos, Malaysia, Philippines, Singapore, Thailand, and Vietnam. To coordinate the ASEANFOODS activities, the Institute of Nutrition, Mahidol University (INMU) was chosen as the Regional Centre in 1986 and INFOODS Regional Database Centre in 1991. The goal and objectives are to strengthening the development of national and regional food composition data (FCD) with high quality, adequate quantity and accessibility to the users. The first ASEAN FCTs was published in 2000 and was available in ASEANFOODS website. A number of proficiency testing schemes for laboratories were organised and few reference materials for food analysis were developed.

During 2015-2016, ASEANFOODS collaborated with and supported by International Life Sciences Institute South East Asia (ILSI-SEA) Region in organising two workshops in Thailand. The specific objectives of the first workshop, from 17-18 December 2015, were to develop a quality evaluation system (draft guideline) for assessing the quality of published national FCTs in ASEAN countries and to develop action plan for succeeding workshop and future activities. The specific objectives of the second workshop, 30-31 March 2016, were 1) to review the proposed plan/strategies for updating of ASEAN FCTs/FCDBs and organising Food-Comp-ASEAN course, 2) to discuss the feasibility of incorporating nutrient data of pre-packaged foods (branded food products) into national FCDBs. The latter activity has commenced in Thailand, to be followed by Malaysia and Philippines.

At the national level, most ASEAN countries have been actively working on generating new data. Recent activities are as follows: Malaysia continued with its new phase of compilation and documentation of the laboratory analyses of nutrients by participating institutions through a web-based system for data generators, data compilers and data users. This online FCDB publishes partial releases of the Malaysian FCD websites since 2015. Facilitated by ILSI-SEAR, a project to analyse the sugar content of commonly consumed foods and beverages is being planned. Philippines: Current activities are on updating FCTs and web-based PhilFCT. New food data, focusing on indigenous fruits and vegetables, are being generated, compiled, checked and evaluated until the end of the 3rd quarter of 2017. Thailand: The hard copy of the new version Thai FCT was published in September 2015. The on-line Thai FCDB is available since April 2016 at the INMU website. Food composition data for new food items and missing data are being developed. Vietnam: Activity on updating the Vietnam FCDB is at the final preparation and is expected to be published by 2017. A strategic plan for updating the ASEAN FCDB has been developed for possible implementation in 2018 when there is sufficient progress of FCDB in the main member countries.

The main activity of the ASEANFOODS Regional Centre in 2017 will be to strengthen the competence of young staffs in ASEANFOODS member countries by collaborating with the area experts in organising the FoodComp–ASEAN 2017 in Thailand.

Keywords: ASEANFOODS, Food composition databas

WHAT'S NEW: THE USDA BRANDED FOOD PRODUCTS DATABASE

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Many current and important public health challenges are linked to food and nutrition. Obesity and associated co-morbidities, a primary public health concern, is diet/food related. The risks for some cancers may be decreased by dietary patterns and cardiovascular disease is associated with many specific nutrients as well as dietary patterns. The USDA is the primary department with farm-to-fork oversight of the U.S. Food Supply, and the USDA conducts much work in the areas of nutrition and dietary guidance. Central to accomplishing this task is tracking the nutritional status of Americans, and this requires knowledge of the composition of the food system. Although the USDA has maintained food composition records since the early twentieth century, the task today is greatly complicated by the volume and fluidity of the food supply. Today there are more than 25,000 food manufacturers in the US who produce more than 20,000 new food and beverage products each year. The average grocery store has more than 36,000 individual items and there are more than 400,000 items in the food supply additionally, meals away from home are increasing and now account for over 50% of total food spending in the United States. All these factors results in limited knowledge of current intake of calories and nutrients by the America people.

The USDA Agricultural Research Service (ARS) maintains a program for monitoring food composition and nutrient intake of the nation; this program has two components: Provide U.S. food composition data and Determine food consumption and dietary patterns of Americans as part of the National Health and Nutrition Examination Survey (NHANES). Electronic records and databases are essential to this mission. For over thirty years this program has maintained the National Nutrient Database for Standard Reference (SR). Until October, 2016, this database contained information on approximately 9,000 foods and many of the items have complete analyses (of up to 146 nutrients) conducted by analytical laboratories. More recently, however, a public-private partnership between the USDA, the International Life Sciences Institute – North America (ILSI-NA), GS-1, One World Sync and LabelInsight has resulted in creation of the Branded Food Products Database (BFPD). This partnership enables the flow of manufacturers label data into the ARS Nutrient Database significantly increasing the database to more than 170,000 foods within 4 months, with the anticipation of many more to be placed in the system. These data represent a tremendous increase in the amount of knowledge but

many gaps remain before the full potential of the Branded Foods Products Data can be realized.

Keywords: Nutrition , Branded Foods, Database

PS_144/163

WHO/CDC SYMPOSIUM ON THE ASSESSMENT OF VITAMIN A STATUS IN POPULATIONS

WHO PROCESS FOR DEVELOPING GUIDELINES FOR VITAMIN A INDICATORS RETRIEVAL, SUMMARIZING AND ASSESSING THE EVIDENCE

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Indicators to assess the micronutrient status in populations are important for determining the magnitude and distribution of deficiency as a public health problem, for choosing the most appropriate intervention, and for monitoring and evaluating the impact and safety of public health programmes. The assessment of micronutrient status is often complex, as indicators can be affected by other conditions such as age, sex, disease, smoking, infection and inflammation; and the use of appropriate indicators must feasible at the population level. The World Health Organization (WHO) previously convened a meeting on Priorities in the assessment of vitamin A and iron status in populations to discuss and initiate the work of updating WHO guidelines on indicators for the assessment of vitamin A and iron status. With regard to the assessment of vitamin A status, indicators considered to be of highest priority to undergo review were: 1) retinol (serum or plasma obtained from venous or capillary blood); 2) retinol-binding protein (RBP; serum or plasma obtained from venous or capillary blood); 3) breast milk retinol; 4) relative dose response (RDR) tests; and 5) modified RDR (MRDR) tests. Additional indicators identified since the previous consultation are retinyl esters and isotope dilution for use in select populations. As guidance on the use of specific biomarkers of vitamin A status and redefinition of thresholds for vitamin A deficiency will have implications for public health and research around the world, this work must be consultative, transparent, methodical, and use the best available scientific and statistical methods. WHO has adopted internationally recognized methods and standards for guideline development to ensure that its guidelines are of the highest quality. The general process includes: (i) identification of key questions and critical outcomes; (ii) retrieval of the evidence; (iii) assessment and synthesis of the evidence; (iv) formulation of the recommendations; and (v) planning for dissemination, implementation, impact evaluation and updating of the guideline.

Keywords: Vitamin A, retinol, status, assessment, indicators

BIOLOGICAL EVIDENCE FOR OR AGAINST HIGH DOSE SUPPLEMENTATION

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The World Health Organization (WHO) recommends high dose capsules of retinyl palmitate be orally administered to children between 6 and 59 months of age for the prevention of mortality. Infants less than 12 months are to receive 100,000 IU and those 12-59 months receive 200,000 IU. These capsules should be targeted in areas of the world that are at risk for vitamin A deficiency based on a variety of factors. Other high dose supplementation programs in different age- or vulnerable groups have been tested and sometimes implemented in many countries. However, currently evidence on their efficacy to improve infant and childhood mortality is not supported by reviews of randomized controlled trials. One of the most debated interventions is neonatal supplementation. Trials indicated mixed results on infant mortality, and a meta-analysis of human trials indicated no overall effect of neonatal supplementation on death within 6 mo of birth. High dose supplements have transient effects on serum retinol and tissue stores of vitamin A, with the exception of the liver where increases may last for several months on the background of low dietary intake in humans. In swine models, vitamin A is well-absorbed, appears in serum primarily as retinyl esters, and is taken up dose dependently in all tissues. Nonetheless, enhancement in piglets did not persist in serum, lung, kidney, spleen, or adrenal gland. It has long been considered that circulating retinyl esters disrupt membranes and are the major cause of symptoms of hypervitaminosis A or toxicity. After high-dose supplements, elevated esters persisted for approximately 12 hours before being sequestered in the liver for storage. Elevated circulating esters were associated with hypervitaminosis A in Zambian children at a cutoff of 5% of total vitamin A, but the current cutoff used in adults, i.e., 10% retinyl esters of total vitamin A, has not been validated.

In piglets, vitamin A storage was enhanced for more than 10 days after high-dose supplements compared with placebo. In the same study, once liver reserves reached 0.7 micromol/g liver, vitamin A concentrations plummeted. It is not known whether this was due to the high dose capsule administered 7 days prior or if it reflects a biological response at this liver reserve, which was referred to as excessive vitamin A status in the past. No group of piglets reached a mean concentration of >1 micromol/g liver, which currently defines hypervitaminosis. Short-term impacts of retinoid signaling and longer follow-up after high dose supplements need to be evaluated.

Keywords: Animal models, catabolism, circulating retinyl esters, hypervitaminosis, supplementation

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SUMMARY OF INDICATORS OF VITAMIN A STATUS AND THEIR INTERPRETATION IN A POPULATION SETTING

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Vitamin A, which includes circulating retinol, retinal in the eye, storage retinyl esters, and the hormone retinoic acid, is an essential nutrient because humans must consume it in the diet either in the preform or as provitamin A carotenoids. Provitamin A carotenoids are produced in plants and provide vitamin A after enzymatic cleavage. Vitamin A deficiency continues to burden the global diseases, particularly in resource-poor countries. The most severe indicator of vitamin A deficiency is xerophthalmia and increased risk of death from infectious diseases, especially in children. Serum retinol concentrations are under homeostatic control due to its essential role in growth and cellular differentiation, which requires constant levels. At high concentrations, the vitamin is toxic. Because retinol-binding protein is a negative acute phase reactant, serum retinol concentrations are depressed during inflammation. Therefore, population status assessment needs to account for inflammation using acute phase markers (C-reactive protein and alpha-acid-1-glycoprotein). A serum retinol concentration of <0.7 micromol/L is considered deficient. However, in some population groups, this concentration may be adequate on the background of inflammation. Other indicators that have been used include breast milk retinol, which is unique to lactating women, doses response tests, isotope dilution methodology, and serum retinyl esters. These biomarkers can be related to liver vitamin A concentrations, which are considered the gold standard for vitamin A status. Breast milk concentrations <1 micromol/L are inadequate. Breast milk has two sources of retinol, i.e., retinol bound to retinol-protein and chylomicra. Therefore, they have utility in defining vitamin A exposure. Dose response test require an analog of retinol be administered and a waiting time of 4 to 6 hours before blood drawing. If retinyl acetate is administered a baseline blood is also required and an increase of 20% is considered abnormal. If 3,4-didehydroretinyl acetate is given, a single blood sample is needed and a ratio of 3,4-didehydroretinol to retinol of >0.06 signifies inadequacy. In the past, the World Health Organization (WHO) considered a 20% prevalence of inadequacy as a severe public health problem. Isotope dilution testing also requires analog administration, blood draws, and a waiting period. However, they are usually considered good estimates of total body stores of vitamin A and have been validated against liver reserves of vitamin A in animals and humans. WHO has not considered a prevalence definition for public health significance when isotope dilution testing is used. This is likely because most studies are stratified across population cohorts. Vitamin A indicators are best used together to best define where along the vitamin A status continuum the population lies. Serum retinol concentrations alone have limited utility, yet other tests are more expensive to implement. The best scenario is likely that serum retinol be measure on the population and then randomly selected subsets of individuals be administered either the dose response or isotope dilution test.

This would allow a more informed interpretation of the serum retinol distribution.

Keywords: Biomarkers, dose response test, inflammation, isotope dilution, serum retinol.

EXPERIENCES AND LESSONS LEARNED WHEN THE MODIFIED RELATIVE DOSE RESPONSE TEST WAS INCLUDED IN POPULATION-BASED SURVEYS TO ASSESS VITAMIN A STATUS

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WHO defines vitamin A deficiency (VAD) as serum retinol <0.70 μmol/L, but this indicator is homeostatically controlled, influenced by inflammation, costly to assess, and requires a venous blood specimen. Retinol binding protein (RBP) is often collected instead because it is less costly and can be collected with a capillary sample, but a standard cut-off for VAD using RBP is not defined. In each survey collecting RBP, a subsample of retinol should also be collected in order to calculate the RBP cut off equivalent to serum retinol <0.70 μmol/L. The modified relative dose-response (MRDR) test is a qualitative indicator of vitamin A liver stores. MRDR is not homeostatically controlled and less influenced by inflammation than retinol or RBP. During the analysis of MRDR, a value for serum retinol is also generated, which can be used to calibrate the RBP cut off values for defining VAD. MRDR requires consuming a small challenge dose of a vitamin A analog (A2) along with a fatty snack and collecting a blood sample 4-6 hours later, increasing the survey complexity. Using examples from Nepal, we describe experiences planning large scale population-based vitamin A assessments including subsamples of MRDR/retinol, determining RBP cut-offs for VAD, and prevalence estimates.

Describe planning and logistical implications for large scale surveys including young children. Use linear regression to examine the retinol-RBP relationship and determine the RBP cut-off that corresponds to the retinol cut-off of 0.70 μmol/L. Describe the RBP cut-offs calculated from the surveys for young children, including pre- and post-vitamin A2 dosing.

Vitamin A2 is not commercially available and must be synthesized. Data collection was planned to start 30 days after biannual vitamin A supplementation (VAS) campaigns because VAS influences circulating retinol. Among children 6-23 months, the

calculated RBP cut-off to define VAD was RBP<0.84 µmol/L and RBP<0.59 µmol/L, respectively, in two surveys collected four years apart.

Including a subsample of MRDR/retinol is feasible with planning. More information is needed to understand the factors influencing RBP calculated cut-offs equivalent to retinol <0.70 µmol/L and the best methods to assess vitamin A status.

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PATHS TO NOURISHING MILLIONS WITH BIOFORTIFICATION

SCALING UP BIOFORTIFICATION: PROGRESS TO DATE, SUCCESS FACTORS AND THE CHALLENGES

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During the past 15 years, HarvestPlus and its partners have made tremendous progress in the development, release and dissemination of biofortified crop varieties. Biofortification is the process of increasing the density of vitamins and minerals in a crop through conventional plant breeding or agronomic practices. Varietal development is jointly led by CGIAR centers in collaboration with National Agricultural Research Institutes, with support from donors and national governments. Over 140 varieties of 10 crops have been released as public goods in over 30 countries worldwide, and are being tested and grown in over 60 countries in Sub-Saharan Africa, Asia and Latin America. The adoption and consumption of biofortified crops is ever increasing. In 2016, over 7 million households (35 million people) were estimated to be growing and consuming biofortified crops. It is estimated that by 2030, about 1 billion people will be growing and consuming biofortified high pro-vitamin A maize, cassava, and sweet potato; high iron beans; sorghum and pearl millet; and high zinc wheat and rice, globally. While the pathways to develop, deploy and scale up biofortified crops are country and context specific, a robust evidence base of the effectiveness of biofortification, continued investment in product (varietal) development, standards for biofortification, strategic partnerships, relevant national policy instruments, private and public sector, and donor investment across the value chain of biofortified crops and, robust monitoring, evaluation and information sharing systems, are all crucial for sustainable scaling up of this technology, regardless of the context. There is robust evidence on the acceptability, efficacy and effectiveness of biofortification, and new research is published on an ongoing basis. For example, a recent systematic review of three randomized iron-biofortified efficacy trials further confirmed that iron-biofortified interventions significantly improve iron status—particularly among women and children under 5 (Finkelstein et al. 2017). Additionally, an effectiveness study carried out in Uganda showed that among recipients of Orange Sweet Potato (OSP) vines: (a) there was sustained adoption 2-4 seasons after delivery; (b) vitamin A intakes of children and women significantly increased, with OSP accounting for 53% of vitamin A intake for children under 5; and (c) the prevalence of low serum retinol was reduced by 9.5 percentage points among children under 5 (Hotz et al. 2012). In addition, a WHO Cochrane review committee was assembled in 2016 to review the scientific evidence and country experiences of scaling up biofortification. This paper summarizes the progress and challenges of scaling up biofortification and the existing evidence focusing on: varietal development and release; biofortification standards and enforcing compliance; HarvestPlus' scaling up strategy, priority countries and global targets; the entry points and strategies at national, regional and international levels; the role of strategic partnerships in scaling up biofortification; M&E systems for biofortification initiatives; lessons learned and challenges.

SCALING UP BIOFORTIFICATION: DELIVERY OF BIOFORTIFIED CROPS AND FOODS IN NIGERIA – PROGRESS AND LESSONS

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New agricultural technologies are seldom able to propagate themselves because adoption by farmers and consumers is often influenced by a myriad of factors other than the improved characteristics in the new technologies. Biofortification is one such new technology in Nigeria, with the primary objective to increase the levels of essential micronutrients in staple crops as a sustainable and complementary strategy to reduce micronutrient malnutrition among vulnerable populations. Seventeen biofortified varieties (six of pro-vitamin A cassava, seven of pro-vitamin A maize, two of orange sweet-potato and two of iron sorghum) have been officially released for production in Nigeria during the past six years. The journey of delivering biofortified varieties to farmers started in 2011, soon after the first set of three biofortified varieties of cassava were officially released to farmers by the government. HarvestPlus has since innovated and deployed several tools and channels that were initially slow but gradually picked up momentum to reach an estimated two million farmers by the end of 2016. This did not go without challenges considering the diversity in culture and agro-climatic conditions, initial need for evidence, confusion of our crops with GMO's, and socio-political and economic instability. There were shifts from: a single crop approach in the early years to multiple crop approach; social to commercial seed

delivery; single field demonstrations to model village concepts; specific component interventions to value chain models; conventional marketing to dedicated and online markets; single to multimedia communication including movies; direct to partner-led delivery; manual to electronic data collection; zero to three policy support documents; zero to over 2,000 small- and medium-sized enterprises; and, finally, special activities to mainstream biofortification such as quiz competitions, national nutrition platforms, educational curriculum and school feeding programs. This paper reviews the different strategies and channels employed in reaching Nigerians with more nutritious crop and food options. It presents coverage data and analyses the lessons learned, suggests new strategies for scaling and predicts the potential reach by 2020.

Keywords: Biofortification, Scaling-Up, Agriculture, Nigeria.

PRIVATE PUBLIC PARTNERSHIPS: A DELIVERY MODEL FOR BIOFORTIFIED IRON PEARL MILLET IN INDIA

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Despite India's tremendous economic growth and agricultural production in recent decades, levels of iron deficiency anemia and zinc deficiency have not significantly improved. Yet, agriculture is a sustainable and affordable source of nutrition and through biofortification—the conventional breeding of food crops with higher micronutrient levels—a measurable impact on nutrition and food security is achievable in populations that consume these nutrient-rich foods daily. Pearl millet (Pennisetum glaucum (L) R. Br.) is a climate resilient crop and major source of food and nutrition security for millions in the semi-arid tropics. Biofortified iron pearl millets are not only high in iron and zinc content, but are higher yielding, more disease resistant, tolerant to drought, heat and soil salinity, and include other agronomical traits preferred by farmers. In India, strong pearl millet breeding programs exist in both the public and private sectors. Seed companies have a well-developed, vertically integrated research and development to distribution and retail chain. Therefore, to promote the scale-up of nutrient-dense biofortified crops, HarvestPlus established partnerships with public and private seed companies. This has facilitated the rapid commercialization of products and engagement of farmers in delivery activities by leveraging their efficient and extensive distribution touch points. For example, farmers' engagement during participatory variety selection informs them of biofortified product characteristics at an early stage and encourages adoption. Public-private partnerships have been a successful strategy to increase the reach of biofortified crops in India: by the end of 2016, an estimated 375,000 people were consuming iron pearl millet. Market research results helps to understand key consumer insights and motivations towards biofortified crops. Collaborative promotion campaigns are organized with partners, such as on-farm

product demonstrations, farmers' field days, mobile campaigns, and engagements at the point of sales, help create further demand. Product information regarding the nutritional and agricultural benefits of iron pearl millet are made available through training sales personnel, retailers, and distributors of seed companies who remain one of the first points of contact of farmers. Collectively, through these private-public partnerships and other market-based approaches, HarvestPlus aims to reach 3 million people in India by 2030 with biofortified pearl millet. In partnership, HarvestPlus' advocacy strategy shall focus on some of the challenges of linking biofortified pearl millet to existing public food programs in the country. These linkages may help to increase demand for biofortified pearl millets and add nutrition components to existing food interventions that reach pregnant and nursing mothers, children under the age of six, school children, and families above and below the poverty line.

Keywords: Biofortification, Scaling-Up, India, Private-Public-Partnerships, Agriculture.

IMMUNONUTRITION IN HEALTH AND DISEASE: EVALUATION OF BIOMARKERS

LIFESTYLE HABITS AND IMMUNONUTRITION

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Immunonutrition is the subject that studies the interrelationship between nutrition and the immune system. However, in the last decade, Immunonutrition also includes an interdisciplinary space in the research field, being related to other tissues and systems of the organism, such as the nervous, digestive and endocrine systems, as well as the gut microbiota that has been recently defined as a "new" organ. Therefore, the study of Immunonutrition acquires a great interest in the assessment of the nutritional status through the evaluation of certain biomarkers capable to detect situations of malnutrition and also the risk of suffering from eating disorders, metabolic syndrome, cardiovascular diseases, neurological disorders, allergies or infections. Lifestyle includes diet and other determinants, such as body fat composition, physical activity, sedentary habits, sleep profile, stress situations and psychological status, as well as tobacco and alcohol consumption. Although the Mediterranean diet (MD) has been promoted at an international level as a consequence of the scientific evidence about its benefits, especially for cardiovascular diseases, chronic degenerative diseases and some cancers, unfortunately, even in the Mediterranean countries, this type of diet is losing its leading role due to globalization effects across the world. The MD is mainly characterized by an elevated consumption of plant based foods, such as fruits and vegetables, a low intake of red meat and the use

of olive oil as the main source of fat food. Indeed, the studies on the adherence to the MD has been positively associated with performance in youth, independently of potential confounders, including body mass index, physical activity, fitness and sedentary behavior. In addition, there are several plausible mechanisms that can explain the protective effect of the adherence to the MD not only on cognition, but also including antioxidative and anti-inflammatory effects and the reduction of vascular comorbidities. In fact, the higher adherence to the MD is associated with lower levels of C-reactive protein and interleukins; thus, an underlying neuroprotective effect could be due to its vascular properties and its ability to reduce inflammation and oxidative stress, which are also associated with neurodegeneration. Regarding body fat composition, several biomarkers, such as leptin, cortisol and insulin have been confirmed as essentially included into the assessment of inflammation-related biomarkers. Fitness has also been confirmed as a useful tool to evaluate cardiometabolic profile. In addition, regular physical activity has been shown to develop a positive impact on the immune system by promoting mechanisms of action to defend the organism, in contrast with a high and intense physical exercise that can lead to immunosuppression with a high risk to suffer from infections. Moreover, the sleep profile has been defined as another important determinant to evaluate, due to its relationship with inflammatory patterns. In summary, the study of the different determinants included into the lifestyle habits and their relationship with the assessment of immunological biomarkers should be taken into account to evaluate the nutritional status in order to detect metabolic alterations and to prevent risk and development of diseases from the beginning of the onset.

Keywords: Mediterranean diet, physical activity, Fitness, sleep profile, immunological biomarkers

BIOCHEMICAL MARKERS IN IMMUNE-DEPRESSED SUBJECTS

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The aim of this lecture is to show the most important preliminary results obtained in our laboratory, related to the nutritional status evaluated through the use of biochemical parameters in 19 children suffering from cystic fibrosis (CF). The patients were treated and recruited at the Nutrition Service of Pedro Elizalde Hospital, Buenos Aires, Argentina. The study was approved by the University of Buenos Aires Ethics Committee, and all participants' parents agreed to sign the written consent before recruitment. The results were compared with reference values obtained from healthy children matched by age and gender.

Lower plasma fractions related to the nutritional status (apoB, Transferrin, Transthyretine) meanwhile higher levels of CRP and Fibrinogen were found in CF children in comparison with the healthy group. In addition, 30% of the CF children showed CPR levels higher than 0.3 mg/dL, concomitant with Fibrinogen levels

higher than 288 mg/dL, and 78% showed HDL levels lower than 35 mg/dL, these values being associated with cardiovascular risk. Moreover, a significant reduction of complement factors (C3c and C4c) was found which is related to a higher plasma ceruloplasmin concentration and Adenosine Deaminase activity (T lymphocyte-associated enzyme). Moreover, changes in the plasma fatty acids profile were found. In conclusion, nutrition is a critical component of the management of cystic fibrosis, and nutritional status is directly associated with both pulmonary status and survival. The results obtained in this paediatric population point out the requirement to include biochemical and functional parameters in the evaluation of patients suffering from CF. Specific nutritional support should be established and adjusted to individual needs.

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Keywords: Cystic Fibrosis, Biochemical markers, Specific plasma proteins, Immune System

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HEPCIDIN AND IRON IN INFLAMMATION

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Hepcidin has emerged as the central regulatory molecule of systemic iron homeostasis. It is a 25-amino acid peptide hormone, produced and secreted predominantly by hepatocytes, circulates in the bloodstream, and excreted by kidneys. By binding to ferroportin and inducing its internalization and degradation, hepcidin regulates cellular iron efflux, controlling absorption of dietary iron from the intestine and release of recycled iron derived from senescent erythrocytes. Hepcidin levels are reduced in iron deficiency, and measurement of blood or urine hepcidin levels may enable evaluation of iron requirements providing a powerful indicator of physiological iron deficiency. Hepcidin measurement in patients have been proposed, as for anemia of chronic disease, anemia associated with chronic kidney disease and hemodialysis, genetic hemochromatosis, and iron deficiency diagnosis. Its concentrations are decreased in situations that require increased concentrations of circulating iron. In case of increased erythropoiesis, as in response to hypoxia, anemia, iron deficiency, or conditions of ineffective erythropoiesis, a decreased hepcidin concentration will result in the release of stored iron and in an increase in the dietary iron absorption. On the other hand, infection and inflammation cause an increase in hepcidin synthesis, resulting in decreased

availability of circulating iron, which is considered to represent a defense mechanism of the human body against extracellularly proliferating (irondependent) pathogens. In chronic (low-grade) inflammatory states, this ultimately leads to a deficiency of iron available for erythropoiesis called anemia of chronic disease, especially in obesity due to adipose tissue enlargement.

Keywords: Hepcidin, Iron concentration, Iron deficiency anemia, Chronic disease anemia, Inflammation

THE IMMUNOINFLAMMATORY PROCESS IN TYPE 2 DIABETES MELLITUS. HOW CAN WE HELP?

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Introduction: Type 2 diabetes mellitus (T2DM) is considered the epidemic of the 21st century, with more than 220 million sick people worldwide. It is calculated that this number will triplicate by 2030. It is present mainly in subjects over the age of 40, however, its association with obesity has increased its prevalence in younger subjects. The nutritional transition in which many countries are immersed, with a rapid change in family income, the adoption of inadequate lifestyles and very low levels of physical activity, have led to an increase in prevalence of diabetes. Its aetiology involves the immune system in a very important way. Obectives: To review the conditions in the immunoinflammatory process that lead to the development of T2DM and its complications, in search of ways to improve the condition. Development: T2DM is a pathology resulting from two main conditions in glucose metabolism, a decrease in the production of insulin or an increased resistance to it. Diabetes is closely related to an alteration of the innate immune system, with the production of pro-inflammatory cytokines and adipokines in a chronic way. Insulin resistance develops before the increase in some inflammatory markers such as C-reactive protein and plasminogen activator 1, among others. Tumor necrosis factor alfa, interleukins 1 alfa and beta, interleukin 6, interferon gamma, retinol binding protein and resistin are increased in type 2 diabetes mellitus. On the other hand, we can find decreases in adiponectin, leptin, ghrelin, visfatin and omentin production. The immunoinflammatory process is responsible for the complications such as retinopathy, nefropathy, neuropathy, cardiovascular and peripheral vascular diseases, as well as periodontal pathologies. There are several low-cost and widely available interventions that may be useful in decreasing or controlling the inflammatory process, such as supplementation with various vitamins, polyunsaturated fatty acids, etc. Conclusions: T2DM is a pathology, where cause and effect are related to the innate immune system, thus, by controlling this inflammatory process, we can avoid the consequent complications of the disease.

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Keywords: Type 2 Diabetes Mellitus, Inflammation, Immunity, Nutrition

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BIOMARKERS REFLECTING INFLAMMATION AND NUTRITION DETERMINANTS OF ANEMIA (BRINDA 2) PROJECT

OVERVIEW OF PHASE 2 OF THE BIOMARKERS REFLECTING INFLAMMATION AND NUTRITION DETERMINANTS OF ANEMIA (BRINDA) PROJECT

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The Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) project is a multi-agency and multi-country collaboration formed in 2012 in an effort to improve micronutrient assessment and anemia characterization globally. BRINDA's overall goal is to refine approaches to estimate the prevalence of micronutrient deficiencies and thus improve the targeting, design and effectiveness of nutrition research and programs. BRINDA phase 1 was recently completed with key findings on approaches to adjust biomarkers of iron and vitamin A status

for inflammation, as well as factors associated with anemia in both high and low inflammation settings.

BRINDA phase 2 activities build on the success of BRINDA 1 by expanding the scope of countries included in analysis and answering new key research questions including: 1) approaches to address the association between inflammation and zinc in pre-school children (PSC) and women of reproductive age (WRA); 2) approaches to address the association between inflammation and vitamin B12 and folate in PSC and WRA; 3) role of stunting and inflammation on micronutrient deficiencies in PSC; and 4) relationships between the double burden of malnutrition (e.g., coexistence of undernutrition and overweight/obesity), inflammation and micronutrient status among PSC and WRA. To address these questions, an expanded harmonized dataset was created, containing 24 cross-sectional nutrition surveys, representing 36,360 PSC and 41,881 WRA from all six WHO geographic regions. Survey prevalence estimates took into account complex survey design and weights, where appropriate. Overall prevalence was defined using the median prevalence estimates across surveys.

The overall prevalence of inflammation in PSC was 30.8% (either CRP > 5mg/L or AGP >1 g/L), ranging from 6.0% (US) to 67.3% (Cote d'Ivoire). In WRA, the prevalence of inflammation was 15.3%, ranging from 6.6% (Vietnam) to 36.8% (Cambodia). In PSC, stunting prevalence (height-for-age z-score <-2) was 26.7%, ranging from 3.6% (US) to 50.8% (Laos), and overweight/obesity prevalence (BMI-for-age z-score >2) was 6.2%, ranging from 0.6% (Laos) to 19.5% (Georgia). In WRA, the prevalence of BMI > 25 kg/m2 was 48.3%, ranging from 8.0% (Vietnam) to 71.7% (Mexico), and BMI <18.5 kg/m2 was 6.0%, ranging from 1.4% (Mexico) to 20.5% (Vietnam). Zinc deficiency in PSC (serum zinc <57 ug/dL in afternoon or <65 ug/dL in morning) was 44.7% overall, ranging from 10.3% (Ecuador) to 78.7% (Cameroon). In WRA, zinc deficiency [serum zinc <59 ug/dL in afternoon or < 66 ug/dL in morning (non-fasting), <70 ug/dL in morning (fasting)] was 52.9%, ranging from 28.8% (Mexico) to 82.2% (Cameroon). The prevalence of zinc, B12 and folate deficiencies by inflammation adjustment approach will be analyzed.

Conclusions: Findings from BRINDA will be used to inform international guidelines on the appropriate interpretation of micronutrient biomarkers in settings of inflammation as well as approaches to address the double burden of malnutrition in various settings.

Keywords: Nutrition assessment, inflammation, zinc deficiency, folate deficiency, double burden

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NUTRITIONAL CHALLENGES IN THE ELDERLY

INTRODUCTION TO THE WORK OF THE IAEA IN THE FIELD OF NUTRITION

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The IAEA's programme in nutrition supports the use of stable (non-radioactive) techniques to combat malnutrition in all its forms. Stable isotope techniques play an important role in understanding the mechanisms of malnutrition and as a reliable tool in designing and evaluating the impact of nutrition interventions. They improve specificity and sensitivity of nutritional evaluations such as the assessment of fat and lean body composition, energy expenditure, breastfeeding patterns, body vitamin A stores, and factors affecting absorption and retention of essential minerals such as iron and zinc in the body. The IAEA fosters its use to generate evidence for informed nutrition programming across the life course, from infant and young child feeding, to maternal and adolescent nutrition, to healthy ageing, and to track progress towards achieving World Health Assembly targets. This complements the efforts of other UN agencies, NGO's and Government Institutions in nutrition. The IAEA provides support and training to build the capacity to use stable isotope techniques in nutrition through a) national and regional nutrition projects via its Technical Cooperation Programme with governments of Member States as well as b) coordinated research conducted by individual investigators to address specific problems. In the area of nutrition and aging, the IAEA supports the application of stable isotope and other nuclear techniques to measure changes in body composition (normally loss of muscle mass and increase in body fat) and physical activity, bone health, and micronutrient bioavailability. An example includes a regional project in 12 countries in Latin America and the Caribbean with the aim of standardizing techniques for the early diagnosis of sarcopenia (age-related loss of skeletal muscle mass and strength) and raising awareness of this important issue for the quality of life of older people in the region. Body composition by deuterium dilution technique in relation to the loss of functionality is assessed in the older population with the aim to determine cut-off values for the determination of sarcopenia in order to improve early diagnosis. A database of fat-free body mass will be compiled, which will allow the development of easier field methods to measure body composition based on anthropometry and bioelectrical impedance. As the basal metabolic rate and thus energy requirements decline with age, the doubly labeled water technique is used to measure total daily energy expenditure in older adults undergoing their normal daily activities in order to determine caloric needs with or without sarcopenia. The project will provide a tool for the health sector to allow for early detection of sarcopenia and ensure early interventions can delay physical disability and improve the quality of life in the elderly. This will also help to reduce health-related costs of the elderly population.

PREVALENCE AND FUNCTIONAL IMPACT OF SARCOPENIA

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The prevalence of sarcopenia in different studies varies significantly, depending on the population studied, definition adopted, method used for the measurement of muscle mass and function. It varies, in different populations, from 1 to 29% in the community and from 14 to 33% in institutions. Recently, a meta-analysis was published (Diz et al., 2016) showing a prevalence of 17% in Brazil. Another meta-analysis of general population studies found a prevalence of 10% in men and women worldwide (Shafiee et al., 2017). Sarcopenia has been associated with negative metabolic and clinical outcomes, including increased insulin resistance, lower energy expenditure, lower resistance for aerobic activities, increased number of falls, increased incidence of reduced mobility, disability, dependencies and death. Considering the ageing of the world population, and, especially, of the developing countries, these numbers show the importance of this condition as a serious public health problem. Being sarcopenia defined as low muscle mass associated with low muscle strength or function, the diagnosis is clearly dependent on cut-off points for the different assessments and these will vary depending on the population studied. Lourenço et al. (2015) verified the performance of the European Working Group on Sarcopenia in older people and their findings showed that the adoption of the original cut-off points in Spanish, Mexican and Brazilian cohorts would define 83.4% of the total cohort as suspects for having sarcopenia, indicating muscle mass assessment; assuming adapted cut-off values, this proportion decreased to 34.2%. In Brazil, the Frailty in Older People Study (FIBRA-BR) found cut-off points considerably lower than the ones originally proposed, considering the 20th percentile of the performance of the studied population. A Latin America Regional Project funded by the International Atomic Energy Agency (IAEA) is verifying the association between low muscularity and function in 12 Latin American and Caribbean countries, aiming to determine tools and standards for the diagnosis of sarcopenia and to increase awareness of this condition in this region. Body composition was measured by the deuterium dilution method, bioimpedance analysis, anthropometry and dual-energy X-ray absorptiometry when available; function and strength by the measurement of walking speed, handgrip strength, timed up-and-go test and six-minute walking test. A sub-group had energy expenditure measured by the doubly labelled water method and physical activity pattern by an accelerometry based physical activity recording system. New parameters for the association between muscularity and physical performance in the Latin America and Caribbean region will be defined and the results will be discussed during this symposium.

DIETARY FACTORS CONTRIBUTING TO SARCOPENIA SYNDROME

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Sarcopenia is a progressive, chronic clinical condition associated with the aging process characterized by the loss of skeletal muscle mass, muscle strength and functionality. In older adult populations, this condition increases the risk of adverse outcomes, such as physical disability, poor quality of life, and increased morbidity and mortality rates. The concept of sarcopenia has evolved significantly from the original definition proposed by Irwin Rosenberg (1989). Recently, the European Working Group on Sarcopenia in Older People published a consensus on the definition of sarcopenia and the diagnostic criteria for sarcopenia syndrome. Regarding the factors that contribute to the of loss of skeletal muscle and development of sarcopenia syndrome, the literature now recognizes the role of such elements as pro-inflammatory cytokines, vitamin D deficiency, anabolic hormone deficiency, insulin resistance and hyperinsulinemia, anabolic resistance to nutrition and exercise, chronic illness, sedentarism, as well as other lifestyle factors, including low or poor dietary protein intake and the non-homogeneous distribution of protein at mealtimes. More recently, other dietary factors have been reported as contributing factors for sarcopenia and sarcopenia syndrome, though most current evidence highlights the role of low dietary protein intake as the main alimentary factor that exacerbates the loss of skeletal muscle mass in older adult populations. This presentation reviews cross-sectional and cohort studies on the association between high dietary protein intake and sarcopenia and analyzes the main results of some published studies of clinical trials on dietary protein supplementation. Finally, the main challenges involved in satisfying the current recommendations for dietary protein in older people in Latin American countries are discussed briefly.

DIAGNOSIS AND PREVENTION OF MUSCLE LOSS; CHALLENGES IN LATIN AMERICA

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Latin America (LA) is experiencing demographic, epidemiological and nutritional transitions. There is an increase in total aging population in LA which has an impact on many aspects of society. Aging is associated with important physiological changes that should be considered by health care systems. One of the highly relevant age-induced condition is the decline in neuromuscular performance. The loss of skeletal muscle mass and the changes in the structure and function associated to aging are clinically important because they are responsible for decreasing muscle strength and the capacity to perform physical activity. Therefore, it is necessary to be able to diagnose loss of muscle early and to implement effective interventions to prevent it. There are different techniques available to diagnose loss of muscle mass. Simple assessment methods to reflect muscle loss include weight loss and decrease in calf and mid-arm muscle circumference. More accurate estimations of muscle mass can be gained by bioelectrical impedance analysis (BIA), dual-energy X-ray absorptiometry (DXA), and the reference method of deuterium dilution technique to determine total body water (TBW) and calculate fat-free mass. Predictive models of appendicular skeletal muscle mass have also been developed in Chile, based on anthropometric measurements and functional tests in the elderly.

The prevention of the loss of muscle mass in the elderly will be influenced by socioeconomic factors such as income, education, existence of support networks and general health status (nutritional status, pathologies and integrity of their denture). Diet quality is important for the prevention of skeletal muscle loss. High quality, easy digestible protein in sufficient amounts is needed to maintain the muscle mass and vitamin D status and intake need to be considered. Physical activity also has positive effects on the overall health of the elderly and may prevent muscle loss. Studies have shown that the prescription of supervised muscle strength training for elderly people counteract or at least attenuate the decline in neuromuscular function.

The challenge for LA is to establish population specific cutoff points for muscle mass loss and to develop screening tools to identify early muscle loss in the elderly to ensure interventions can be implemented. A group of researchers is finalizing a project whose objectives are to develop an anthropometric model of prediction of skeletal appendicular muscle mass in Latin American elders and establish cutoff points for healthy muscle mass.

Keywords: Elderly, muscle loss, nutrition, physical activity.

VITAMIN D: NEW INSIGHTS FROM PHYSIOLOGY TO CLINICAL PRACTICE

VITAMIN D STATUS AROUND THE WORLD: EPIDEMIOLOGICAL DATA AND DIAGNOSIS

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Low vitamin D concentration is an increasing public health problem around the world, contributing to the double burden of malnutrition as defined by WHO. Serum or plasma 25-hydroxyvitamin D [25(OH)D] continues to be the optimal marker of vitamin D status because its long half-life and because it reflects both D2 and D3 levels.

The debate regarding optimal cut-offs for diagnosis is still open. In the last years, and for better comparison among studies, international guidelines have been accepted to define sufficiency/optimal levels ≥75nmol/l (30ng/ml); insufficiency <75 nmol/l; deficiency <50 nmol/l (20 ng/ml) and severe deficiency <27.5 nmol/l (10.8 ng/mL). This last cut-off is the most controversial one, as some authors propose <30 nmol/l (12ng/ml) as deficient, and others go down to 20 nmol/l (8 ng/ml).

Identified risk factors include restricted diets, insufficient sunshine exposure, sunscreen use, darker skin pigmentation, high latitude, full-body clothing cover, season, air pollution, age, efficiency of absorption in the gut, liver and kidney disease, and medication use (notably anticonvulsants, corticosteroids).

Deficiency affects mainly all population groups and is present in all continents. In infants, highest prevalence of rickets, the clinical manifestation of vitamin D deficiency have been observed in North America, South America, Europe and parts of the Middle East. Concentrations <30nmol/l have been observed in Iran (86%), Kuwait (66%) or India (61%). Lowest prevalence in Argentina (3%) and China (0.4%). High prevalence of deficiency (<30 nmol/l) has been observed in children i.e. from Afghanistan (73%) and Malaysia (35%); in female adolescents from Saudi Arabia (81%). In fact, being a female is a risk factor in certain countries. Concentrations <50nmol/l were observed e.g. in adults from Jordan (14% of females vs. 2% males), Sri Lanka (59% vs. 34%) and Nigeria (34% vs. 5%). Elderly people are especially at risk because with aging there is an important change in lifestyle like less solar exposure and less outdoor activity. A high prevalence of concentrations <30nmol/l have been observed in Germany (67%), India (62%), Morocco (52%; females) or Australia (22-45%).

Within the EU-funded ODIN study, applying vitamin D Standardization Program (VDSP) protocols to serum 25(OH)D data from representative childhood/teenage and adult/older adult European populations, an overall pooled estimate, irrespective of age group, ethnic mix, and latitude of study populations, showed that 13.0% of the 55,844 European individuals had serum 25(OH)D concentrations <30 nmol/L l on average in the year, with 17.7% and 8.3% in those sampled during the extended winter (Octo-

ber-March) and summer (April-November) periods, respectively. The prevalence of <50 nmol/L l was 40.4%. In a study we performed on non-supplemented Spanish elite athletes, apart from seasonal variations, a significant difference was observed between those training indoor and outdoor, especially in winter around a mean 20nmol/l difference. Even sunny countries are at risk for vitamin D deficiency during the winter months.

Keywords: Vitamin D deficiency. Rickets. Calcidiol. Public health.

Further collaborators:

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VITAMIN D: CLASSIC AND NOVEL ACTIONS

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Vitamin D has a key role in calcium homeostasis. Indeed, vitamin D participates actively in calcium intestinal absorption, renal excretion and bone synthesis and remodelling. In addition, vitamin D also affects the absorption and excretion of phosphate. Vitamin D is mainly produced by photobiogenesis at the skin by the action of ultraviolet radiation B on 7-dehydrocholesterol, but it can also be derived from a number of dietary sources i.e. ergocalciferol (vit D2) from plants and cholecalciferol (D3) from animal foods, mainly fatty fish, eggs, meats and dairy products. D3 is by far the most important source of vitamin D. Vitamin D requirements ranges from 400 to 600 IU/d (10-15 µg/d), depending on age, sex and lifecycle conditions.

Vitamin D is transported from the intestine to the liver and rapidly hydroxylated to 25(OH)D2 and 25(OH)D3 by a cytochrome P450 dependent enzyme. Those metabolites reach the systemic circulation and later are hydroxylated in the renal cortex to render calcitriol (1-25(OH)2D), the active vitamin D. Alternative 24-hydroxylation of 25(OH) D renders 24-25(OH)2D, which is inactive, this compound contributing to the regulation of calcitriol levels in plasma. Blood and adipose tissue are well known stores for vitamin D, and plasma 25(OH)D3 is recognised as the best biomarker of vitamin D status.

The regulation of calcitriol synthesis relies on the activity of both 1-α-hydroxylase (CYP27B1) and 24-hydroxylase (CYP24A1). Increased levels of parathormone (PTH) due to vitamin D insufficiency or hypocalcemia, lead to increased expression of 1-α-hydroxylase, which results into increased synthesis of calcitriol. Opposite, high levels of plasma calcitriol and calcium inhibit the secretion of PTH. In addition, calcitriol inhibits its own synthesis through the modulation of the renal hydroxylases. In addition, when calcium levels increase thyroid C cells produce calcitonin, blocking calcium bone mobilization and stimulating calcium and phosphorus renal excretion.

In addition to the classic roles of vitamin D in increasing intestinal calcium and phosphate absorption and increased bone synthesis and remodelling, novel roles of vitamin C affecting cell proliferation, differentiation and apoptosis, as well as increasing innate immunity and decreasing adaptive immunity have been recognised. Moreover, vitamin D is involved in the protection of cardiovascular system through the regulation of the renin-angiotensin system, PTH secretion, adipocyte apoptosis and insulin secretion.

The action of vitamin D in the immune system is mainly mediated by the increased phagocytic capacity of antigen presenting cells (dendritic cells and macrophages) against microbes. This action is due to calcitriol which enhances the expression of cathelicidins, one particular type of antimicrobial peptides. In addition calcitriol inhibits the production of the granulocyte and macrophage colony stimulating factor (GM-CSF). Moreover, calcitriol inhibits the expression of major proinflammatory cytokines e.g IL-1, IL-6. IL-12 and TNF-α, and the development of Th1 cells, differentiation of B lymphocytes and antibodies production.

Keywords: Bone metabolism. Calcitriol. Immune system. Photobiogenesis.Vitamin D

VITAMIN D LEVELS DURING PREGNANCY AND FETAL IMPLICATIONS

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Maternal vitamin D insufficiency during pregnancy is a common issue and a significant public health problem globally. The circulating 25(OH)D concentration sufficient to meet the physiological needs of humans is an ongoing subject of debate, which affects the prevalence of vitamin D deficiency/insufficiency estimated around the world. Since evidence is lacking regarding appropriate cut-points to define vitamin D status during pregnancy, levels used to establish intake recommendations and vitamin D content of prenatal vitamin supplements are quite conservative.

During pregnancy, maternal hemodilution is accompanied by a number of physiological changes to both vitamin D metabolism and maternal body composition; such adaptations might lead to differences in the determinants of response to vitamin D supplementation between pregnant and non-pregnant women. Maternal 1,25-dihydroxyvitamin D concentrations increase during the third trimester, and it can be synthesized by the placenta since it contains the enzyme 1-α-hydroxilase.1 Furthermore, it is possible that vitamin D increases the synthesis of various calcium-binding proteins in the placenta. Clinically, understanding how individuals respond could lead to individualized antenatal counselling regarding vitamin D supplementation to ensure vitamin D repletion without increasing the risk of vitamin D toxicity.

The importance of vitamin D in pregnancy for maintaining maternal calcium homeostasis and there for fetal bone development is well recognized; moreover, there is a large discussion on potential maternal detrimental effects of vitamin D deficiency on perinatal outcomes, fetal development and the long-term skeletal health of children. Recent studies are also evaluating its effects on asthma fetal programming.

Risk factors for vitamin D insufficiency are well described, and include ethnicity, extensive skin covering and liberal use of sun protection, overweight/obesity, low dietary vitamin D intake, and smoking, in addition to the seasonal variation that is observed at temperate latitudes. The increasing obesity rates in young women enhance the prevalence of vitamin D deficiency, due to vitamin D storage in adipose tissue, reducing its maternal blood levels and fetal availability. Moreover, gestational diabetes risk is higher in obese mothers which may affect the associations with vitamin D levels.

Pregnant women require at least 400-600 IU per day of vitamin D. It has been proposed by The Endocrine Society that at least 1500-2000 UI/ of vitamin D may be needed to maintain a blood level of 25(OH)D above 30 mg/dl. A recent randomized trial of 1000 IU of vitamin D supplementation during pregnancy found no effect on offspring bone health in infants born in the summer but did find enhanced fetal bone mineral accretion in infants born during the winter months.2 The benefits of vitamin D supplementation during pregnancy should be evaluated through rigorous intervention studies.

Keywords: Vitamin D, gestation, pregnancy, supplementation, perinatal outcomes

VITAMIN D AND OBESITY

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Vitamin D (vitD) adequate concentration is essential for growth, development and health. It plays a relevant role in the regulation of calcium levels and bone metabolism. In addition, recent studies indicate that hypovitaminosis D compromises long-term condition as a consequence of its non calciotropic effects, such as the implication/regulation of immune system, endocrine pancreas, liver, skeletal muscle and adipocytes. In fact, vitD insufficiency is associated with a wide range of chronic disease and conditions, including obesity, and several types of cancers. Suboptimal vitD status has also been associated with increasing severity of metabolic dysregulation (insulin resistance, hyperlipidemia, liver disease and hypertension) in children and adults with obesity. In the last years the prevalence of overweight and obesity in Spanish children and adolescents has highly increased. Therefore, the identification of associated factors and risk groups related to hypovitaminosis D is critical. In this context, we have characterized vitD status in 471 children and adolescents (2 to 18 years age) and analyzed its correlation with gender, pubertal period, age and Body Mass Index (BMI). An inverse lineal effect of BMI and age on 25(OH)D concentrations was observed in children, 39.6 % of vitD levels variability was explained by BMI. Therefore, understanding the underlying contribution of suboptimal vitD status to the metabolic dysregulation disorders in obese subjects is important.

Recently, several studies have attempted to establish the molecular mechanism of the relation between vitD levels and obesity. Some of these studies suggest that vitD, due to its fat-soluble characteristic, is retained by the adipose tissue. In addition, it has been described that adipose tissue has the capacity to metabolize vitD locally, and this can be dynamically altered during obesity. Considering the importance of low grade chronic inflammation in metabolic syndrome and obesity, many authors hypothesized the involvement of the vitD in the pathogenesis of these diseases altering the balance between pro and anti-inflammatory cytokines and thus affecting insulin action, lipid metabolism and adipose tissue function and structure. Indeed, VitD increases the production of some anti-inflammatory cytokines and reduces the release of some pro-inflammatory cytokines. The association of the vitD pathway gene variants with anthropometric measurements and lipid profile has also been investigated. Polymorphisms in the vitD receptor (VDR) gene have been shown to be associated with the components of metabolic syndrome, obesity and type 2 diabetes mellitus in different populations. There are some reports of associations between the retinoid X receptor gamma gene variants and lipid and anthropometric parameters. And polymorphisms at the vitD-binding protein gene have been associated with body-fat percentage and obesity.

VitD supplementation in obese subjects showed controversial effects: with some studies demonstrating improvements in insulin sensitivity, glucose and lipid metabolism while others showing no beneficial effect on glycemic control and on inflammation. In conclusion, despite of the evidences of a significant role of VitD in the pathogenesis of obesity, metabolic syndrome and type 2 diabetes, its potential function in treatment and prevention of these diseases is unclear.

Keywords: Obesity, Vitamin D, Child, Molecular

NUTRITION DATA LIFE-COURSE: HARMONIZATION AND MANAGEMENT

CURRENT AND NEW INDICATORS FOR SMART SURVEYS, DEVELOPMENT AND APPLICATION

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According to recent global data from UNICEF, WHO and the World Bank, 50 million children are suffering from acute malnutrition and 159 million children are stunted. Availability of high quality nutrition data is essential in understanding the extent of nutritional needs and how to best develop programs to most ap-

propriately address those needs, especially during emergencies and large scale responses. The availability of timely and credible nutrition data, presented in accessible ways at national and sub-national levels, can help governments and other actors to be responsive to these challenging circumstances, guide nutrition and health programming in-country and help prioritize support globally. Valid nutrition data and evidence make the difference.

SMART (Standardised Monitoring and Assessment of Relief and Transitions) is recognised as the standard methodology for nutrition and mortality surveys at national and sub-national level by decision makers in the international nutrition community, including government ministries (e.g., national Ministries of Health), institutes of statistics, national and international NGOs organizations , , UN agencies , academia, and consultants. Endorsed by the Global Nutrition Cluster, most nutrition surveys in Sub-Saharan Africa are conducted using the SMART Methodology . The high quality data collected with SMART feed into national and regional nutrition information systems for effective and co-ordinated decision-making, particularly in times of emergencies when data is critical for resource allocation. SMART tools are also critical for the preparedness of governments and other actors gathering and utilizing data of various population groups, geographic levels and contexts allowing comparability across countries and over the course of multiple years.

Given the standardization of data collection tools, comparability across countries and contexts, adaptability with mobile technology, and data quality checks, Nutrition International approached the SMART team at Action Against Hunger to ultimately increase availability of consistent and reliable data for the monitoring of nutrition indicators based on the SMART tools for their cross-country nutrition and health programming.

Keywords: Nutrition, assessment , standardization, surveillance, quality.

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NUTRITION INTERVENTION MONITORING SURVEYS (NIMS) – A STORY OF HARMONIZING DATA INDICATORS AND METHODS ACROSS MULTIPLE COUNTRIES

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Nutrition International (NI), formerly the Micronutrient Initiative, has been working to reduce malnutrition in vulnerable populations for 25 years. In part this has involved improving government monitoring and reporting to ensure that nutrition programs are reaching vulnerable populations with interventions that achieve desired results. In reviewing the multiple surveys and monitoring tools that NI has developed and implemented, NI recognized the need for harmonized surveillance methods and tools to (i) obtain and store uniformly collected data to facilitate quality assurance and cross-country analyses; (ii) ensure indicators are consistent across multiple interventions, (iii) establish harmonized electronic data collection tools to facilitate concurrent external survey monitoring and speed survey feedback and final reporting; (iv) potentially adapt these tools for use during supervisory visits to improve regular program monitoring and reporting; and (v) inform other similar global nutrition surveillance efforts.

NIMS tools were initiated in collaboration with Action Against Hunger (ACF) to build on their SMART approach of harmonized data collection for nutrition status indicators. NIMS collect indicators of program related knowledge, attitudes and practices (KAP) as well as facility stocks and provider KAP; related modules currently address maternal iron and folic acid (IFA) and antenatal care, intermittent IFA, infant and young child nutrition, micronutrient powders for young children, delivery and newborn care, zinc and oral rehydration for treating diarrhea, and facility-related issues for each of these topics. NIMS also include external monitoring tools, being developed and tested in collaboration with the University of Toronto, to provide simultaneous data-cleaning and related feedback to survey teams.

Based on NI's experience while implementing NIMS in four countries, this presentation will summarize the key discoveries and recommendations related to: 1) developing harmonized indicators, 2) ensuring consistency during contextualization, 2) optimizing training and implementation, 3) relative inputs compared

to individually developed surveys, 4) potential use for supervisory monitoring visits, and 5) implications for future updates.

Keywords: Nutrition, surveillance, harmonization, quality, standardization.

Further collaborators:
Action Against Hunger
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EXTERNAL MONITORING OF NUTRITION SURVEYS – EXPERIENCES FROM DEVELOPING AND IMPLEMENTING MONITORING TOOLS IN TWO MULTI-COUNTRY SURVEY CONTEXTS

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The University of Toronto (UofT), like other academic institutions, partners with implementing agencies to develop scientifically rigorous methods for measuring nutrition-specific and nutrition-sensitive indicators at individual, household and population levels and robust study designs for effective, accurate and interpretable impact evaluation of large-scale interventions aimed at maternal, newborn and child nutrition and health. Recent external monitoring efforts have included: (a) a series of baseline assessments using a quasi-experimental design in four countries as part of Enhancing Nutrition Services to Improve Maternal and Child Health in Africa and Asia (ENRICH), a multi-country, broad-spectrum and integrated intervention program funded by Global Affairs Canada (GAC) and implemented by World Vision Canada (WVC), and partners; and (b) Nutrition International's (NI) Nutrition Intervention Monitoring Surveys (NIMS) conducted in several countries. Both sets of surveys employed SMART approaches and tools embedded within larger household survey (HHS) tools, which were developed to ensure consistency in target indicators, component variables and response sets across settings while accommodating local contextualization, adaptation and translation by in-country research partners (CRPs) in each of the participating countries.

Based on UofT's experiences in support of external monitoring of nutrition surveys in two multi-country survey contexts, this presentation will summarize the key discoveries and recommendations related to: (i) developing English and predominant local language Open Data Kit (ODK) templates for field-based data collection at multiple sites on android devices; (ii) remote coordination with in-country local teams to pre-test, correct and adapt draft tools on very short timelines; (iii) daily monitoring and quality assurance during data collection using rapid analysis and feedback on primary data uploaded to cloud servers. We focus on lessons learned from multiple challenges encountered and met across settings. We highlight the advantages of ODK approaches

when development is controlled centrally, and some specific difficulties that can arise when it is not. Our experience indicates that ODK can be highly effective and efficient when sufficient time and money is invested to make it work smoothly form the first day of data collection, and that it is also flexible, allowing rapid resolution of logistical and technical difficulties in the field when best approaches are applied.

Keywords: Harmonization of data collection, maternal and child nutrition, nutrition intervention program, ODK, multi-country

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World Vision Canada, Aga Khan University Pakistan, James P Grant School of Public Health, BRAC University, Egerton University, Muhimbili University of Health and Applied Sciences, Nutrition International

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GLUTAMATE A SIMPLE MOLECULE WITH SEVERAL FACES

WHY DO WE LIKE THE UMAMI TASTE OF GLUTAMATE?

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The answer to this question lies behind the understanding of glutamate (Glu) taste properties, its function by itself as an amino acid, and the cooking processes that make Glu so abundant in the foods we eat. Taste strongly determines our food choices and their utilization in the body. Our taste papillae in the tongue express different taste recep-tors responsible to informing the brain of the chemical background of foods. We are pro-grammed from birth to prefer certain tastes, sweet, umami, weak sour and moderate salty tastes, and avoid others such as very strong bitterness, sourness and saltiness. These innate behavioral responses ensures the intake of sufficient nutrients while pro-tecting us against the ingestion of an excess of sodium, spoiled foods or plant toxic me-tabolites. In the other hand, food habits and dietary patterns are learned from our mother throughout pregnancy and lactation, and through our life eating experiences. They are strongly determined by food and cultural environment.

Glu is the representative compound for umami taste, one of the tastes we are conditioned to prefer. Abundant in breast milk, soups stocks, fermented and cured foods, this amino acid serves multiple functions. As a nutrient, Glu is part of proteins such as meats, fish, eggs, legumes, and dairy products. By itself alone, when is not bound to proteins or peptides, Glu is metabolically active and can behave as a signaling molecule. It is rich inside cells as unbound Glu also known as free Glu (FGlu) where it ca be used to synthesize other amino acids or bioactive molecules like the antioxidant glutathione, to generate energy through the Krebs cycle,

or to communicate with neighboring cells. It also contributes to the nitrogen metabolism and detoxification of ammonia producing glu-tamine via glutamine synthetase. Each of these functions requires either metabolic en-zymes for synthesis and degradation of FGlu, transporters for carrying Glu through cell membranes, or Glu and taste receptors for rendering information about the cellular envi-ronment or the food we ingest.

It is important to emphasize that only FGlu has taste. The Glu bound to proteins cannot interact with taste receptors and consequently is not relevant to umami, but it is still significant to our body. Many cooking or food manipulation process from many tradi-tional cuisines such as extraction in soups, fermentation, maturation, curing or drying enhances the availability of FGlu. This is why soy or fish sauces, cheeses or soup stocks are very rich in umami. The enzymatic breakdown of proteins or cells in meats or beans releases large amounts of FGlu, which gives a very subtle, long lasting and coating sen-sation throughout the whole tongue characteristic of umami. At the end of the presenta-tion, I will describe how FGlu could function as a general marker of familiar foods or foods that are adequate for our ingestion.

Keywords: Umami, glutamate, MSG, taste receptors, signaling
Conflict of Interest disclosure: I am employee of Ajinomoto Company.

UMAMI TASTE: A TOOL TO REDUCE SODIUM IN-TAKE

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Sodium chloride (NaCl) has been the most commonly used ingredient to confer salty taste to foods. However, excess sodium in the bloodstream has been associated with the development of several chronic non-communicable diseases, mainly arterial hypertension a risk factor associated to cardiovascular and kidney diseases. In addition, excessive sodium intake has also been associated with stomach cancer, osteoporosis and obesity, among others. Thus, in order to limit sodium intake to levels considered safe, the World Health Organization (WHO) recommends for adults a daily intake of not more than 5 g of NaCl (less than 2 g of sodium). According to the country, most sodium could come from processed foods (USA), or added while eating, home cooking and foods from restaurants (Brazil). As an example, in Brazil, the mean intake of NaCl is 12 g per person per day (4.7 g sodium). The Pan American Health Organization (PAHO) recommends three strategic actions to reduce sodium intake: (1) promotion of healthy eating (particularly with regard to the rational use of salt); (2) implementation of educational actions for health professionals, manipulators and manufacturers of food, and the population; and (3) reformulation of processed foods. The last recommendation indicates there is an urgent need to find salt substitutes to reduce the sodium content in the foods. Among those substitutes umami compounds have been pointed as an alternative strategy, since

they have the ability to balance the taste and harmonize the total flavor of a dish. Umami can also improve the palatability of a wide variety of foods. The umami taste also depends on the amount of salt. It was verify that soups low in salt, but with umami, were tastier than those that did not contain umami. Like salty, umami is also a basic taste and the compounds associated to umami are monosodium glutamate (MSG), guanosine-5'-monophosphate (GMP) and inosine-5'-monophosphate (IMP), mainly. GMP and IMP act synergistically with MSG, and all of them are approved to be used as food additives. Those compounds has been evaluated by scientific committees and regulatory agencies, including the Joint FAO/WHO Expert Committee on Food Additives (JECFA), the Scientific Committee on Food (SCF) of the European Commission, the United States Food and Drug Administration (US FDA), and the Federation of American Societies for Experimental Biology (FASEB). JECFA and the SCF established an acceptable daily intake (ADI) "not specified", which indicated that the substance posed no health risk to consumers when used as a food additive in amounts necessary to obtain the desired technological effect. US FDA and FASEB confirmed both the safety of MSG when used as a food additive, and classified it as a Generally Recognized as Safe (GRAS) substance. In this lecture it will be presented an overview about the safety aspects of MSG as food additive, and the potential applications of its use to reduce sodium content in specific industrialized foods, such as soups, stocks and seasonings, instant noodles, meat products, snacks and milk products.

Keywords: Basic test, umami, monosodium glutamate, safety evaluation, industrialized foods.

HOW DOES GLUTAMATE WORK IN YOUR BRAIN?

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One challenge of modern neurobiology is the identification of individual molecules that operate within neural circuits, regulating brain function and control synaptic plasticity. Neurotransmitters, the essential molecules for the transfer of information between neurons, are released from a presynaptic terminal into a synaptic cleft. The interaction of a neurotransmitter to its postsynaptic receptors induces an ionic flux that depolarizes or hyperpolarizes the neuron. Neurotransmitter binding also may cause metabolic changes such as the activation of second messenger systems or opening the ion channels.

The glutamate (Glu) in the central nervous system (CNS) is the main excitatory neurotransmitter, and its action depend the extracellular concentrations be kept low. Due to the blood–brain barrier essentially prevents the entry of glutamate into the CNS, most of the glutamate must be synthetize in the brain mainly from glucose. Essentially by transamination of α-ketoglutarate in both neurons and glia. Depending of the type of neuron, Glu can be used for excitatory synaptic transmission or decarboxilated by a glutamate descarboxilase for the synthesis of GABA, the main

inhibitory neurotransmitter in GABAergic neurons. In synaptic terminals, Glu is stored in vesicles and released via a calcium-dependent mechanism. Once in the synaptic cleft, Glu binds and activates postsynaptic glutamate receptors. The action of Glu is finished by removal from the synaptic cleft by neuronal presynaptic and glial high affinity reuptake systems. Given the critical role of Glu in neural function, it is not surprising that a greater level of regulation is required of brain L-glutamate concentration than that observed in most other tissues where important roles has in the intermediary metabolism and is present at millimolar concentrations.

Astrocytes are the most important cells for controlling both the biosynthesis and turnover of glutamate and GABA. In astrocytes, glutamate is used for the synthesis of glutamine, which is catalyzed by a glutamine synthetase as an inactivating mechanism of this neurotransmitter. Then, glutamine is released and recycled to regenerate glutamate by a phosphate-activated glutaminase. The uptake of glutamate and GABA and their transformation in glutamine by astrocytes give origin to the Glutamate-GABA-Glutamine cycle operating between the nerve endings of glutamatergic or GABAergic neurons and surrounding astrocytes. In addition, the coupling between excitatory and inhibitory neurotransmission is key for maintaining the synaptic function and convert the Glutamate-GABA-Glutamine cycle as a special mechanism of protection against excitotoxicity in normal and pathological conditions such as in neurodegenerative diseases.

In this lecture, we will review the current knowledge on glutamatergic signaling in the central nervous system with a special emphasis in the coupling excitatory and inhibitory neurotransmission and the key role of the astrocytes in this process.

Keywords: Neurotransmission, glutamate, excitation/inhibition, metabolism

GLUTAMATE IN THE CONTROL OF ENERGY BALANCE

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With metabolic syndrome, overweight, and obesity on the rise worldwide, there is a need to better understand the biology that controls energy balance and regulates body weight. Several external and internal factors have been implicated in the modulation of hypothalamic neurons responsible of satiety and hunger sensations including glucose and fat metabolites; hormonal, immunological and nervous mediators. Studies considering the recognition of dietary glutamate by specific receptors in the intestinal tract have contributed to the understanding the role this amino acid has in the regulation of energy balance. Glutamate functions as a nutrient and as a dietary signal from the gastrointestinal towards the brain. At the moment, glutamate's role in umami taste upon stimulation of specific receptors on epithelial cells present in taste buds is well established. Animal studies have also shown that stimulation of glutamate receptor, mGluR1, within gastric epithelium releases serotonin, nitric oxide that subsequently stimulates the vagus nerve. The vagus nerve then carries information to the hypothalamic centers that control hunger and satiety. In addition, animal and human clinical studies have shown that consumption of glutamate modify body weight and food consumption. In a rat model of obesity, glutamate consumption decreased fat accumulation and leptin production. Data also show that children that drink infant formula rich in glutamate consume less milk than children who do not. Additionally, studies with adults have shown that monosodium glutamate consumption reduces energy intake from fat and sweet snacks. These studies provide evidence for dietary glutamate's role in the regulation of energy balance as a "proteostat" that limits food intake and increases energy consumption.

Keywords: Energy balance, food consumption, monosodium glutamate. umami

Conflict of Interest disclosure: I am member of "Instituto para estudio del Glutamato en Latinoamérica", Ajinomoto supports my participation in IUNS 21st International Congress

Track 6: Functional Foods and Bioactive Compounds

ESSENCE OF WASHOKU, UMAMI IS THE BASIC TASTE FOR BETTER NUTRITION?

UMAMI: THINKING OF AN IDEAL HEALTHY DIET FROM THE UNESCO HERITAGE FOOD CULTURE, WASHOKU

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Life-expectancy at birth for Japanese is long; the mean for women is 86 and 80 for men. Cancer and heart disease have been increasing; however, the age-adjusted death rates have been quite constant, indicating the increase has been due to the increase in the elderly population. The prevalence of obesity is the lowest in the 50 developed countries, with obesity defined as BMI over 30. The prevalence of obesity in the last 40 years has increased in the USA from 15% to more than 30%, and in England from 7% to 25%. In Japan it has also increased from 2% to 3.5%, but the increase has been small. The Japanese have maintained their lipid intake at about 55g/day for more than 40 years. World-wide the higher the income, the higher the lipid intake; however, Japan has been exceptional in this. Sugar intake is more than 100g in the USA and Holland and more than 50 g in Taiwan but only about 30 g in Japan.

The above results may be attributed to the Japanese cuisine. A special aspect of this cuisine is UMAMI seasonings. These include glutamate from sea kelp, inosinate from fish, and guanosinate from mushrooms. People may always seek tasty ingredients in meals, for example, salt, sugar, lipids and UMAMI seasonings. Japanese had been using high salt for a long time and had high blood pressure. A major cause of death until 1980 was stroke (brain hemorrhage) from high blood pressure. After the 1980's, UMAMI seasonings became more common because of low-cost commercial production and salt intake decreased. Perhaps the factors of low lipid intake over a long period and low sugar intake were also due to UMAMI seasonings.

Visual appeal may be an important factor of the Japanese cuisine providing psychological satisfaction. Gourmet Japanese cuisine is trying to express a view of nature in cooking. To that end, not only expensive ceramics and lacquer ware but also fish in a container in a boat-shaped wooden container, tree branches, grasses, flowers and even seaweed are used. Even in home situations, the presentation of food is an important consideration. The tendency to provide a number of smaller separate dishes may also contribute to the health of Japanese. Japanese cuisine tends to vary the preparation of standard ingredients (such as the diverse dishes based on soybeans); this perhaps contributes to a feeling of novelty that reduces habituated consumption.

Does such an attempt have the potential to contribute to health? For example, if the same dish is served in a paper container or on beautiful tableware, is the effect on health the same? If food is beautifully presented in small amounts on a variety of dishes rather than in a large amount in a single dish, our eating speed will be moderate and our intake will decrease. I think that such factors may have influenced obesity prevention, health promotion, and longevity for Japanese.

Keywords: Washoku, Japanese cuisine, health, UMAMI, small portion

UMAMI: ESSENCE OF WASHOKU FOR HEALTHY AGING

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More than 109 years ago, umami taste, the perceived taste essence of Washoku was originally discovered as a new taste quality by Japanese scientist, Professor Kinunae Ikeda with a motivation to improve the poor nutritional status of Japanese people. Finally, he contribute to develop the first umami taste seasoning, monosodium glutamate (MSG) as an affordable seasoning to make everybody able to cook delicious and tasty foods easily, cooperated with Ajinomoto Company. Today after his great work, Japan has been entered into the highest aged society with an active long–life expectancy. However, even now, many Japanese elderly faces to under-nutritional status, especially protein-energy malnutrition suffering from decrease in oral and gut functions with aging (hypo-salivation/ taste and swallowing dysfunction/dyspepsia/constipation). Using the purest umami taste substance (MSG), we has shown that umami taste could be sensed at oral tongue as well as gastrointestinal tracts and might act as an intake nutrient sensor (especially., protein) to modulate appetite and food digestion. Especially, many animal and human studies indicate that umami taste can stimulate exocrine secretions related to food digestion such as saliva and gastric juice. Now, we can know some clinical trials to examine whether umami taste has a power to improve the functional decrease of those aging-related health issues, or not. In this my presentation, I'll review the recent reports on umami taste research for improving elderly health, and discuss umami taste is how important to has been contributed to active-long life expectancy of Japanese people.

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SUBLIMINAL IMPACT OF BASIC TASTES FOR DECISION MAKING ON FOOD SELECTIONS

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Taste is known to play an important role in shaping food choice, and overall in the consumption of food. However, there is limited understanding of the mechanisms underlying these effects, particularly for non-sweet tastes and in the case of complex, cognitive aspects that go beyond appetite, reward or affective associations, e.g. health or dietary goals. Notably, little is known about whether taste could prime and potentially bias food choice via upstream effects, at the level of brain regions involved in cognitive executive processes that support goal-oriented, adaptive behaviors necessary for healthy eating in the current environment.

We conducted a study to explore possible associations of umami taste with brain and cognitive determinants of healthy eating. Previous experimental studies have shown that pre-meal intake of a broth or soup supplemented with monosodium glutamate, a key substance underlying the umami taste of foods, can decrease appetite and food intake, particularly in women with propensity to overeat and gain weight. Based on these data, we examined acute changes in brain and cognitive domains related to healthy eating following intake of a chicken broth alone or supplemented with monosodium glutamate in a sample of healthy young women. Subjects were evaluated with a food-modified computerized inhibitory control task, a buffet meal test with two calorically conflicting menu sets during which subjects wore eye-tracking glasses, and brain responses during a food choice paradigm evaluated with functional neuroimaging. We found evidence for improvement in key parameters related to inhibitory control following intake of the broth with monosodium glutamate, particularly in subjects with high levels of disinhibition, who also showed lower intake of saturated fat during the meal. Additionally, consumption of this broth led to a reduction in the rate of fixation switches between plates at the meal, and increased engagement of a brain region in the left lateral prefrontal cortex previously associated with successful self-control during food choice. Altogether, these results suggest potential facilitating effects of umami taste, specifically monosodium glutamate, in cognitive-executive processes that are relevant for the support of healthy eating behaviors and food choice.

Keywords: Umami, monosodium glutamate, neurocognition, eating behavior, food choice

CONTROL OF APPETITE WITH PROTEINS, PEPTIDES AND AMINO ACIDS

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Protein consumption impacts many essential physiological functions in addition to providing amino acids for protein synthesis. Appetite control is one of these functions. Consumption of proteins increase satiety and reduce food intake when consumed alone or with carbohydrate. The role of proteins in appetite control are of interest because they are more satiating than either carbohydrate or fat. They regulate food intake and metabolic functions by the combined actions of the intact protein, encrypted peptides and amino acids in the gastrointestinal tract and brain centers. The impact of consuming proteins on appetite control depends on many factors, including source, quantity, time of day, before or with a meal and age. These factors interact with the physiologic sensing of protein intake arising from the actions of peptides and amino acids released by digestion. The sensing systems include amino acid and peptide receptors in the gastrointestinal tract, and free amino acids in plasma and brain. As well the products of digestion stimulate many gastrointestinal hormones the signal the brain's food intake regulatory centers. Proteins may also increase food intake by adding palatability to foods and meals. In contrast, isolated proteins, their peptides or free amino acids are often unpleasant when consumed alone. The exception to the generally unpleasant taste of protein hydrolysates or free amino acids is monosodium glutamate, which provides the umami taste and may also provide signaling of protein ingestion via gut receptors. With the exception of glutamate, the potential of individual free amino acids to be uses as tastants or additives for regulation of appetite and food intake in humans has received little exploration. However it is clear they provide nutrient signaling via the gut. In summary, food proteins and the peptides and amino acids have many physiologic functions that contribute to regulation of appetite and healthy body weight.

Keywords: Protein intake, appetite control, amino acids, taste, satiety

NEW TECHNOLOGIES THAT MATCH NEW CONCEPTS IN NUTRITION

FOOD LOSSES AND WASTE (FLW) AS SOURCE OF BIOACTIVE COMPOUNDS OF NUTRITIONAL INTEREST

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In recent years, two relevant facts have emerged, which will probably have an impact on the food industry agenda in the near future. On the one hand, the estimation made by the Food and Agriculture Organization (FAO), that around one third of all food produced in the world is lost or wasted. In addition to reducing farmers' incomes and increasing consumers' expenses, FLW have also an important negative environmental impact because of the associated greenhouse gas emissions and inefficient use of water and land. On the other hand, the increasing awareness raised by consumers on the significant role that diet has in the modulation of body functions, which can contribute to improve the state of well-being, to reduce the risks associated to certain chronic diseases, and ultimately to improve the overall quality of life. Market drivers for this awareness include the ageing population, the increasing health care costs, the technological advances in the food technology field, and the progresses made in different food legislations. Within this framework, agricultural by-products, which for many years have been considered as undervalued substrates due to the problems arising from their removal from food production, and the necessity to treat them before their disposal in the environment, are now being regarded as a cheap source of highly appreciated bioactive compounds. As a consequence, an exciting new field of research has arisen, which include the development of emerging processing technologies (such as High Pressure Processing Pulsed Electric Fields, and Ultrasound), able to maximize the efficiency of extraction and the remaining bioactivity of the compounds of interest during the processing and storage of the formulated product; and to successfully deliver the desired bioactive component to the target sites in the body. Other aspects to consider are related to the challenges associated to the regulatory positioning of bioactive compounds and functional foods, to the strategies that should be deployed when launching novel foods containing the recovered compounds into the marketplace (such as Kano Method), and to the need to meet consumer expectations and acceptance, in terms of documented efficacy, food safety, organoleptic properties and price of health promoting food. Therefore, the presentation will discuss general aspects related to the state-of-the-art in the recovery technologies of the target compounds, and their successful recycling inside the food chain as functional additives, in products devoted to different population niches. Specifically, topics to be addressed will be: the recovery strategies and stages to be consider, the impact that emerging technologies have in aspects such as nutritional value, functional properties, bioavailability and shelf-life of biocompounds, and the use of marketing methodologies leading to the success of the final food products. In addition to the positive impact that this new field will have on the reduction of FLW by recovering part of the nutritional potential of by-products, improving the competitiveness of food chains, and reducing the environmental impact, it can be also considered as a promising opportunity for the agro-industrial development of Countries like Argentina.

Keywords: Emerging food processing technologies, High Pressure Processing, by-products, Kano method, health promoting compounds

Further collaborators:

Gabriela Denoya, Mariela Maldonado, Julio Juárez, Adriana Pazos, Vanina Ambrosi

APPLIED NANOTECHNOLOGY: IMPROVEMENT OF NUTRITIONAL FOOD PROFILES

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Nanotechnologies are considered to hold a great promise for the development of new products in almost all industrial sectors and many applications are currently marketed worldwide. The development of new products and applications involving nanotechnologies holds great promise in different industrial sectors, food not excluded.

The great advantage of materials at this dimensional state is that they show unique functional properties from bulk materials, properties that can be exploited for a wide range of applications. These properties are mainly due to a high surface to mass ratio that results in a higher reactivity for interactions.

Nanotechnology offers new opportunities also for the food and agricultural industries and several applications can be found at different stages of the food production chain.

Food additives and flavor enhancers, food supplements (e.g. to increase iron or other trace element bio-availability), novel food structure (e.g. nanoemulsion to reduce fat content), nanoparticles for selective binding and removal of contaminants and pathogens from food. Furthermore, nanotechnology has the potential to transform our future food packaging materials, as part of an active and intelligent packaging system

Despite these promises, however, nanotechnologies should be carefully applied because toxicological data on several nanomaterials already in use are lacking and because the development of analytical methods able to guarantee consumer protection is still ongoing and need to face several challenges before any routine application in food control could be imagined. To be successful in the long run, proper education of the public is also paramount in the introduction and development of nanotechnology in food system. In spite of these the development of functional foods through the addition of bioactive compounds holds many technological

challenges, so the technique that industry can use is microencapsulation. It is an useful tool to improve the delivery of bioactive compounds into foods, particularly probiotics,

minerals, vitamins, phytosterols, lutein, fatty acids, lycopene and antioxidants. Several microencapsulation technologies

have been developed for use in the food industry and show promise for the production of functional foods because the addition of bioactive ingredients should not affect the sensory properties, colour or flavour of food products. Moreover, these technologies could promote the successful delivery of bioactive ingredients to the gastrointestinal tract. The microcapsules can release their contents sealed at controlled rates under specific conditions, and can protect the encapsulated product of light and oxygen. Microencapsulation is formed by a micro-porous polymeric membrane of an active substance container. A microcapsule consists of a semi-permeable membrane, spherical, thin and strong center around a solid / liquid. The substances that can be microencapsulated are vitamins, minerals, dyes, prebiotics, probiotics, flavors, nutraceuticals, antioxidants, odors, oils, enzymes, bacteria, perfumes, drugs and even fertilizers.

Keywords: Functional food, nanotechnology, microencapsulation

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THE HUMAN MICROBIOME: SHARING OUR BODIES

SHARING OUR BODIES. THE SYMBIOSIS OF HUMANS AND OUR MICROBIOTA. A HIGHLEVEL OVERVIEW OF RESEARCH IN THE FIELD

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Our knowledge about human gut microbiota, its resident species and their functional interaction capacity with its host has grown exponentially in recent years, especially due to next generation DNA sequencing technologies. These recent techniques have helped demonstrate the incredible diversity present in this ecosystem. Indeed, the adult human intestinal microbiome is considered one of the places with the highest microbial densities known. Estimations indicate that the gut microbiome has over 1800 bacterial genera and between 1500 and 3600 bacterial species, the vast majority of which has so far not been cultivated. Such estimations do not take under consideration other microbial groups which are present within the intestinal system, such as Archaea and Fungi. Several recent studies have provided important information with respect to what constitutes a 'healthy gut microbiota' while furthering our understanding of the role of gut microbes in intestinal and metabolic diseases. They have shown that the gut microbiota plays an important role in maintaining the host's overall health. For instance, nutrients such as non-digestible, fermentable carbohydrates can affect gut microbiota composition and modulate microbial-host interactions, which in turn maintain and/or pro-

mote health. Dysbiosis ensues when this relationship is disrupted. Manipulation of gut microbiome can provide new avenues for the treatment and prevention of human diseases.
Keywords: Human Microbiome

EXPLORING THE ROLE OF THE MAJOR GUT MICROBIOTA CLUSTERS ON NUTRITIONAL AND FUNCTIONAL BENEFITS OF NUTRIENTS AND NON-NUTRIENTS

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The biotransformation capabilities encoded in the gut microbiome greatly exceed that of the host genome, these include functions involved in the breakdown, metabolism and absorption of dietary components. As such, the gut microbiota is a key factor in shaping the biochemical profile of the diet and, therefore, its impact on host health and disease.

The ILSI Europe Functional Food Task Force set up a working group to gain a perspective on the state of the art in this area with a focus on the role played by the gut microbiota in metabolism and absorption of key nutrients and non-nutrients. This has taken the form of a systematic review focussing on energy and the following candidate dietary substrates: protein, carbohydrate, fat, resistant starch, dietary fibre and polyphenols. In reviewing the literature, particular attention was paid to the characterisation of the microbiotas which are predominantly implicated in each case, and indications of the potential health impacts.

In addition to this systematic review, we have conducted a detailed evaluation of the main gut microorganisms and microbial pathways involved metabolism of these dietary components and furthermore we have critically examined existing and novel methodologies used to study diet-gut microbial interactions including 'omics' techniques, mathematical modeling, isolated microbes and enzyme assays.

It is anticipated that a more thorough understanding of the role the gut microbiota plays in the metabolism of dietary substrates and of the relevant members of the microbiota and community profiles holds considerable promise to facilitate the development of novel health-orientated dietary strategies.
Keywords: Gut microbiota, microbiome, nutrient metabolism, health impact
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Scientific advisory boards: Herbalife Nutrition Institute, McCormick Science Institute, European Natural Soybean Association, Alpro Foundation ILSI Europe working group

HIGH QUALITY OLIVE OIL: NUTRITION AND HEALTH

MANUFACTURING OF OLIVE OIL FROM A NATIONAL PERSPECTIVE

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The history of the Argentine oliviculture has had periods of apogee and great depressions. A few years after the foundation of Mendoza (1561), the first olive trees were introduced to the country in order to produce oil in an artisanal way. Then a royal decree would force to be cut them, but a plant was saved in La Rioja; this olive tree still survives and is known by the name of "Fourth-Centennial Olive Tree" and is located in the Arauco District, region of which takes the name the unique Argentine variety that appears in the World Catalog of Olive Varieties (1995), published by the I.O.C. (International Olive Council). With the arrival of immigrants, the consumption of olive oil (more than 3 L/person in 1930) was impelled. The first law of promotion of oliviculture arises in 1932: "make homeland, plant an olive tree", through which one more than 7,000,000 olive trees were planted, being Mendoza the main producer. Then with the production of lower cost seed oil, the apogee of winemaking and the discrediting campaign by the health sector, there was a new cut of olive trees (60's). This situation changed radically at the beginning of the 1990s with the laws of Tax Deferrals for industrial, agricultural, livestock and tourist enterprises (Law No. 22.021 in La Rioja, Law No. 22702 in Catamarca and Law No. 22973 in San Juan). These laws stimulated the development of new plantations in the northwest provinces, so Catamarca went from 952 ha in 1998 to 16,354 ha in 2016, and is currently the first olive oil producer of Argentina. In Catamarca, 80% of varieties are oilers, mainly Arbequina, Coratina, Barnea, and Frantoio. The remaining 20% are dual purposes, such as Manzanilla and Empeltre. In Mendoza 59% of the olives is for preserves, mainly Arauco and Manzanilla. The remaining 41% goes to oils: Arbequina, Farga, Empeltre and Frantoio. The predominant olive oil extraction system is the horizontal centrifugal continuum (80%), predominantly the two-phase. In a study made at Facultad de Ciencias Agrarias UNCuyo (2016), no statistically significant differences were found in the lipid profile, using ANOVA (analysis of variance) for $\alpha < 0.05$, for the different methods of extraction (decanter or press), but there was differences for varieties and cultivation latitudes. At the moment Argentina is the eleventh world producer of olive oils, occupying the first place in America; This represents 5% of world production. However, the consumption per capita is 200 g, compared to 15 kg/person of sunflower oil. In Italy and Spain the consumption exceeds 10 kg/person and in Greece reaches almost 20 kg. In some countries, with the frontal labeling, olive oil has a red traffic light, and this goes against all nutritional recommendations, so these measures should be review

Keywords: Olive oil, production, consumption, extraction method

THE QUALITY OF OIL AS A DISTINCTIVE TOOL

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The United Nations Food and Agricultural Organization (FAO) states that there is food security (FS) when all people at all times have physical and economic access to harmless and nutritious food to satisfy their needs. As a result, it is vital to reduce the negative effects of development over the environment and natural resources as well as climate change. FS thus implies offer and availability of harmless and high quality items of food. Olive oil (OO) has been declared Argentine National Food by Congress (Act N°26.839/13) and is a food matrix with synergy compounds which are responsible of its particular features of quality and for the favorable effects in the prevention of some prevalent diseases such as heart disease and cancer according to scientific evidence. In the chemical composition of virgin olive oil (VOO) two parts are distinguished: a) a principal saponifiable fraction (98-99% of the total weight of oil) made up of triacylglycerols (TAG) with a participation of major fatty acids (FA): palmitic, oleic (genetic reference) linoleic; and in minor quantities: myristic, palmitoleic, heptadecanoic, heptacenoic, stearic, linolenic, arachidic, gadoleic, behenic and lignoceric acids. Triolein and andpalmitic-oleic-oleic are the major TAG in AOV, together with low concentrations of monoglycerides and diglycerides and free fatty accids; b) the unsaponifiable minority fraction (up to 2% of the total weight of oil) made up of compounds chemically related to FA (waxes and phospholipids) and not related to FA (terpene hydrocarbons, polyphenols, sterols). The production of VOO as a result of genetic, environmental and technological interactions include: the supply and processing of olives, storage and conservation of oil, control of quality and marketing of final product. Among the principal factors which condition quality are variety, degree of fruit ripening and extraction system. The quality control of VOO monitors two chemical degenerative processes: hydrolysis and oxidation by means of physical-chemical indexes (acidity, peroxides, ultraviolet absorption), sensory analysis and authenticity control particularly profiles of FA and sterols. This is regulated in Argentina by the Argentine Food Code (CódigoAlimentarioArgentino), Chapter VII, sections 535,536, where oil is classified according to the degree of free acidity as: Extra, Virgin and Ordinary in consonance with the marketing norm of the International Olive Council. Results from the Faculty of Health Sciences are shown which were obtained of VOO varietals from Catamarca (2014 and 2016 harvests). Quality and FS are in an evolution process so as to recover consumers' confidence and the future has been placed in the commitment towards quality on the part of producers and manufacturers making sure that commercialized products are rigorously controlled. The Value Added Secretary (Argentine Ministry of Agriculture and Industry) reported in 2016 on requests on the adding of value (Geographic information / Denomination of origin) so as to protect the quality of VOO from Argentina: OO from the southwestern part of Buenos Aires and OO and olives from Araujo.

Keywords: Olive oil – Composition - Quality control – Catamarca

SENSORY ANALYSIS OF OLIVE OIL FROM CATAMARCA. REGIONAL EXPERIENCE FOR THE TASTING PANEL

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The province of Catamarca, located in the olive-farming region of the Argentinian northwest, produces principally high quality olives from which to extract extra virgin olive oil (EVOO) using a two-phase technology. It possesses varied agricultural and ecological areas which give origin to olive oils with characteristic sensory profiles obtained from different varities grown according to the degree of the ripening process of the olives. Although the characteristics of the product are defined by the combination of agronomic and industrial factors, qualified and timely interventionin the fundamental stages of the olive chain of value is a key to define the sensory attributes of the product and to assure the degrees of fruit taste with their different shades of flavor as well as the balance between bitterness and spiciness. The Test Panel method is an effective tool to establish distinguishable features among olive oils from the assessment of their attributes by resorting to the senses of selected and trained tasters. In the commercial classification of olive oils, according to the International Olive Council (IOC), fruit tastes together with the absence of defects determines whether a sample of olive oil is extra virgin or not. The determination of the characteristic and representative attributes of the types of extra virgin olive oil from Catamarca and the region as well as their consistency are necessary elements to differentiate them and give them added value. The Tasting Panel known as "Catadores del Valle" in coordination with the National Institute of Agricultural Technology (INTA) is the official panel recognized by IOC and constitutes a key instrument for the control, monitoring and quality improvements of types of olive oil extracted in the region. This panel was started in the year 2000 as an initiative of the private sector and in coordination with the School for sight-impaired people from Catamarca. The panel has worked without interruption and with the aim of achieving the technical level required internationally in a context of integration and support towards people with different capacities. The results obtained from the analyzed samples show the high quality and the sensory touches of the varities of olive oil produced in the region. They are elaborated mainly with Arbequina base which provides them with delicate fruit flavors with touches of apple, banana and dried fruits. Other typical varities grown in the area are Coratina, Barnea, Frantoio, Camomile and Arauco. They produce olive oils with great personality, from medium to intense fruit flavors which are ideal to intensify or complement other types of oil. All these provide consumers with a great diversity of high quality olive oils with distinctive sensory profiles. The EVOO possesses excellent characteristics of flavor and scent all of which in a context of harmony, complexity and persistence contribute to an appetizing gastronomy.

Keywords: Extra virgin olive oil, Sensory Panel Test, Catamarca

OLIVE OIL AS FUNCTIONAL FOOD. SCIENTIFIC EVIDENCE IN HEALTH

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Functional food is defined as all food consumed habitually as part of a normal diet, which independent from the provision of nutrients, contain biologically active components with the capacity to affect positively a particular biological activity, reducing the risk of diseases. The component which makes some food functional can be either a macro nutrient with a determined physiological effect, or an essential micro nutrient eaten in a dose above the recommended intake. It can also be a non-essential element of the food or a component without any nutritional value. The strategies of functional food production can be varied but these components will always come in the form of some food. In the case of olive oil (OO) both principal components as well as others which are present in small concentrations have been included in this category. It is important to remark that not all OO, considered to be the Mediterranean Diet fat, are equally beneficial to health. The scientific community has unanimously highlighted the beneficial nutritional effects and the healthy attributes of extra virgin olive oil (EVOO) both for its lipid part and its antioxidants. Among the principal components the most important is oleic acid (C18:1, ω-9) whose healthy properties have been recognized by the Food and Drug Administration (FDA) and the European Food Safety Authority (EFSA). Among the secondary components with bioactive character the phenolic compounds are highlighted by abundant scientific evidence. Nowadays it is also known that the special healthy attributes of OO can be found in the combined and synergic effect between principal and secondary components all of which are present in the fruit, the olives. Consequently, the most recommended olive oil for health will be the one with the highest quality. In this sense, EVOO is the one with the higher potential as a result of the scientific evidence provided by nutritional epidemiology which highlights its importance in relation to the health of its consumers. The beneficiary effects of olive oil as a functional food in dealing with different pathologies would not be merely due to its content of oleic acid but also due to the participation of polyphenols which act as a defense antioxidant mechanism against the constant production of Free Radicals (FR). These are highly unstable and reactive components which attack other cell components causing harm to proteins, lipids and DNA implied in the origin and evolution of chronic degenerative diseases. There is no data about the secondary components with a bioactive nature of the varities of olive oil obtained in Catamarca, which is considered to be the main producer province of OO in Argentina. All this makes it necessary to carry out more research about the phenolic portion present in olive oils from Catamarca so as to be able to design a functional oil enriched with these bioactive components, in the appropriate doses for the prevention of diseases associated to old age and oxidative stress.

Keywords: Functional food - Olive oil - Oleic acid - Polyphenols

CONSUMPTION OF OLIVE OIL IN A HEALTHY DIET

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In a diet fats are the principal source of energy and their biological properties are defined by the quality of the fatty acids that constitute them which has a deep influence in health. In the last decade improvements and recommendations in the field of fats and fatty acids in human nutrition have been produced. They are based on a significant body of scientific evidence derived from epidemiological and clinical studies as a result of the growing global incidence of chronic-degenerative diseases related to changes in diet and life style which currently constitute the main cause of mortality and incapacityat world level. The 2008 FAO/WHO Expert Consultation defined nutritional objectives with minimum and maximum intakes of total fats and fatty acids in adults. In relation to mono-unsaturated fatty acids (MUFA) found in lots of items of food, oleic acid (C18:1,ω-9), a major component of olive oil, is the most recommended to be consumed in any diet due to its beneficial effects especially in the extra virgin quality. This is the result of its high oleic content and its contribution in minor bioactive components such as polyphenols. The studies which more strongly support the healthy cardio effects of MUFA have been conducted in the context of a Mediterranean Diet based on the habitual consumption of vegetables, fruit, legumes, fish, dried fruit, skimmed dairy products, moderate consumption of red wine and olive oil as the main source of fat in diet (20% or more in the total energetic intake). In Argentina, although the availability and consumption per capita of olive oil has been growing in the last 20 years, it is still marginal in relation to other seed oils and compared with the main consuming countries. It can be found in only 10.5% of homes and it is used mainly as a flavoring (90%) in middle income segments. From a nutritional point of view virgin olive oil is the natural juice of olives and is extracted by physical processes which make it different from the rest of eatable vegetable oils which are obtained by chemical processes of refining. Although it is mostly recommended to be used "raw" to preserve all the organoleptic and nutritional properties derived from the crushed fruit, it is also adequate to cook at high temperature without decomposing, which means it keeps its chemical structure in normal conditions. All this makes olive oil suitable for gastronomic preparations such as stir-frys, barbecues, stews or fried dishes. Our relation with food is complex as it is part of culture, consumers behaviors vary significantly among countries and among segments of consumers. The popularization of the properties of olive oil together with a change in habits which lead to a more balanced and healthy diet is a way to encourage local consumption.

Keywords: Mono unsaturated fatty acids – Olive oil – Diet - Health

FUNCTIONAL FOODS 2017 – NEW PERSPECTIVES

ANTIOXIDANTS AS BIOACTIVE INGREDIENTS IN FUNCTIONAL FOODS. A REAPPRAISAL

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Nutritional antioxidant supplementation has been considered largely of secondary importance for human health in medical practice. However, oxidative stress caused by the body imbalance of oxygen and nitrogen reactive species (ROS/RNS) may induce gene-regulatory effects and influence signal transduction pathways1. Therefore the use of antioxidants as active ingredients in functional foods, nutraceuticals and food supplement formulations is demanding increasingly a reappraisal of its effectiveness not only in order to avoid diseases as part of a healthy life style together with a balanced diet and physical exercise but as part of adjuvant therapies in chronic degenerative diseases. Oxidative stress caused by the body imbalance of oxygen and nitrogen reactive species (ROS/RNS) may induce gene-regulatory effects and influence signal transduction pathways. Our previous findings on the effect of a mango bark extract (Mangifera indica L.) showed a dose-dependent inhibition of tumor necrosis factor (TNFα) and nuclear factor κB (NfκB) both in vitro and in vivo indicating that its antioxidant effect was down-regulated by these factors2. Other transcriptional factors (JAK 1/2, STAT 3, AKT, MAPK, IKK) and the VEGF have been also inhibited by mangiferin, the major component of the mango extract3. It has been described recently that the Antioxidant Responsive Element (ARE) acts as specific enhancer of antioxidant enzymes regulation through the transcriptional factor Nfr24. This factor may exert an autoregulatory effect on mafG and BSV1 transcriptional regulation5. These effects are underlying the human antioxidant defense pathways and may explain the potential benefits of antioxidants as bioactive principles in functional foods and food supplements as well.

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sion by electrophiles: induction of the transcriptional repressor BACH1 by Nrf2" Biochem J, 440,167-174.

Keywords: Oxidative stress, antioxidants, functional foods, nutraceuticlas, antioxidant therapy

FUNCTIONAL FOODS FOR THE ELDERLY - SPECIAL CONSIDERATIONS

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New strategies are needed to face the current panorama in world population fast ageing. Old age generally involves specific situations that interfere in the aspects of food intake and nutrition such as a) decrease of availability of financial resources, making the access to healthy and functional foods more difficult; b) decrease or loss of autonomic decision, influencing choices of what eat and how to prepare it; c) sensory losses (vision, flavor and taste) that interfere with the level of food intake and the amount of added condiments (salt and sugar, mainly); d) physiological losses (masticatory, enzymatic, gastro-intestinal) that lead to nutrient decreased intake, digestion and absorption. The inclusion of functional foods in diet is currently discussed as a strategy to prevent damage to health and prevent or delay the establishment of chronic diseases related to age. However, regarding older people diet, there is still a gap between scientific and technological knowledge that was developed in laboratories and what in fact is applied. One hindrance about the inclusion of healthy and functional ingredients (FI) in the diet of the elderly is the difficulty to change food habits, since the food pattern results of lifelong choices. Within this context, our research group works on two main strategies: improving the acceptability of FI-containing preparations and conducting clinical trials, mainly aiming older people. In studies of acceptability improvement, yellow passion fruit (Passiflora edulis) peel flour – PePF, a very rich fiber ingredient (total fiber content is higher than 65%, db), was used. Men and women (n = 36) with daily fiber intake below the recommended healthy levels (21g for women and 30g for men with more than 50 years old) were selected to perform acceptability tests. The participants middle age was about 69.1±5.6 years old. They were submitted to anamnesis and food survey to identify preparations that were compatible with their eating habits. The two more popular dishes were supplemented with PePF (16g/100g). The final products had acceptability and consumption intention evaluated by an elderly panel. PePF-enriched preparations had a high acceptability index (93.44%) and a high consumption intention (79.9% of the elderly reported that they intend to consume PePF-enriched preparations always or very frequently). According

to Brazilian laws, each portion of developed preparations can be labeled as fiber source food. In the clinical trial, yacon root pulp (Smallanthus sonchifolius) - YRP, containing 65-70% of fructooligosaccharides – FOS (db) was used. The effect of daily supplementation with 100g of YRP for 60 days on the lipid profile, glycemic index and insulinemic index of postmenopausal women (n = 46) aged about 65.7 + 8.5 years old was investigated. Supplementation with YRP pulp did not cause alterations in the lipid profile or glycemic parameters during the investigated period compared with the control group. However, it led to a decrease in body weight and waist circumference. This model of clinical trial with elderly people will be used to evaluate functional effects of PePF added foods.

Keywords: Elderly, fibers, functional foods

COMMUNICATIONS OF FOOD FUNCTIONALITIES

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Functional foods have potential positive effect on health beyond basic nutrition. The concept of functional foods was first developed in Japan in 1980s after escalating health care costs, the ministry of health initiated a regulatory body, which documented, regulated and approved various foods that had health benefits. Nutraceuticals are dietary supplements that deliver a concentrated form of a presumed bio-active agent from a food, presented in a nonfood matrix, and used to enhance health in dosages that exceed those that could be obtained from normal food. Various clinical trials in Kenya have demonstrated the potential benefits of functional foods in solving common morbidity. Solar dried amaranth leaves blended with maize flour porridge was fed to children aged 24-48 months for 6 months among pastoralist communities. Findings realized significant improvement of nutrients and higher retention of β – carotene, iron and zinc. Another study determined the nutrient composition and contribution of hypochondriac amaranth grain based porridge on nutrition status of 52 HIV children at a comprehensive care clinic. There were positive significant contribution to the nutrition status, CD4 counts and reduced morbidity incidences. An experiment with Spirulina powder in elevation of protein-energy malnutrition and iron deficiency anemia, targeted 240 children aged 6-23 months through a randomized controlled trial. The Spirulina fortified corn soy blend showed faster recovery from PEM and IDA compared to those on CBS alone and the controls. A study on effect of 80 g of peanut supplementation on bio-markers of CVD in 85 HIV free-living adults with dyslipidemia in a randomized crossover clinical trial for 22 weeks period, lowered cardiovascular risk significantly through reduction in total cholesterol, triglyceride and Low Density Lipoprotein Cholesterol. These case studies demonstrate the high potential of functional foods from locally available foods to lower the burden of diseases in Kenya.

Keywords: Randomized clinical trials, functional foods, morbidity

THE IMPACT OF FAST-FOOD DIET ON BONE DEVELOPMENT, METABOLISM AND QUALITY

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Endochondral ossification in the growth-plates provides a narrow window of opportunity to achieve optimal bone size and quality. Modern western diet has negative health implications; however, its effects on skeleton development have not been explored. We show that young rats, fed exclusively with McDonald's meals suffer from growth retardation due to growth-plates lesions within the tibiae. Bone mineral density decreased significantly, structural parameters of trabecular and cortical bone deteriorated dramatically, as did the mechanical performances of the bones. Supplementations with either multi-vitamins and minerals, or calcium alone resulted in partial rescue of growth-plate and bone phenotypes, but were accompanied by kidneys' calcium deposits. Our findings highlight for the first time, the severe pathology that consuming a fast-food diet does to the skeleton of growing young mammals. Pathologies that extends much beyond the known metabolic effects. These results are relevant to human's health as human bone pathologies corresponds with the rats' phenotypes, and fast-food eating pattern is highly common among children around the world.

Keywords: Processed food; skeleton development; chondrocytes; cortical bone;

LEVERAGING TRADITIONAL CROPS FOR BETTER NUTRITION AND HEALTH – THE CASE OF CHICKPEA

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Adequate nutrition in early life is a prerequisite for human capital formation and economic development. Although poor feeding practices is a problem predominantly thought to exist in low income and middle income countries, malnutrition is rapidly rising among developed nations as well. In this context, and in light of scarcity of protein sources, utilization of crops- such as chickpea-as a source of micro and macro nutrients is mandatory in the long route to nutritional improvement.

In this presentation, we outline interesting features of the chickpea crop, in terms of its nutritional value and agronomic potential that may help combat several health issues in both Western countries as well as in many low income sectors in developing countries.

On the global scale, chickpea consumption is steadily increasing in recent years. In developing countries, chickpea brings a variety of taste and texture to the cereal-based diet, as well as high-quality protein, fiber, carbohydrates and minerals, thereby ensuring a balanced diet and improving the nutritional status of the population. In developed countries, chickpea may be an ultimate source of protein for the increasing vegetarian/vegan populations. On top of that, allergenicity issues, content of phytoestrogens, and more are negligible in chickpea.

The chickpea crop should be considered as an outstanding source of protein, the ultimate alternative to soybeans, as well as the next health-food for human consumption.

Keywords: Chickpea (Cicer arietinum L.). Protein source. Legumes. Allergy.Malnutrition

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UPDATE ON ACTIVE PRINCIPLES. ACTIVE FOOD PRINCIPLES AND THEIR RELATIONSHIP WITH HEALTH

OLIVE OIL: SOMETHING MORE THAN A MONOUNSATURATED FAT

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It is widely accepted that any variety of olives may be used to obtain olive oil; however, the field yields and the quality of the product vary. Each variety of olive produces a different type of oil with its own sensory characteristics that give them their distinctive features. Virgin olive oils are oils obtained from the fruit of the olive tree (Olea europaea L.), by mechanical procedures and by some other physical means in especially thermal conditions so as to avoid the alteration of the oil. It means no other treatments apart from washing, decanting, spinning and filtrate. In this process, solvents, chemical refining and additives are excluded. These olive oils are classified with different denominations according to physicochemical and organoleptic parameters. From a chemical point of view, oil contains a principal or saponifiable fraction, which represents 98-99% of the total weight of the oil, and a minority fraction which represents 2%. The latest innovations in the process and the spreading of extra virgin olive oil (EVOO) culture are based on its quality. There are many studies derived from nutritional epidemiology which support the scientific evidence concerning the importance of EVOO in connection with the health of its consumers. These oils play a central role in the Mediterranean Diet, and its habitual consumption is associated to a lower risk of chronic-degenerative diseases. Among the constituents of the

major fraction, oleic acid (C18:1, ω-9) is the principal nutrient, which besides its energetic function, is attributed the major part of the bioactivity of olive oil. It represents 68-82% of the total amount of fatty acids found in oil. It can be found it its free form, though it maily form part of the oil triacylglycerols. EVOO contains, in it sunsaponifiable fraction, hundreds of minor constituents which are difficult to determine because of their structural complexity and their low concentration; however, they have demonstrated a beneficial effect on people´s health. In this group some compound classes are included which are not chemical related to fatty acids, among which polyphenols with a great structural complexity are worth mentioning. The antioxidant potential of these compounds allows them to act as defense mechanisms against oxygen reagent species associated to the steady deterioration of the biological systems, even in good living conditions. Even today the molecular mechanism by which these compounds produce beneficial effects on health is still unknown or difficult to explain.

Keywords: Olive oil – Oleic acid – Bioactive compounds - Polyphenols

UPDATE ON PREBIOTICS

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The human colonic microflora has a central role in health and disease, being unique in its complexity and range of functions. As such, dietary modulation is important for improved gut health.. Diet can affect the composition of the gut microflora through the availability of different substrates for bacterial fermentation.

As such, functional food ingredients such as prebiotics could effect a beneficial modification in the composition and activities of gut microflora by increasing positive flora components. The prebiotic approach aims to increase resident bacteria that are considered to be beneficial for human health, e.g. bifidobacteria and lactobacilli.

A prebiotic was originally defined, Dr Robertfroid, in 1995 as a "non-digestible food ingredient that beneficially affects the host by selectively stimulating the growth and/or activity of one or a limited number of bacteria in the colon, and thus improves host health"[.A more recent definition from FAO , stated that "A prebiotic is a selectively fermented ingredient that allows specific changes, both in the composition and/or activity in the gastrointestinal microbiota that confers benefits upon host wellbeing and health".

The principal concept associated with both of these definitions is that the prebiotic has a selective effect on the microbiota that results in an improvement in health of the host. The definitions arose from observations that particular dietary fibres bring about a specific modulation of the gut microbiota, particularly increased numbers of bifidobacteria and/or lactobacilli, and that ingestion of these compounds was associated with improved host health. Overall, saccharolytic fermentation leads to the formation of end products (SCFA) that are recognised as being beneficial to the host. It is recognised that there are numerous potential new ap-

plications being considered for prebiotic use e.g. prevention and or management of type 2 diabetes mellitus; drug bioavailability; effects on autoimmune diseases and allergy; modulation of pathogenic biofilms.

Common prebiotics in use include inulin, fructo-oligosaccharides (FOS), galactooligosaccharides soya-oligosaccharides, xylo-oligosaccharides, isomalto-oligosaccharides and lactulose.

The majority of studies have so far focused on inulin, FOS and GOS. These saccharides have now a long history of safe use and are generally regarded as safe, There is also a range of new prebiotic compounds emerging, and these include:

gluco- oligosaccharides, levans, resistant starch, xylosaccharides and soy-oligosaccharides. These compounds have been studied to varying degrees in vitro, in animal feeding studies, but rarely in human feeding studies.

Novel compounds new to the human diet fall under the regulatory category of "novel foods" and will require legislated levels of safety and toxicological assessment before they can be included in food products. However, little legislation exists governing the use of the word "prebiotic" itself on functional food products and there is a growing collection of commercially available products which bear the prebiotic label but for which supportive scientific literature is sparse or lacking all-together.

Keywords: Key words:colonic microflora, prebiotic, saccharolytic fermentation, bifidobacteria

VARIATION ON THE CONTENT OF POLYPHENOLS ACCORDING TO THE PRESERVATIVE PROCESS USED

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There is studies that show that polyphenols from plants, reduce the oxidative stress at the cellular level, decreasing the incidence of chronic noncommunicable diseases (CNDs), hence the importance of antioxidant intake through vegetables. "A dietary antioxidant is a substance present in food, which significantly decreases the adverse effects of reactive species of oxygen and nitrogen, over normal physiological functions in humans." From here comes the recommendation of daily consumption of, at least, five rations of fruits and vegetables or other products derived directly such as green tea, wine and olive oil. In order to know the content of polyphenols that present the foods in the region, they were obtained directly from the market, both fresh and preserved, or elaborated at the pilot scale: olives, tomatoes, different varieties of beans (Phaseolus vulgaris L.) among others.

It was used the Folin-Ciocalteu technique for its quantification, measuring the absorbance in a UV light spectrophotometer at 760 nm of wavelength. The data obtained were statistically compared. Below are some values found. For example, for olives the highest content of polyphenols was found in green olives, cv. Nevadillo, untreated (2.72 g/kg over dry pulp); this content was decreasing according to the advance of the olive maturation degree, obtain-

ing the lowest value for advanced veraison which was 1.94 g/kg of total polyphenols over dry pulp. For cv. Arauco varied from 2.53 g/kg (fresh) to 1.94 g (preserves). The content of polyphenols of the elaboration of black olives type Californian, from different degree of maturation, was decreasing with the oxidation. For "green" olives it was 2.47 g/kg on the first day, reducing to 1.81 g/kg and finally stabilizing at a value of 1.61 g/kg of total polyphenols, when obtaining bright black color. The content of polyphenols was 420 mg/L for olive oil cv. Arbosana elaborated in Mendoza, Argentina, decreasing to 370 mg/L for the one elaborated in Pelotas, Brazil. The content of polyphenols in fresh vegetables was: tomato (7.32 g/kg), cucumber (3.13 g/kg), pepper (1.46 g/kg), eggplant (1.41 g/kg) and asparagus (1.18 g/kg). When the tomato was dried, its value increased to 27.93 g/kg. For legumes as dry red beans, its content was 13.38 g/kg, but there was no differences with the salad dressing-type paste obtained from it. For black beans the polyphenol content was 1.5 g/kg, obtaining a similar value for its paste, being significantly lower than for the type red. The french beans did not contain polyphenols. Applying the Student's t-test for a small number of samples and with unknown variances, it was found that there is statistically significant differences between the beans with different colorations.

It was verified that the content of polyphenols changes with the studied variety, the maturation degree of the vegetable, geographical area of cultivation, also varying according to the technological processing used for conservation

Keywords: Polyphenols, elaboration process, vegetables, conservation

LOW-GRADE INFLAMMATION AND FEEDING, IS THERE A CONNECTION?

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Low-grade systemic inflammation has important differences with respect to a classical inflammatory response. It is characterized by an increase in circulating levels of acute phase proteins and cytokines with inflammatory activity, such as C-reactive protein (CRP), the factor of alpha tumoral necrosis (TNF-a) and interleukins (IL) 1², 6 and 17, as well as an increase in the infiltration of immune cells, macrophages and T lymphocytes in insulin dependent tissue. A distinctive characteristic of this inflammatory process is that it exhibits high levels of inflammatory factors and immune cells infiltrated in tissue, but does not show structural alterations or loss in its primary functions.

Low-grade inflammatory status is a pathological characteristic of a wide range of chronic conditions, such as obesity, diabetes type 2, metabolic syndrome, cardiovascular disease, nonalcoholic fatty liver disease, and cancer.

Currently the diagnostic criteria have not been precisely defined, there is no consensus on the markers that represent better the low-grade inflammation or that differentiate between acute and chronic inflammation or between the various phases of the inflammatory response.

Feeding plays a central role in the regulation of chronic inflammation. The inclusion of 5 portions of fruits and vegetables per day is associated with lower values of CRP, being an importance factor the variety in them. The consumption of nuts and seeds is inversely associated with CRP and IL-6, just as whole grains where there is an inverse association with CRP. Diets of high glycemic index or high glycemic load are associated with low-grade inflammation, but the results are not completely conclusive.

Respect to feeding patterns, the Western diet, rich in red meats, whole dairy products, refined cereals and simple carbohydrates, has been associated with higher levels of CRP and IL-6, meanwhile the Mediterranean diet, rich in whole grains, fish, fruits and vegetables, nuts, olive oil, moderate alcohol consumption and low red meat consumption is associated with lower levels of inflammatory markers as seen with the vegetarian diet and DASH diet.

The modulation of the inflammatory response through diet can be useful in preventing or treating non transmissible chronic diseases, but it is still necessary to know the quantities of nutrients needed, their complex relationships and whether they act equally for all individuals, ages and physiological and pathological states, or well if it could be made recommendations at population level.

Keywords: Inflammation, diet, nutrients, foods, adults

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FUNCTIONAL FOODS AND BIOACTIVE COMPOUNDS ON THE MANAGEMENT OF METABOLIC SYNDROME

POLYPHENOLS, MICROBIOTA COMPOSITION, INFLAMMATION AND OBESITY

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Polyphenol intake can elicit beneficial effects on human health. For this reason, research on this field has become an increasingly

important area of human nutrition research. The consumption of diets rich in fruits and vegetables is associated with a reduction in the risk of suffering chronic diseases such as cardiovascular events, specific tumors, or neurodegenerative illnesses. The action of gut microbes on polyphenols leading to the production of metabolites with diverse physiological relevance is been analyzed in recent years. In this context, the concept of polyphenols as potential prebiotic candidates is a newly emerging concept.

Gut microbiota plays a key role in host physiology and metabolism. Diet has a major influence on gut microbiota and is able to modify its impact on health, with either beneficial or deleterious consequences. In this context, the supplementation of diets with different polyphenols has evidenced changes in gut microbiota composition that are associated with beneficial effects, including anti-inflammatory actions and an amelioration of insulin resistance.

Within the existing plant secondary metabolites, quercetin (flavonoid), trans-resveratrol and pterostilbene (stilbenes) have been described to exert anti-inflammatory, insulin-sensitizing and antiobesity effects. In rats fed a high-fat-sucrose diet, quercetin prevented body weight gain and reduced serum insulin levels, which was accompanbied by a reduction of the abundance of Eubacterium cylindroides and an increase of Bacteroides vulgatus, Clostridium clariflavum and Akkermansia muciniphila. Trans-resveratrol supplementation ameliorated insulin resistance, which was associated with an inhibition of Gracilibacter thermotolerans, Parabacteroides distasonis and butyrate-producing species from Clostridia class (Clostridium aldenense, Clostridium hathewayi, Clostridium sp. MLG661). Pterostilbene supplementation prevented body weight gain and decreased serum cholesterol levels in Zucker rats, which correlated with an upregulation of Odoribacter splanchnicus and Alistipes shahii, but particularly Akkermansia muciniphila.

In summary, the intake of phenolic compounds, either as pure compounds or as part of foods, could be an effective approach to modulate gut microbiota, contributing thus to the amelioration of obesity-related traits such as inflammation, dyslipidemia and insulin resistance.

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COCOA EXTRACT INTAKE WITHIN AN ENERGY RESTRICTED DIET AND METABOLIC SYNDROME FEATURES: CARDIOMETABOLIC RISK AND DEPRESSIVE SYMPTOMS

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An excessive body weight contributes to increase the risk of suffering clinical manifestations, such as insulin resistance, dyslipidemia, hypertension, diverse metabolic syndrome features, and depression, among others. The prescription of nutritional strategies as well as lifestyle changes, such as the reduction of energy intake and adherence to healthy dietary patterns, could contribute to combat these metabolic disorders. Nowadays, the intake of plant extracts rich in polyphenols is receiving especial attention in the protection against obesity-associated comorbidities. Thus, cocoa is one of the richest sources of polyphenols with potential benefits on blood pressure, insulin resistance, lipid profile, endothelial dysfunction, oxidative stress, and inflammation. These therapeutic effects have been attributed to bioactive compounds occurring in cocoa, mainly flavanols, which are the most abundant polyphenols in this seed. Furthermore, cocoa also contains other bioactive compounds such as methylxanthines and minerals with additional healthy properties. Phytochemicals from cocoa are usually consumed within chocolate bars or cocoa beverages. However, taking into account the potential benefits of cocoa consumption, it could be used as a functional ingredient to be included in other foods for human consumption. In this way, the consumption for 4 weeks of 1.4 g of cocoa extract (645 mg polyphenols with 415 mg of flavanols) within ready-to-eat meals and under an hypocaloric diet (-15% energy restriction) was able to produce a higher reduction of oxidised low-density lipoprotein-cholesterol (ox-LDL) levels compared to obese subjects following the dietary strategy without cocoa supplementation. Regarding blood pressure, the regular consumption during 4 weeks resulted in a higher reduction of acute systolic blood pressure (SBP) response independently

of body weight loss and also showed an adaptive effect of the acute SBP. Moreover, the intake of cocoa significantly increased the levels of plasma homovanillic acid, which is a marker reflecting the dopaminergic activity in the brain. Interestingly, homovanillic acid was negatively associated with the reduction of depressive symptoms in cocoa consumers, suggesting the possible implication of cocoa on psychological behavior. Finally, it is important to highlight that metabolomics analyses in plasma and urine have suggested an adequate adherence to the nutritional intervention supported by the presence of metabolites derived from cocoa. To sum up, the inclusion of cocoa within a well-designed dietary hypocaloric strategy might contribute to obtain additional benefits to weight loss and body composition, such as improvements in hypertension, oxidative markers, and psychological status.

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Ibero-Baraibar I, et al. Oxidised LDL levels decreases after the consumption of ready-to-eat meals supplemented with cocoa extract within a hypocaloric diet. Nutr Metab Cardiovasc Dis 2014;24:416-22.

POTENTIAL HEALTH BENEFITS OF CONJUGATED LINOLEIC ACID FROM NATURAL AND INDUSTRIAL SOURCES. EVIDENCES FROM ANIMAL STUDIES

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Conjugated linoleic acid (CLA) is a group of positional and geometrical isomers of linoleic acid recognized by their functional properties. The major contribution of natural CLA is supplied by dairy products and meats where c9,t11-18:2, known as rumenic acid (RA), represents 80-90% of total CLA. On the other hand, industrially synthesized commercial CLA mainly contains a mixture of equimolecular amounts of c9,t11-18:2 and t10,c12-18:2 (mix-CLA).

Nutritional studies in human and experimental animals have demonstrated a variety of beneficial health consequences from CLA consumption. However, controversial and detrimental health effects have also been reported. The precise actions and the biochemical mechanisms by which CLA-rich foods mediate the metabolic effects remain unclear. Since the specific effects of c9,t11-18:2 and t10,c12-18:2 are different, we have analyzed the effects of CLA from industrial and natural source on different animal models or experimental conditions that share some metabolic disorders observed in the metabolic syndrome. Specifically, parameters associated with the lipid depots and glucose regulations are described.

In normal mice, mix-CLA and RA-rich oil (natural-like CLA) modified the triacylglycerol (TAG) metabolism having different effects depending on the type of CLA and the dietary unsaturated fatty acids (FA) proportions. The reduction of fat in carcass and adipose tissue was higher in the mix-CLA than in RA supplemented diets, independently of the dietary n-9, n-6 and n-3 FA ratio. However, RA showed beneficial effects without hepatomegaly, steatosis, or hypertriacylglyceridaemia. In mice fed high fat (HF) diets, mix-CLA reduced plasma and muscular TAG concentrations. These beneficial effects were associated with a protection against hepatic oxidative stress mediated by an increase in glutathione levels. Nevertheless, the biochemical mechanisms involved in the regulation of lipid levels were related to a reduced hepatic VLDL-TAG secretion and decreased muscle and adipose tissue lipoprotein lipase enzymes, leading to a liver steatosis and dystrophy of epididimal fat pads. Contrary, in a steatosis rat model induced by protein depletion, protein repletion with mix-CLA showed preventive effects on liver steatosis through higher VLDL-TAG secretion and reduced adipose tissue lipid accumulation. In the glucose regulation, dietary mix-CLA supplementation at HF levels partially prevented glycolytic pathway alterations in liver of mice increasing the glycogen synthesis. Glucose utilization was also investigated in isolated skeletal muscle; where in basal conditions dietary mix-CLA improved glucose uptake and incorporation as well as glycogen synthesis via an increase in glucose oxidation. Finally, we have investigated the effect of a functional milk fat (FMF) enriched in RA on glucose and lipid metabolism of rats fed HF diets. Noteworthy, FMF prevented the hepatic TAG accretion induced by HF diets by increasing the hepatic VLDL-TAG secretion and the b-oxidation. In addition, FMF improved the muscle glucose utilization associated with a higher flux through the phosphofructokinase enzyme.

Even though the experimental results in animal models cannot be directly extrapolated to humans, knowledge of the mechanism involved in the beneficial effects of natural or commercial CLA, under different conditions, might be useful for the development of functional foods effective to prevent some metabolic alterations observed in human metabolic syndrome.

MATERNAL SUPPLEMENTATION WITH FLAVO-NOIDS AND ANTIOBESITY EFFECT IN THE OFF-SPRING OF OBESE FEMALE RATS

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Maternal obesity is a risk factor in the development of metabolic diseases of offspring including, obesity, diabetes and metabolic syndrome. This may be due to an influence by different environmental effects such as maternal feeding during early stages of life, commonly known as perinatal programming. The use of animal models in this studies helps to analyse the mechanisms by which physiological and metabolic changes can promote the development of diseases in the adult stage. Dietary supplementation with flavonoids has been studied regarding the biological properties and its effect in the prevention of diseases such as obesity. Therefore, the aim of this study was to determine the effect of the narirutin and kaempferol-3-O-glucoside on the prevention of metabolic disorders in the offspring of female Wistar rats fed and obesogenic diet during perinatal period.

Material and methods: Obesogenic group of female rats were fed with a cafeteria diet (372 kcal/100g) and supplemented group (n=2) with cafeteria diet supplemented with kaempferol-3-O-glucoside (15 mg/kg bw) and narirutin (30 mg/kg bw) during perinatal period (7 weeks); a parallel a control group (n=2) were fed a standard diet (335 kcal/100g). After the lactation period (3 weeks), male offspring (control G1 group (n=12), obesogenic G1 group (n=9) and supplemented G1 group (n=9)) were fed standard diet for 91 days. Body weight and food intake were recorded weekly. After the experimental period, animals were sacrificed and serum and tissue samples were obtained.

The obesogenic model was successfully achieved, showing statistical differences between control group and obesogenic group. According to the offspring male rats, changes in body weight were observed in the supplemented group compared to the obesogenic group (p<0.05). Likewise supplemented group showed statistically significant lower liver weight and lower fat percentage than the cafeteria group (p<0.05). Food intake (g) and food efficiency (g/100 kcal) were significantly lowered in male offspring of supplemented female rats. On the other hand, regarding biochemical measurements, there were no differences in glucose levels, however significant differences were found in leptin and insulin levels. Concerning the molecular mechanisms implicated, differences in the expression of genes involved in inflammation, glucose and lipid metabolism were observed in liver and adipose tissue between obesogenic group and supplemented group.

In this context, the obesogenic diet during perinatal period in female wistar rats induces metabolic alterations and an increase dietary intake in their male offspring in adulthood. In addition, dietary supplementation with flavonoids could prevent the development of obesity in the adult offspring.

Keywords: Narirutin, kaempferol-3-O-glucoside, metabolic programming, obesity, nutrigenomics

POLYPHENOLS FROM BERRIES INHIBIT INFLAMMATION-RELATED ADIPOSITY

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Obesity-associated insulin-resistance is set by a chronic inflammatory state established in the adipose tissue. Chilean native fruits calafate (CA) and maqui (MA) berries present remarkable anti-inflammatory features. We have been evaluated antioxidant, anti-inflammatory and insulin-sensitizer effects of these fruits in an in vitro and in vivo inflammatory setting. We exposed differentiated 3T3-L1 cells to conditioned media (CM) from activated macrophages that were treated with CA and MA extracts. Extracts modulated beneficially: metalloproteinase (both MMP-2 and MMP-9) activity, GSH levels, caspase-3 activity, and inflammatory markers gene expressions. Furthermore, MA reverted CM specific IRS-1 phosphorylation, and CA improved insulin-stimulated glucose uptake. Similar experiences were observed in a in vivo model (mouse), that were induced to present inflammatory-related insulin-resistance by a chronic exposure to high fat diet. Thus, treatments with extracts of Chilean native fruits were able to block the development of oxidative stress, inflammation and insulin-resistance in vitro and in vivo.

Keywords: Obesity, inflammation, insulin-resistance, polyphenols, chilean native fruits

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PHYTONUTRIENTS IN NUTRITION AND HEALTH: FROM THEORY TO PRACTICE

QUERCETIN PROTECTS AGAINST ATHEROSCLE-ROSIS BY INHIBITING DENDRITIC CELL ACTIVATION

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Objective: Quercetin is a typical flavonol with atheroprotective effects, but the effect of quercetin on dendritic cell (DC)

maturation in relation to atherosclerosis has not yet been clearly defined. Thus, we investigated whether quercetin can inhibit DC maturation and evaluated its potential value in atherosclerosis progression in ApoE-/- mice.

Methods and results: Quercetin consumption inhibited DC activation, inflammatory response and suppressed the progression of atherosclerosis in ApoE-/- mice. Subsequently, quercetin treatment inhibited the phenotypic and functional maturation of DCs, as evidenced not only by downregulation of CD80, CD86, MHC-II, IL-6 and IL-12 but also by a reduction in the ability to stimulate T cell allogeneic proliferation. Finally, an in vitro study demonstrated that quercetin inhibited DC maturation via upregulation of Dabs, which then downregulated the Src/PI3K/Akt-NF-κB-inflammatory pathways.

Conclusions: Our data indicate that quercetin attenuates atherosclerosis progression by regulating DC activation via Dab2 protein expression.

Keywords: Atherosclerosis. Dab2. Dendritic cells. Inflammation. Quercetin

A GLOBAL SNAPSHOT OF FRUIT AND VEGETABLE INTAKE AND AVAILABILITY, AND IMPLICATIONS FOR PHYTONUTRIENT INTAKES

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In 2004 the World Health Organization (WHO) and Food and Agricultural Organization (FAO)

established minimum fruit and vegetable intake recommendations for adults at 400 g or 5 servings per day. The basis for this recommendation was epidemiological data that showed a strong inverse relative risk for chronic disease morbidity with fruit and vegetable intakes up to this level. Despite this recommendation, there has not subsequently been a global assessment of fruit and vegetable intake. Utilizing WHO World Health Survey data (2002) and FAO food supply utilization data (2012), we evaluated fruit and vegetable intake, fruit and vegetable variety, and intakes of selected phytonutrients in different regions globally. The results show a striking shortfall globally in fruit and vegetable intake relative to the WHO minimum recommendation, and relatively narrow range of variety. According to this assessment, approximately 75% of individuals worldwide fail to meet WHO minimum intake levels. These data strongly support the need to better educate consumers regarding the health promoting and risk reducing effects of fruit and vegetable dietary patterns.

Keywords: Phytonutrients, Nutrition, Health,

Further collaborators: The present study used data from the WHO and WHS. The study was supported by the Nutrilite Health Institute.

NEW LIPIDS FOR A NEW NUTRITION

ESSENTIALITY, PHYSIOLOGICAL AND NUTRITIONAL ASPECTS OF POLYUNSATURATED FATTY ACIDS AND THEIR DERIVATIVES: CURRENT TRENDS

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Linoleic acid (LA, C18: 2n-6) and alpha-linolenic acid (ALA, C18: 3n-3) are essential polyunsaturated fatty acids (PUFAs) for mammals, including humans, because they lack the enzymatic machinery to synthesize these fatty acids. These PUFAs have important biochemical and physiological functions in the body and are the metabolic precursors of n-6 and n-3 long chain polyunsaturated fatty acids (LCPUFAs). LA is the precursor of n-6 LCPUFAs, including its main metabolic product, arachidonic acid (AA, C20: 4 n-6), which has a relevant role in the development of the nervous and visual system and in the control of vascular homeostasis and inflammatory response. ALA is the precursor of eicosapentaenoic acid (EPA, C20: 5n-3) and docosahexaenoic acid (DHA, C22: 6n-3).EPA participates in the control of vascular homeostasis and the resolution of inflammatory responses. DHA plays a key role in the formation and function of the nervous and visual system, particularly the brain and retina, and in the protection of the central and peripheral nervous system. The synthesis of n-6 and n-3 LCPUFAs derived from LA and ALA occurs mainly in the liver, and to a lesser extent in other tissues, such as the brain. Formation of AA, EPA and DHA occurs through elongation and desaturation reactions of the respective precursors LA and ALA. The synthesis of n-6 and n-3 LCPUFAs requires the participation of enzymes Δ-5 and Δ-6 desaturases, with Δ-6 desaturase being the limiting enzyme of the process. The activity and expression of both enzymes is regulated by hormones such as insulin and estrogens, and by the intracellular redox state. In addition, polymorphisms in the sequences encoding these enzymes negatively regulate the synthesis and tissue levels of n-6 and n-3 LCPUFAs, particularly DHA, affecting physiological processes such as cognitive abilities or cardiovascular health. Another relevant aspect is nonalcoholic hepatic steatosis, a pathology in which there is a reduction in the activity of the Δ-5 and Δ-6 desaturase enzymes, which generates a reduction of the tissue levels of n-6 and n-3 LCPUFAs. These effects would be produced by oxidative stress of nutritional origin and by the development of insulin resistance. Most recently, several investigations have demonstrated the role of eicosanoids, 20-carbon derivatives from EPA and docosanoids, 22-carbon derivatives. Eicosanoids and docosanoids are determinant in the survival of cells against inflammatory processes that compromise its viability, in controlling the inflammatory process and, particularly, in the resolution of inflammation. In this con-

text, the DHA-derived docosanoid neuroprotectin D-1 (NPD-1) shows neuroprotective properties against cerebral aging, neurodegenerative diseases and injuries caused by cerebral ischemia-reperfusion episodes. This work discusses the physiological and nutritional importance of PUFAs, the synthesis of LCPUFAs and the metabolic implications of n-6 and n-3 LCPUFA and its derivatives.

Keywords: Essential fatty acid, polyunsaturated fatty acids, n-6 fatty acid, n-3 fatty acid, nutritional importance of polyunsaturated fatty acids

SUSTAINABLE ALTERNATIVES TO OBTAIN NEW EDIBLE OILS AND FORMULATES RICH IN POLYUNSATURATED FATTY ACIDS WITH NUTRITIONAL INTEREST

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Omega-3 polyunsaturated fatty acids (ω3 PUFAs) are key nutrients because of their multiple roles in the human metabolism. Eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) are the most known ω-3 PUFAs due to their beneficial effects for human health. These two ω-3 PUFAs are mainly contained in marine food sources, such as fatty fish. However, fish consumption may be linked to some drawbacks such as low sustainability and high price of the resource (because of overfishing worldwide) and some health concerns (fish may be contaminated with organic and inorganic pollutants such as PCBs, dioxins and heavy metals).

EPA and DHA can be metabolized by the human body using alpha-linolenic acid (ALA) as precursor, which is contained in seed oils from chia (S. hispanica), rosehip (R. rubiginosa) and flaxseed (L. usitatissimum), among other plant-based oils. This fact is becoming ALA-rich oils into an interesting and more sustainable commercial option to provide ω-3 PUFAs. However, ALA is not efficiently converted into longer-chain ω-3 PUFAs such as EPA and DHA because of the low efficiency of the enzyme Δ6-desaturase, which is the responsible to convert ALA into stearidonic acid (SDA), an intermediate ω-3 PUFA between ALA and EPA in the metabolic pathway.

The direct supply of SDA could become a suitable option from a nutritional point of view, because it has been proved that metabolic conversion of SDA into longer-chain ω-3 PUFAs such as EPA is much more effective than when ALA is used as precursor. SDA is mainly available in the seed oils of a reduced number of plants such as Echium plantagineum, which is native from the Mediterranean basin and is being cultivated in several countries in the world because of its seed oil. This species grows wild in Central and South Chile, although it has not been cultivated with commercial purposes yet.

In the symposium, it will be explained the research that we are carrying out with seed oil from E. plantagineum at the Laboratory of Lipids in the Institute of Nutrition and Food Technology, University of Chile, as a part of a currently in force FONDECYT research project (code 11160636). Seeds from E. plantagineum grown in Chile (from an experimental and controlled production in the south of the country) are being collected to extract and characterize its oil, which in turn will be used as source to produce novel structured lipids able to deliver SDA to the human body with a high bio-efficiency.

Keywords: Novel lipids, biotechnology, omega-3 fatty acids, stearidonic acid

ROLE OF N-3 POLYUNSATURATED FATTY ACIDS FROM VEGETABLE SOURCES IN THE METABOLIC SYNDROME

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Excessive food ingestion and the increase in the consumption of high-fat, fructose or sucrose diets characteristic of modern society have been related to the development of visceral adiposity, systemic oxidative stress, impaired glucose homeostasis, insulin resistance, type 2 diabetes, dyslipidemia and hypertension ,the major component of the Metabolic Syndrome (MS). Diets can play a major role in the prevention or improvement in this syndrome and its associated pathologies. In addition to other lifestyle interventions, it has been recognized that the adjustments to the quality of dietary lipids such as n-3 polyunsaturated fatty acids (n-3 PUFAs) from marine (fish oil, EPA and DHA) or plant sources [α-linolenic acid (ALA) 18:3 n-3]are also important in the prevention and treatment of the MS by modulating the expression of several genes involved in these chronic manifestations. This presentation highlights recent advances in the understanding of metabolic and molecular mechanisms concerning the effect of dietary whole seeds and /or oils rich in ALA , and focuses on the prevention and/or improvement of dyslipidemia, insulin resistance, impaired glucose homeostasis, diabetes and obesity in experimental animal models, with some extension to humans.

Keywords: Alpha linolenic acid. Metabolic syndrome.Dyslipidemia.Diabetes. Obesity.

PS_144/1037

ADDRESSING BARRIERS TO EXCLUSIVE BREAST-FEEDING: EVIDENCE AND LESSONS LEARNT FROM BABY FRIENDLY COUNTRY PROGRAMS

SYSTEMATIC REVIEW OF BARRIERS TO EXCLUSIVE BREASTFEEDING (EBF) IN LOW AND MIDDLE INCOME COUNTRIES: EVIDENCE AND PROGRAM IMPLICATIONS

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Despite numerous global initiatives on breastfeeding, trend data show exclusive breastfeeding (EBF) rates have stagnated over the last two decades. In low- and middle-income countries (LMICs), only 37% of children younger than 6 months of age are exclusively breastfed, defined as the proportion of infants aged 0–5 months who are fed only with breastmilk and no additional liquids or solids until 6 months of life. Although some countries have made gains in EBF, early initiation and EBF rates in many countries are drastically below global targets. Key challenges to EBF remain unaddressed through infant and young child feeding programming. A recent UNICEF report notes that 43% of newborn babies are fed prelacteal foods or liquids, which can lead to difficulties in establishing breastfeeding. Also, most infants are introduced to other foods or liquids too early, prior to 6 months of age. The objectives of this systematic review were to ascertain barriers to EBF in LMICs according to three domains: 1) Maternal areas: prenatal barriers; 2) Barriers encountered on the first day, including initiating and establishing EBF; and 3) Barriers encountered in maintaining EBF over the first six months of life and to summarize the program implications of these findings. A search of SCOPUS, MEDLINE, CINAHL, and PsychINFO was conducted to retrieve studies from January 2000 to October 2015. Using inclusion criteria, we selected both qualitative and quantitative studies that described barriers to EBF in low- and middle-income countries. Following application of systematic review criteria, 48 articles from 14 countries were included in the review. Sixteen barriers to EBF were identified in this review. There is moderate evidence of a negative association between maternal employment and EBF practices. Studies that examined EBF barriers at childbirth and the initial 24 hours post-delivery found strong evidence that caesarean section can impede EBF. There is moderate evidence for early initiation of breastfeeding and likelihood of practicing EBF. Breastfeeding problems were commonly reported from cross-sectional or observational studies. Counseling on EBF and the presence of family and/or community support has demonstrated improvements in EBF. Improving the counseling skills of health workers to address breastfeeding problems and increasing community support for breastfeeding are critical components of infant and young child feeding programming, which will aid in attaining the 2025 World Health Assembly EBF targets. Legislation and regulations on marketing of breastmilk substitutes, paid maternity leave, and breastfeeding breaks for working mothers require attention in LMICs.

Keywords: Barriers, exclusive breastfeeding, systematic review, low and middle income countries, program implications

DEVELOPMENT AND ROLL-OUT OF NATIONAL BABY FRIENDLY COMMUNITY INITIATIVE (BFCI) GUIDELINES: EXPERIENCE ON ADDRESSING BARRIERS TO EBF IN KENYAN COMMUNITIES

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Background and Objectives: Baby Friendly Community Initiative (BFCI) is a community-based initiative to protect, promote, and support exclusive breastfeeding (EBF) through community support groups (CSGs) and mother to mother support groups. Implemented in western Kenya through the Maternal and Child Survival Program (MCSP) and Ministry of Health (MOH), BFCI offers a platform to identify and address key barriers to exclusive breastfeeding to ensure EBF is sustained for the entire 6 month period.

Methods: After development of the National MOH BFCI Implementation Guidelines, Training and Monitoring tools, MCSP and MOH rolled out BFCI. During implementation of BFCI, routine monitoring of infant and young child feeding practices, including early initiation of breastfeeding, introduction of prelacteal

feeding, and early introduction of foods and liquids and exclusive breastfeeding was carried out in Migori and Kisumu counties, Kenya. Following identification of breastfeeding problems, health providers and community workers were supported to document and counsel on breastfeeding problems through the use of a checklist.

Results: BFCI provided a platform to identify key barriers to EBF, including: issues with positioning and attachment, beliefs that "boys need more to eat than girls", pressure from grandmothers to provide mixed feeding, perceptions of insufficient breastmilk, cultural beliefs hindering EBF (i.e. 'bad/evil eye'), lack of confidence in mothers' ability to breastfeed, and lack of sufficient community support structures. BFCI addressed these challenges through continuous medical education sessions for health workers and community health volunteers (CHVs), health education to mothers through multiple channels, inclusive of health facilities, CSGs and CHV home visits, provision of 'safe' spaces for breastfeeding at health facilities and within communities, and establishment of CSGs, which allowed for discussions amongst mothers and referral of mothers to health facilities, as needed. Conclusion: Multiple channels are required to address EBF barriers with engagement at both the community and health facility level.

Keywords: Exclusive breastfeeding, community, baby friendly, barriers

PROGRAMMATIC EXPERIENCE ON REVITALIZATION OF THE BABY-FRIENDLY HOSPITAL INITIATIVE (BFHI) IN MALAWI: LESSONS LEARNT ON BARRIERS TO EXCLUSIVE BREASTFEEDING AT FACILITY LEVEL

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Background and objectives: In Malawi, optimal breastfeeding practices remain challenging as only 61% of babies are exclusively breastfed, according to 2016 Demographic & Health Survey data. Since approximately three-quarters of deliveries are facility-based, it is imperative to support exclusive breastfeeding (EBF) in the immediate 24 hours postpartum in health facilities.

In partnership with the Ministry of Health, USAID's Maternal and Child Survival Project (MCSP), World Health Organization (WHO), and UNICEF worked to revitalize Baby-Friendly Hospital Initiative (BFHI) with linkages to the community-level. BFHI is a global initiative to implement practices that protect, promote, and support breastfeeding and can reduce barriers to and improve rates of early initiation of breastfeeding and sustained EBF.

Methods: MCSP spearheaded revitalization of BFHI and addressed barriers to early initiation of breastfeeding and EBF in 15 districts by 1) revising infant and young child feeding (IYCF) hospital-based policies to address barriers to early initiation of breastfeeding and continued EBF, and prevention of mother-to-child transmission (PMTCT) of HIV; 2) adapting the WHO BFHI training course to the Malawi context to address breastfeeding challenges; 3) supporting hospitals on the Ten Steps to Successful Breastfeeding through staff capacity building, and; 4) identifying existing referral linkages between the hospital- and the community-levels to continue breastfeeding support to postpartum women after discharge.

Results: MCSP supported capacity building on BFHI and breastfeeding with half of health workers trained in 15 health facilities and 3 centers of excellence. Health facilities developed policies stating commitment to BFHI and to addressing barriers to IYCF, such cessation of EBF before 6 months, poor latching/positioning, and PMTCT of HIV. BFHI has been able to support early initiation of breastfeeding despite limited space in maternity wards and staff shortages. Facilities identified staff to counsel mothers in waiting areas and postnatal wards on EBF. MCSP oriented 1,400+ community-based promoters to support breastfeeding mothers on EBF barriers. The experience resulted in 13,948 mothers initiating breastfeeding within 1 hour and receiving EBF counseling at discharge.

Conclusions: BFHI is a successful approach to addressing barriers to EBF at facility and community levels. BFHI promotes multi-level cooperation to address a range of breastfeeding barriers.

Keywords: Baby friendly hospital initiative; exclusive breastfeeding; initiation; health facilities

PROGRAM IMPLICATIONS FOR ADDRESSING BARRIERS TO EBF: PROGRESS TO DATE AND FUTURE CONSIDERATIONS

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Optimal breastfeeding practices benefit all mothers and children, regardless of where they live or level of economic well-being. Exclusive breastfeeding, in particular, is considered the cornerstone of child survival and health. It not only provides all the nutrients necessary for growth for the first six months of life, but also protection from many childhood life-threatening diseases and some noncommunicable diseases later in life. Breastfeeding is beneficial to a mother's health and contributes to child development, educational achievement, and economic wellbeing. Nonetheless, despite ample evidence that rates can be dramatically improved with a proven set of policies and programs, exclusive breastfeeding for six months is not a normative behavior in most parts of the world, as shown in the systematic review and baby friendly experiences presented in this panel. Why is this so? A key reason is that for too long, breastfeeding has been viewed as a personal issue rather than a collective societal responsibility. For ex-

ample, women give birth in maternity facilities that impede rather than facilitate immediate skin-to-skin contact and early initiation and later receive care from healthcare providers who lack basic knowledge and skills to provide supportive counseling, lactation management, and information. They face obstacles in the workplace because of limited or nonexistent maternity protection and enabling workplace breastfeeding policies and relentless marketing by the breast-milk substitute industry. Family, community and cultural traditions can undermine a woman's decision to breastfeed. In summary, the world is not as supportive environment for women who wish to breastfeed and as a result they face daily barriers. To enable women to practice optimal breastfeeding, society needs to be more supportive and accommodating not the other way around as has been the case for too long. The key message in the 2016 series on breastfeeding in The Lancet was that "success in breastfeeding is not the sole responsibility of a woman – the promotion of breastfeeding is a collective societal responsibility". To this end, it called for:

• dissemination of evidence of breastfeeding's fundamental value for all women and children regardless of where they live or level of economic well-being;

• fostering of positive societal attitudes by addressing misperceptions about breastfeeding;

• demonstrating political will by mainstreaming breastfeeding into programs to promote maternal and child health and child development and prevent noncommunicable diseases;

• regulating the breast-milk substitute industry by enacting, monitoring and enforcing the Code of Marketing of Breast-milk Substitutes and subsequent relevant World Health Assembly Resolutions (Code); and,

• scaling up and monitoring breastfeeding promotion interventions using proven interventions tailored to patterns of sub-optimal breastfeeding and delivered at scale, and implementing enabling interventions to ensure that maternity and workplace protection are implemented and that all maternity facilities comply with the Baby Friendly Hospital Initiative and the Code.

Keywords: Breastfeeding, collective social responsibility, breastfeeding promotion, addressing barriers to exclusive breastfeeding

Track 7: Food Culture Practices and Nutritional Education

PS_144/90

THE PREDIMED STUDIES: A LEAP FORWARD IN NUTRITION

RATIONALE AND DESIGN OF THE PREDIMED TRIALS

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PREDIMED: The selection of the ideal dietary model to prevent non-communicable disease needs to be based on the most robust research designs.

The PREDIMED trial (www.predimed.es) was a primary prevention trial, funded by Instituto de Salud Carlos III, designed to test the long-term effects of the Mediterranean diet (MedDiet) on incident cardiovascular disease (CVD) in men (55–75 years) and women (60–80 years). Participants had no history of previous CVD but were at high risk because of either type 2 diabetes or ≥ 3 classical risk factors. Participants were randomized into one of three diets: 1) MeDiet supplemented with extra-virgin olive oil (EVOO); 2) MeDiet supplemented with nuts; and 3) control diet (advice on a low-fat diet).

Throughout the study (2003-2011), 7,447 participants attended quarterly individual educational visits and group sessions. They received written material with information on key Mediterranean foods and seasonal shopping lists, menus and specific recipes for a typical week. Free (at no cost) allotments of extra-virgin olive oil (1 L per week, including a minimum of 50 mL/day for participants and the rest for family needs) or mixed nuts (30 g/day: 15 g walnuts, 7.5 g almonds and 7.5 g hazelnuts plus extra allocations for the family) were supplied. The primary outcome was a composite of myocardial infarction, stroke or cardiovascular death. The planned duration was 6 years, but the trial was prematurely stopped after 4.8 years of median follow-up for early evidence of benefit of both MedDiets.

PREDIMEDPLUS: Since there are no clinical trials demonstrating that sustained weight loss over >2 years with diet and lifestyle reduce the risk of CVD, we designed the PREDIMED-PLUS Study. This is a randomized, primary cardiovascular prevention trial comparing the effect of two interventions: a)intensive intervention on lifestyle with hypocaloric MedDiet, physical activity and behavioural therapy (intervention group); b)MedDiet following usual care (control group) in participants with metabolic syndrome and overweight/obesity (BMI 27-40 kg/m2, aged 55-75, men or 60-75, women)

Recruitment of participants began in September 2013 in the vanguard centre of Navarra (http://medpreventiva.es/cD5Mp1).

The recruitment was completed on December-2016, in 23 centres. We randomized 6,874 participants. PREDIMEDPLUS is therefore the largest lifestyle and diet trial ever conducted in Europe. We included a 4-week run in period with 3 screening visits before randomization to select the most suitable candidates. In total, 9,677 participants received these screening visits. Participants in the intervention group receive 3 contacts/month during the first year and 2/month during the ensuing years. The control group receives a group session every 6 months. Extravirgin olive oil and tree nuts are provided at no cost to both groups.

The main goal of PREDIMED-PLUS is to get an effective tool based on a hypocaloric traditional MedDiet, physical activity and behavioral therapy strategies to mitigate the priority public health problem of obesity. The primary outcome is the same CVD composite end-point than in PREDIMED-1 and the planned duration is 6 years of intervention plus 2 additional years to collect events.

Keywords: Olive Ol, Nuts, Mediterranean Diet, Trial

THE MEDITERRANAN DIET AND DIABESITY

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A considerable body of evidence from prospective studies supports the importance of individual nutrients, foods, and dietary patterns in the prevention and management of metabolic syndrome (MetS) and type 2 diabetes (T2D). The Mediterranean diet (MedDiet) is characterized by high intake of fruits, vegetables, legumes, fish, whole grains, nuts and olive oil; moderate consumption of dairy products and wine, and low intake of red and processed meat and foods with added sugars.

We summarizes the current scientific evidence from epidemiologic studies and clinical trials on the relation between the MedDiet and T2D and the possible mechanisms underlying the reported associations. A meta-analysis of prospective studies showed that greater adherence to the MedDiet was associated with a significant reduction in the risk of T2D and gestational diabetes. Some studies have shown that the MedDiet may be effective in reducing insulin resistance. However, few randomized controlled trials (RCTs) have evaluated the effect of the MedDiet on T2D and MetS management.

Results from the landmark PREvención con DIeta MEDiterránea (PREDIMED) intervention trial showed that participants assigned to the MedDiet had a significant 30% reduction in the risk of T2D and promoted the reversion of MetS and its components, hyperglycemia and central obesity. In addition, some RCTs showed the beneficial effects of the MedDiet compared with other dietary patterns on glycemic control in patients with T2D.

Bioactive components of the MedDiet synergize to affect various metabolic pathways, leading to a reduced cardiometabolic disease risk. The abundance of healthy, nutrient-dense foods that make up the plant-based MedDiet predicts its bioactivity and potential to beneficially influence metabolic pathways that lead to MetS and T2D, as well as other chronic conditions.

Since there are no clinical trials demonstrating that sustained weight loss over >2years with diet and changes in lifestyle reduce the risk of cardiovascular disease (CVD), we have also designed the PREDIMED-PLUS Study, a parallel group, multi-centre, randomised, primary prevention trial (PREDIMED-PLUS) on men and women aged between 55 and 75 years, with a body-mass-index ≥27 to <40 kg/m2 and meeting ≥3 criteria for the MetS. The objective of the present research is to compare the cardiovascular effect of two interventions: a) intensive weight-loss intervention on lifestyle program with hypocaloric MedDiet, physical activity and behavioural therapy, b) non intensive care with recommendations on MedDiet following the usual care of medical physicians. The principal end-points are a composite of major hard clinical cardiovascular events, and weight loss and weight maintenance at long term. In October 2017, 6,874 participants have been randomized to the trial. The final results will be available from 2020.

We hypothesize that an intensive weight-loss lifestyle intervention, including physical activity, based on the traditional MedDiet is a sustainable long-term approach for weight reduction among overweight/obese adults and that the achieved lifestyle changes will exert beneficial effects on CVD incidence. The rationale for the proposed investigation is that it can provide a new, affordable, and sustainable approach to reduce excess cardiovascular morbidity and mortality, beyond what was already observed in the PREDIMED I trial.

Keywords: PREDIMED, Mediterranean diet, diabetes, obesity, metabolic syndrome

THE PREDIMED STUDIES: A LEAP FORWARD IN NUTRITION

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Growing old frequently presents with a plethora of debilitating consequences, among which there are physical disabilities, major organ damage and cognitive decline. The fact that life expectancy has increased throughout the world has raised much interest in factors leading to the presence or absence of aging-associated diseases as major determinants of healthy or unhealthy aging, also named successful or unsuccessful aging. Decades of research on environmental risk factors of cardiovascular diseases (CVD) and other aging-related disorders have firmly established the concept of healthy lifestyles as protective factors. Thus, there is consistent evidence that no smoking, physical exercise, staying lean and adhering to a healthy diet such as the Mediterranean diet account for 80% or more of protection from CVD and diabetes in the general population worldwide. The PREDIMED randomized clinical trial tested calorie-unrestricted Mediterranean diets supplemented with extra-virgin olive oil or mixed nuts against a control diet consisting of advice to reduce dietary fat in older individuals at high risk of CVD for various clinical outcomes: incident CVD (myocardial infarction, stroke or death from these causes) as primary outcome and incident diabetes, metabolic syndrome, peripheral artery disease, atrial fibrillation, congestive heart failure, depression, dementia, major cancers and cataract surgery as prespecified secondary outcomes. Together with neurodegenerative disorders, chronic kidney disease, chronic obstructive pulmonary disease and osteoarthritis, these frequent non-communicable diseases shorten the lifespan and make up unhealthy aging. The results of PREDIMED have shown a beneficial effect of the Mediterranean diets on many of these outcomes: CVD (with a noticeable effect on stroke), diabetes, peripheral artery disease, atrial fibrillation, breast cancer, depression and age-related cognitive decline. PREDIMED has also found a neutral effect of the Mediterranean diets on heart failure and the need for cataract surgery, and other outcomes are still pending analyses of results after extended follow-up. Beneficial effects observed on clinical outcomes can be explained in part by risk factor reduction with the Mediterranean diets: cholesterol, blood pressure, insulin resistance, visceral adiposity, oxidation and inflammation. Nutritional genomic studies in PREDIMED have also shown that adherence to the Mediterranean diets blunts the development of cardiometabolic phenotypes in genetically susceptible individuals, thus providing another mechanisms for the observed reduction of clinical outcomes. From the PREDIMED results up to date, one can reasonably state that the Mediterranean diet is associated with healthy aging. The ongoing PREDIMED PLUS study will eventually extend this observation to the effects of sustained weight loss with energy-restricted Mediterranean diet plus physical exercise.

Keywords: Mediterranean diet, aging, cardiovascular risk, non communicable diseases

EFFECTS OF THE MEDITERRANEAN DIET ON THE LIPID PROFILE AND LIPOPROTEIN-RELATED MARKERS

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Decreased values of the most relevant HDL function, cholesterol efflux capacity, have been shown to be related to a high incidence of sub-clinical atherosclerosis and coronary events. Similarly, a predictive value of oxidized LDL for cardiovascular events has been reported. With this regard, it is becoming increasingly more accepted that the functionality of HDL and atherogenicity of LDL can be more indicative of the cardiovascular role of these particles than the mere concentration of HDL- and LDL cholesterol.

Objective: Our aim was to study the effects of a whole Mediterranean diet (MedDiet) pattern intervention on HDL biological functions and LDL pro-atherogenic traits, in high cardiovascular individuals in the frame of PREDIMED Study.

Methods: The PREDIMED Study is a large-scale, multicenter, randomized, controlled, and parallel-group trial with MedDiet interventions (supplemented with virgin olive oil or nuts) versus a low-fat diet control group, on primary prevention of cardiovascular diseases conducted in Spain.

The sub-studies about lipoprotein state and their properties were performed in subsamples of approximately 296 and 210 participants in HDL and LDL subsets, respectively.

Biological samples were obtained for the HDL- and LDL-related biomarkers at the start of the study and 1-year after for the lipoprotein-related analysis.

Results: Both MedDiets increased cholesterol efflux capacity relative to baseline. The MedDiet-VOO intervention increased HDL ability to esterify cholesterol, paraoxonase-1 arylesterase activity, and HDL vasodilatory capacity relative to control, and decreased cholesteryl ester transfer protein activity relative to baseline. Adherence to a MedDiet induced these beneficial changes by improving HDL oxidative status and composition. The 3 diets increased the percentage of large HDL particles relative to baseline.

In addition, after the MedDiet-VOO intervention LDL resistance against oxidation increased, the degree of LDL oxidative

modifications decreased, estimated LDL particle size augmented, and LDL particles became cholesterol-rich relative to the low-fat control diet. LDL lipoproteins became less cytotoxic for macrophages only relative to baseline.

Conclusion: The MedDiet, especially when enriched with VOO, improved HDL atheroprotective funcions and decreased LDL atherogenicity, in high cardiovascular risk individuals. These traits promoted by a MedDiet could contribute to explaining some of the cardioprotective benefits of this dietary pattern.

Keywords: Mediterranean diet, HDL functionality, endothelial dysfucntion, olive oil, nuts.

NUTRIGENOMIC TEACHINGS OF THE PREDIMED STUDIES

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Introduction: There are many studies that show that the response to the same diet is not equal in everyone. There are several factors (i.e., sex, age, diet, physical activity) that may contribute to that differing response. Great importance is placed on genetic variability in relevant genes for each phenotype studied. Diet is a complex environmental factor as hundreds of macronutrients, micronutrients and other food components are ingested together. Currently, instead of analyzing specific nutrients, more relevance is placed on the study of the whole dietary patterns. On the other hand, numerous meta-analyses of genome-wide association studies have identified new single nucleotide polymorphisms (SNPs) related to cardiovascular risk factors and diseases. However, additional information on how environmental factors modulate the effect of the SNPs on their specific outcomes is scarce. Diet is one of the main environmental factors interacting with genes in determining different genotypes. Therefore our aim was to analyze whether the whole Mediterranean diet (MedDiet) pattern (both observationally measured and intervention with MedDiet) interact with the genetic risk modifying the risk of diseases (both at intermediate and at final phenotype levels).

Methods: We have analyzed gene-MedDiet interactions in more than 7,000 high cardiovascular risk participants (aged 55-80 years, who fulfilled at least one of two criteria: T2D; 3 or more cardiovascular risk factors) in the PREDIMED (PREvención con DIeta MEDiterranea) trial both at baseline and after follow-up. We have focused on intermediate and on final cardiovascular disease phenotypes after 4.8 y of median follow-up. Among genetic factors we have selected those SNPs more relevant in determining each analyzed phenotype. We also constructed genetic risk scores (GRS).

Results and Discussion: We have found several gene-diet interactions between the MedDiet intervention on stroke incidence (involving the TCF7L2 and LPL genes) and myocardial infarction (MLXIPL). Likewise, we have detected several gene-MedDiet interactions on plasma lipids and glucose involving several genes: SORT1, TRIB, , MYLIP, CITED2, CAPN3, KLF4, TRPS1, PLEC1, PDE3A, CTF1, PGS1 and ERGIC3, among others. Also, we have detected gene-diet modulations in determining obestiy and dia-

betes, particularly including CLOCK genes and taste genes. Conclusions: MedDiet intervention as well as specific dietary pattenrs modify the effects of relevant SNPs and GRS on cardiovascular outcomes and intermediate phenotypes.

Keywords: Nutrigenetics, genes, mediterranean diet, cardiovascular, obesity

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PS_144/110
TOWARDS GLOBAL LEADERSHIP IN NUTRITION

NUTRITION LEADERSHIP IN ACADEMIC RESEARCH: THE CHALLENGE OF CROSS-DISCIPLINARY COLLABORATION

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Executive Director GAIN.

Cross disciplinary collaboration in nutrition research is frequently held up as desirable. It is difficult enough outside of an academic setting, but within the academy it is even more challenging. The presentation examines (1) why this type of collaboration is so desirable to help prevent malnutrition, (2) why it is challenging within an academic setting, and (3) what, if anything, can be done to incentivise greater amounts of high quality cross disciplinary collaboration to advance nutrition status.

Keywords: Cross-disciplinary academic

GLOBAL NUTRITION LEADERSHIP: PERSPECTIVES FROM THE CORPORATE SECTOR

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Since the foundation of the first Nutrition Leadership Program in Europe in 1994, Unilever has been involved in training, building and maintaining a global network of nutrition leaders. Currently, this network consists of more than 1300 nutritional professionals in Europe, Africa and Asia.

The need for such a network has surfaced as nutrition professionals in academia, industry, and the public sector are generally very strong in their field but also require the skills to collaborate and thus to address nutrition-related public health problems in an impactful way. The Nutrition Leadership Programs (NLP) has helped provide the leadership skills such as communication, strategic influence and interpersonal skills required to do so.

From an industry standpoint, the NLPs are critical for:
• the development of future leaders that have a broader understanding of the nutrition agenda and are able to effectively collaborate across cultures

• building understanding that each actor in the field of public health has their role to play to combat nutrition related challenges (academia, industry, governments and NGOs)

• access, via employee participation and sponsor representation, to an inspiring and strong global network of (future) nutrition leaders

Based on the data from career development of NLP alumni it is evident that this program is an effective tool in nutrition leadership development across regions. The need to train nutrition professionals in leadership skills and the ability to collaborate effectively across stakeholders to drive the public health agenda forward has not diminished in the time since the first NLP was founded. As a matter of fact, increasing business across regions has identified the need for leadership at a global level. We will discuss how connecting regional NLPs into a global NLP could benefit corporate organizations in driving an aligned public health agenda at the global level.

Keywords: Nutrition leadership. Leadership program

Conflict of Interest disclosure: Fernanda Martins is Nutrition&Health Manager at Unilever, a manufacturer of Food and Beverages products and sponsor of the ENLP and ANLP.

THE NEED FOR GLOBAL NUTRITION LEADERSHIP TO MEET THE SUSTAINABLE DEVELOPMENT GOALS

Lartey, Anna

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In 2015, the world received a broad set of universal, ambitious and sweeping set of goals. These are considered a transformative agenda that must leave no one behind. Although nutrition is explicitly mentioned in Goals2, at least 12 out of the 17 goals cannot be achieved without addressing nutrition. The current nutrition situation where 800 million people are undernourished, two billion are micronutrient deficient and 159 million children under five years are stunted, but at the same time 1.9 billion are overweight or obese, calls for a different way of doing business. In response to this, countries are putting in place nutrition policies and strategies to be able to achieve these targets. However, the complexity of the nutrition problem requires multi-sectoral actions involving different stakeholders. The training given to nutrition professionals provides scientific content. However, in a multi-sectoral environment, new skills sets are needed, such as the ability for leading change, team building, effective communication, networking and negotiation skills, to effectively deliver on nutrition and to keep nutrition on the global agenda. Taking advantage of the SDG, the need for a Global Nutrition Leadership Program that would function and deliver effectively within a multi-sectoral environment is needed. Region-based Nutrition Leadership training programs aim to fill this gap. However, to have a stronger voice at the global table, regional Nutrition Leadership Programs should join forces under the umbrella of a Global Nutrition Leadership Program to develop a harmonize approach of building leadership skills for early to middle career nutritionists.

Keywords: Nutrition leadership. SDG. multisectoral

FINDING SYNERGY BETWEEN INTERNATIONAL LEADERSHIP DEVELOPMENT INITIATIVES: PERSPECTIVES FROM THE NUTRITION LEADERSHIP PROGRAMMES

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There is growing recognition that to address today's nutritional problems there is a need for effective leaders in nutrition across sectors (academic, corporate, governmental and non-governmental), and at all career levels (junior, mid-career and senior). This requires strong leadership skills to build transdisciplinary alliances, identify evidence gaps, seize opportunities for action, and to effectively communicate to varied audiences about nutrition at the individual, organizational and system levels.

Regional Nutrition Leadership Programs (NLPs) are now well established in Europe, Africa, South-East Asia, Middle East, Latin-America, and Oceania. Interest has been expressed by the SUN movement and other agencies in developing leadership capabilities in other (sub-)regions. Leading change in nutrition is challenging, and requires a unique set of values, attitudes and orientations in addition to excellent technical, facilitation, strategic, and inter-personal skills. By creating awareness and developing these skills at an early- or mid-career stage, the different NLPs seek to increase the capacity of nutrition professionals to lead from where they are at all levels in the system.

Representatives from different NLPs have joined forces to build the functional capacity necessary to deal with the global nutrition challenges common to so many regions of the world. In keeping with the region-led approach of the NLPs, the initial emphasis is on supporting and strengthening existing NLPs whilst creating a common global purpose across NLPs and forging linkages between them. We will share details of this new initiative, which includes as a first step a detailed mapping of the global nutrition leadership landscape and a critical assessment of the potential added value that inter-regional collaboration could provide.

Keywords: Nutrition Leadership Programs, Global nutrition, leadership

Further collaborators: A large group of individuals involved in leadership development globally, including the different NLPs.

PS_144/92

THE ENUTRITION ACADEMY: GLOBAL ONLINE LEARNING AND CAPACITY DEVELOPMENT

OVERVIEW OF CURRENT COURSE CONTENT & LESSONS TO BE LEARNED

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The eNutrition Academy (eNA) initiative, focussing on the learning needs for Africa, has been developed by global and regional nutrition professional bodies (International Union of Nutritional Sciences, Federation of African Nutrition Societies, African Nutrition Society, American Society of Nutrition, Nutrition Society UK and Ireland). The aim is to strengthen nutrition capacity in Africa using an electronic learning platform in response to identified gaps in training resources in Higher Education Institutions (HEI).

Two units of study on the subject of dietary assessment were created (co-authors BE and RA) and developed into eLearning units with support from the web host, Cambridge University Press. These are open and free access units. The unit content is stand-alone but the development of each unit followed a similar format and incudes text material, access to free learning resources, video clips and interactive online exercises. The authors used additional learning materials, produced by colleagues African group members, to supplement the content in order to ensure a context specific approach. This also encouraged a higher level of engagement and adoption of the material. A third unit to complement the dietary assessment units was developed by our sub-group from across Africa and is currently undergoing review before being developed into online content.

An evaluation form was also created by the sub-group members which explored learner satisfaction with the material and the on-line features. The two units developed to date were evaluated by nutrition students and professionals in Africa. Training based on the experience was provided for other African colleagues to support current and on-going eLearning production. The presentation will discuss the findings of the evaluation to inform future developments.

Keywords: Dietary assessment, online learning, evaluation, development

MAPPING OF FREE AND OPEN-ACCESS ELEARNING RESOURCES IN HUMAN NUTRITION

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Capacity building and leadership have been recognized as key ingredients for delivering effective actions in nutrition and health, and particularly within the scaling up nutrition framework. The eNutrition Academy (eNA) initiative has been developed by global and regional nutrition professional societies/federations (International Union of Nutritional Sciences, Federation of African Nutrition Societies, African Nutrition Society, American Society for Nutrition, The Nutrition Society [UK]). It aims to strengthen nutrition capacity in Africa using an electronic learning (eLearning) platform. The eNA is an innovative response to the identified gaps in pre-service training resources in higher education institutions (HEI) in sub-Saharan Africa. The current study maps the typology and characteristics of existing eLearning resources which are openly and freely accessible to African HEIs. This rapid mapping exercise relies on an online search of existing eLearning resources, performed between January and May 2017 by the author as well as a cross-section of nutrition students and faculty in Africa. The search strategy was guided by the following search terms: nutrition, food systems, eLearning, course, open-access. Two independent reviewers used a template to extract characteristics of the identified eLearning platforms, including category of sponsors, content, organization or content, level of interactivity and target audience. This presentation will provide evidence on the 17 identified eLearning resources in nutrition and the gaps in their content and their delivery approach. The findings will form a basis for developing appropriate content delivery of nutrition training through the eNA.

Keywords: ELearning, Nutrition, Africa, Training, Higher education.

ETHICAL CHALLENGES AND IMPLICATIONS OF SHARING, SELLING AND DONATING HUMAN MILK

STRENGTHENING SYSTEMS FOR ESTABLISHING INTEGRATED HUMAN MILK BANK PROGRAMS AS ESSENTIAL NEWBORN CARE THROUGH GLOBAL LEARNING EXCHANGES: A BEST PRACTICE FOR ENSURING OWNERSHIP

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Background and objectives: Human milk is essential for all infants to ensure optimal growth and development. For preterm, low-birthweight infants unable to access sufficient breastmilk from their own mothers, pasteurized donor milk from a human milk bank (HMB) is recommended by the World Health Organization. HMB, when integrated with skin-to-skin, and lactation support programs, increases access to human milk, influences the culture of care to advocate for all infants to receive human milk. HMB expansion is limited due to lack of global guidance or quality standards to ensure safety. The aim of this work was to establish a systematic approach for building local technical capacity; a best practice of this approach is conducting learning exchanges to established HMB programs with the goal of developing a mechanism for mentorship and transferring skills for new HMBs.

Methods: Three HMB learning exchanges were facilitated between June 2015 and March 2017 to foster multinational collaboration. This included delegations from India to Brazil, Vietnam to Scotland, and Kenya to South Africa. Multi-disciplinary teams attending each exchange included ministry of health representatives, newborn and nutrition technical leaders, and nursing and midwifery experts. Focus was on specific needs from each region to ensure that the experience fulfilled pressing concerns. HMB champions hosted in-country site-visits. Approvals were obtained from the host ministry of health authorities to promote sustainable relationships.

Results: Each resulted in increased local ownership and capacity to adapt and strengthen systems in their own setting, including establishing local guidelines, operating procedures and policies. Various HMB models were explored in public and private sectors, exposing each team to best practices in HMB processes, and optimal integration with newborn and nutrition practices. Critical areas of learning included the importance of robust policy and practices to ensure sustainable, ethical, quality, and safe donor human milk.

Conclusions: In the absence of global guidance on HMB, learning exchanges play a critical systems strengthening role for ensuring that evidence-based best practices are integrated into new programs. Additional opportunities to share knowledge and expand best practices are lacking. Global HMB guidance and quality standards are needed as part of ensuring that infants worldwide have access to safe human milk.

Keywords: Human milk bank, breastfeeding, preterm

INDIGENOUS PEOPLES' GENDER ROLES, BIODIVERSITY AND FOOD SECURITY

INDIGENOUS PEOPLES' FOOD SYSTEMS: GENDER ROLES, BIODIVERSITY AND FOOD SECURITY – A NEW PUBLICATION

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It is with pleasure that in this session we release our publication titled "Indigenous Peoples' Food Systems: Gender Roles, Biodiversity and Food Security, co-edited by Harriet Kuhnlein and Thingnganing Longvah. We are grateful to the journal, Maternal and Child Nutrition (Wiley), for this free access publication venue, and to the International Union of Nutritional Sciences (IUNS) for supporting this effort.

The IUNS Task Force on Traditional, Indigenous and Cultural Food and Nutrition (2010-2017) has evolved from earlier task forces within the Union that addressed Nutrition and Anthropology (1986-1994) and Indigenous Peoples' Food Systems and Nutrition (2001-2009). Major recent free access publications from the Task Force describe the methodology and process of documenting food systems of 12 diverse cultures of Indigenous Peoples, and how their biodiverse food systems are used and promoted to benefit health status of rural indigenous communities. Our current effort, released today, describes how gender roles and the right to food for several cultures of Indigenous Peoples can be fostered to protect their unique food resources and traditions for their food security benefits, especially for women and children. In particular, aspects of societal maternal or paternal lineality and locality, division of labor, spirituality, and decision-making are described to recognize the impact gender roles have on leadership process, and dynamics of family food access, availability and use. Indigenous Peoples' food systems from cultures in Ecuador, Nigeria, Thailand, India, Canada, Japan and Morocco are included. Perspectives from these traditional and transitional rural indigenous cultures give important insights on how gender roles with indigenous world views affect use of local food biodiversity and food security at family and community levels. We avoided gender-based sterotypes and sought local interpretations, customary laws and norms impacting ownership and inheritance of resources and the related decision-making that is important for maintaining biodiversity, food security, and well-being. Articles based in these local

cultures give descriptions of local food biodiversity and patterns of use; some give detailed descriptions of nutritional status of women and children; and attention is given to historical changes in environmental circumstances and cultural norms affecting food and nutrition security.

We recognize all Task Force members for their contributions to this publication, and we thank Bioversity International and the Indigenous Partnership for Agrobiodiversity and Food Sovereignty for the inspiration to conduct this research that was first discussed in 2015 at the Indigenous Terra Madre in Shillong, India.

Keywords: Indigenous Peoples, food systems, biodiversity, gender, traditional food

NUTRITIONAL DIMENSIONS AND POTENTIAL OF INDIGENOUS FOOD SYSTEM IN NORTHEAST INDIA

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Northeast India, home to more than 200 diverse tribes with distinct cultural, linguistic, religious and historical background is considered one of the most diverse regions of the world. The paper presents the indigenous food system in Northeast India, the diversity of the food resources, their nutritional attributes and the impact of their use on food and nutrition security among indigenous tribes.

Wide variety of wild species and interspecies still constitutes the bedrock of the indigenous food system. Several studies on the food system of the different tribes in Northeast India revealed that the indigenous food count can be anywhere from 250 to 748. Majority of these are collected from the wild however, the current usage is much lesser than documented. The indigenous tribes of Northeast India being owners of the land have access and control with customary laws protecting the forest reserves. About 10 – 15% of the wild foods from forests find market and form source of income. Traditionally local crops, ethnic vegetables and indigenous fruits are collected by women folk either from the forest areas, conserved in shifting land or indigenous kitchen gardens. This is demonstrated by the fact that many edible wild species are in various stages of domestication as a result of human selection. The most commonly harvested wild food are green leafy vegetables, roots & tubers, fruits, flowers, seeds, spices, insects, snail, crab, small fishes and game animals. The indigenous food system in Northeast India also boast of rich agrobiodiversity with several landraces. Several landraces of rice, specific to tribes have been documented that have better nutritional attributes such as low glycemic index normally not seen in high yielding or hybrid rice thus reflecting in low incidence of diabetes in the region. Traditional plants are often used as both food and medicine and this connection must be noted. For example, Clerodendrum colebrookianum leaves popularly used in Northeast India minimize high blood pressure and perhaps the use of such vegetables is the reason for lower prevalence of hypertension and diabetes in the region. Wild foods remain important from both cultural and nutritional perspective manifesting in lower rate of child undernutrition in northeast India as compared to the rest of India.

Traditionally wild foods are consumed in various combinations along with cereals and vegetables to meet the food and nutrient needs and form a significant portion of the diet but their contribution to the household food supply vary according to the region and tribe. In view of the importance of wild foods resources in the food system of the indigenous people, systematic documentation and nutrient characterization of important food source is required. This will help in efforts to capitalize on the health benefits of indigenous food systems and integrate it into contemporary food systems to be able to fully support health and nutrition of the population in a sustainable manner.

Keywords: Indigenous food system, Northeast India

GENDER ROLES, FAMILY RELATIONSHIPS, AND HOUSEHOLD FOOD AND NUTRITION SECURITY IN THE OHAFIA MATRILINEAL SOCIETY IN NIGERIA

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Objective: Information on the nutritional status and household food security of the Ohafia matrilineal society are scarce. This study examined gender roles, family relationships, food security, and nutritional status of households in Ohafia, Nigeria.

Methods: A cross sectional descriptive study was conducted. Multistage sampling technique was used to select 287 households from three villages: Akanu, Amangwu, and Elu. Qualitative and quantitative data collection methods were adopted, namely, focus group discussions and questionnaires. Anthropometric measurements (height and weight for mothers and children, and mid upper arm circumference for young children) were taken using standard techniques. The body mass index of the mothers was calculated. All nutritional indices were compared with reference standards. Food insecurity was assessed using the Household Hunger Scale (HHS) and Dietary Diversity Score (DDS), then, analyzed using the Statistical Product for Service Solution (SPSS®) version 21. Data analysis used descriptive statistics.

Results: Most (91.2%) of the respondents were female. The matrilineal system known as "ikwu nne" or "iri ala a nne" (inheritance through mothers' lineage) is still in place, but is changing. One important benefit of the system is the access to land by women. While women participated actively in agriculture, food preparation, and care of family, the men were moving to off farm activities. High prevalence of household food insecurity (66%) and signs of malnutrition including moderate to severe stunting (48.4%) and wasting (31.7 %) in children, household hunger (34.5%), and overweight (27.5%) and obesity (19.2%) among mothers were observed. Conclusion: Despite women access to land, malnutrition remains a serious problem in these communities. These communities urgently need gender sensitive interventions.

"A member of the Task Force on Traditional, Indigenous and Cultural Food and Nutrition"

MATRILINEAL SYSTEM, HOUSEHOLD FOOD SECURITY AND NUTRITIONAL STATUS OF WOMEN AND CHILDREN AMONG THE OHAFIA IBOS OF SOUTH-EASTERN NIGERIA

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Objective: Women occupy a central role in subsistence agriculture, being responsible for about 80% of agricultural production. However, gender disparity in access to agricultural resources and services count against their productivity and consequently on the food and nutrition security of their household. It has been shown that when women have access to or own land they allocated much of their household income to food and therefore have more healthy children. In patriarchal societies, rules of inheritance favour male rather than the female in terms of land allocation. Nigeria is basically a patriarchal/patrilineal society; however, a few matrilineal societies exist in different parts of the country, one of which is the Ohafia Ibos of South-eastern Nigeria. The Ohafia Ibos operate a system where inheritance is through mothers' lineage (translated into the local dialect as "iri ala a nne."). Researchers have examined the socio-political implication of the matrilineal descent system among the Ohafia Ibos. This paper focuses on the origins, features, food and nutrition security, and nutritional status of women and children in matrilineal Ohafia communities.

Methods: A cross sectional descriptive study was conducted. Multistage sampling technique was used to select 287 households from three villages: Akanu, Amangwu, and Elu. Qualitative and quantitative data collection methods were adopted, namely, focus group discussions (FGD) and questionnaires. Anthropometric measurements (height and weight for women and children, and mid upper arm circumference [MUAC] for young children) were taken using standard techniques. The body mass index of the mothers was calculated. All nutritional indices were compared with reference standards. Food insecurity was assessed using the Household Hunger Scale (HHS) and Dietary Diversity Score (DDS), then, analyzed using the Statistical Product for Service Solution (SPSS®) version 21. Data analysis used descriptive statistics.

Results: The origin of the matrilineal system in Ohafia is based on oral tradition. The system is still in place but is changing. Although the matrilineal system allows women to inherit and have access to land, men are the household heads and preside over land matters. While women are actively engaged in agriculture, food preparation, and care of family, the men are moving to off farm activities. Indigenes perceive the matrilineal system to have some merits and demerits which have had significant impact on the lives of the people. Despite the rich biodiversity, high prevalence of household food insecurity (66%) and hunger (34.5%); malnutrition, including moderate to severe stunting (48.4%), wasting (31.7 %), and severe malnutrition (11.5%; MUAC < 11.00 cm) in children; and overweight (27.5%) and obesity (19.2%) among mothers were observed.

Conclusion: The matrilineal system and women access to land did not appear to shield these communities from household food insecurity and the double burden of malnutrition among women and children. While a detailed study of the intervening variables is recommended, these communities urgently need gender sensitive interventions.

Keywords: Matrilineal system, food and nutrition security, malnutrition, women and children, Ohafia

SUPPORTING INDIGENOUS CULTURES AND HONORING POSITIVE GENDER ROLES THROUGH WOMEN'S GROUPS IN TUNGURAHUA, ECUADOR

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Across Latin America, there have been improvements in undernutrition in recent decades, but these improvements have not been equal for Indigenous Peoples. They do not experience the same health and access to healthcare as non-Indigenous people, resulting in physical and cultural health consequences for the individual and the collective group. Traditional food systems of Indigenous Peoples, including wild leafy greens, can provide nutritional

value to diets and also support cultural aspects of food security. This study focuses on women in the maternal land of Tungurahua and their connection with culture and the food system through a food-based community nutrition intervention. Building upon the Quichua concept of mink'a—a system of community collaboration for the common good, mothers' cooking clubs were organized. The community nutrition intervention promoted the reintroduction of local foods through community cooking clubs and recipe competitions at local fairs. A positive deviance approach identified the local foods to be included in the intervention recipes, which were prepared in mothers group sessions under the guidance of a mother that was selected and trained as a guide mother. Two leafy greens were among the key foods identified to be widely available, but used by only a few households. Mothers met for 12 days consecutively to learn the recipes and prepare a meal together with other mothers at the house of a guide mother. An elder supported each of the mothers groups with traditional knowledge and Quichua language. We assessed the social, cultural, and nutritional potential of the mothers' club intervention to increase the consumption of local foods and the potential to improve children's diets with local foods. Key informant interviews and focus groups were conducted with 54 mothers and 16 elders to identify perceptions of the intervention and traditional foods. Social and cultural dimensions, including gender, were identified through content analysis. The nutritional contribution of the leafy greens was estimated through semi-quantitative food frequency questionnaires conducted with 160 participant mothers and 98 mothers living in nearby communities without the intervention that served as a comparison group. The use of local foods was a source of pride for mothers and elders. Non-food uses of the nettle proved an initial barrier to acceptance; however, peer support within mothers' groups enabled increased consumption. The greens were estimated to contribute an additional 8% vitamin A, 7% iron, 12% vitamin C, and 27% folate to children's recommended dietary intakes. By promoting wild leafy greens, mothers' groups improved food security and the cultural and nutritional value of their diet. Additionally, mothers' cooking clubs increased self-efficacy and cultural identity for Quichua women, offering a highly acceptable nutrition intervention model, honoring both gender roles and culture.

Keywords: Quichua. Community Intervention. Mothers' Groups. Culture. Traditional Foods.

Conflict of Interest disclosure: Julieta Sarsoza and Lorena Ambato worked for World Vision Ecuador at the time of the study, but did not influence data collection or interpretation.

NUTRITIONAL STATUS, FOOD INSECURITY AND BIODIVERSITY AMONG THE KHASI IN MEGHA-LAYA, INDIA

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Tribal communities in India are 8.6 % of the national population- an estimated 104 million people. The Khasi in Meghalaya State is among the largest tribal cultures and is well-known for unique matrilineal and matrilocal patterns. Women head households and enjoy positions of importance and dignity as preservers of clan, family and lineage. The youngest daughter is the receiver and custodian of intergenerational property transfer and the maternal uncle is head of family with executive management toward children, including behavioral discipline. The West Khasi Hills (WKH) district population is mostly Khasi, and is known for rich biodiversity and extensive rainfall, with sacred forests considered storehouses of genetic ecosystem resources; however, deforestation is widespread and high rates of childhood undernutrition and anemia are known in the State. The research purpose was to establish Khasi nutritional status and food biodiversity in the region to help determine priorities for food security using local natural resources.

A random sample of 600 households was determined in 20 villages for index child and mothers; anthropometry, dietary and food security interviews, and finger prick blood samples were taken; and environmental conditions recorded. Literacy was 77% for women and 67% for men, with 21% completing grade 12. Household income was low, 45% had safe drinking water, and 77% had sanitary latrines. Due to extensive missing nutrient data, food group analysis was conducted and compared to the Indian RDI. Cereals & millets, roots & tubers were consumed by more than 50% of individuals exceeding 70% RDI. White rice from the public distribution system was consumed by more than 95% of adults 2-3 times per day; leafy vegetables (GLV), milk, and fat intakes were poor; and overall dietary diversity was low. Moderate food insecurity existed in 63% of households, with 19% food secure. Colostrum was routinely given; exclusive breast feeding usually ceased at 6 mo, with breast feeding continuing until about 2 yr. Children's food intake by gender was similar with wide variation. Children's weight and height were close to 2006 WHO standards in early months, but growth faltering began around the third month. Underweight (31%), stunting (57%) and wasting (10%) existed for children <5 yr, with undernutrition higher among boys than girls. BMI ≤18.5 for women was 19% and 8% had BMI ≥ 25. Anemia was present for 68, 70, 86 and 83% of 1-5 year children, pregnant, lactating, or non-pregnant-or-lactating women, respectively. Women's hypertension was 15% and glucose intolerance was 0.7%.

The Khasi local food system has 372 differentiated species/varieties, many uncultivated and without scientific identification or nutrient data. Of 31 wild GLVs, only 10 were consumed by ›50%

of households 1-2 times/wk; 52 wild fruits were known, but only 5 varieties regularly consumed. Environmental protection, agro-biodiversity, food composition research, and food and nutrition education can be strengthened to improve health in this unique society.

Sincere appreciation is expressed to staff at the National Institute of Nutrition, Hyderabad, and the Northeast Slow Food and Agrobiodiversity Society, Shillong.

Keywords: Indigenous Peoples, Khasi, nutritional status, biodiversity, food security

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PS_144/102

AFRICAN GRADUATE NUTRITION STUDENTS NETWORK (AGSNET) SYMPOSIUM AT ICN, 2017

"I CANNOT SIT HERE AND EAT ALONE WHEN I KNOW A FELLOW GHANAIAN IS SUFFERING; WE WERE NOT BROUGHT UP THAT WAY": PERCEPTIONS OF FOOD INSECURITY AMONG GHANAIAN MIGRANTS

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Background: In the UK, ethnic minority groups tend to have higher levels of poverty than the white British population and therefore may be at high risk of food insecurity. Ghanaians are thought to have a high level of social support in their communities, but the role of this resource in relation to food security is unknown. We explored the influence of social and economic factors in shaping dietary practices among Ghanaians living in Greater Manchester to get an insight into perceptions of food insecurity among participants.

Methods: A qualitative study of adults aged ≥25 years (n=31) of Ghanaian ancestry living in Greater Manchester using face-to-face interviews. Participants varied in socioeconomic status, gender and migration status. Interviews were transcribed verbatim and analysed thematically.

Results: This study shows that most people can manage on limited resources and from the social support within the community, however people opt for 'belly food', which tends to be unhealthy and do not prioritize their own health. Food insecure household were perceived to be reluctant to make use of food banks for the fear of gossip and pride, paradoxically, this reluctance does not extend to close network. The church and other social groups formed a trusted base in which people operate; support given through these channels is more acceptable than through the "official context".

Conclusions: This study suggests that food security within the Ghanaian community could be enhanced through supportive networks within the community. The churches and other social organisations such as the Ghana Union might be a means through which formal support may be mediated. If the churches and social groups can target the most deprived, there is the need for research to find out whether the resources of the church are sufficient to meet their needs, as effective interventions depend on being able to effectively target the vulnerable. Future survey-based research is needed to better assess the accessibility and utilization pillars of food insecurity given that perceptions data may not suffice to capture the physical and utilization component of food insecurity. There is also the need to explore the implications of food management and coping strategies for dietary quality and health among this population.

Keywords: Food insecurity, Social networks, Ghanaians, Dietary practices, Migrants

BODY COMPOSITION IN PRE-PUBERTAL MOROCCAN CHILDREN USING ISOTOPE DILUTION: DEVELOPMENT AND VALIDATION OF BIOELECTRICAL IMPEDANCE ANALYSIS EQUATIONS FOR PREDICTION TOTAL BODY WATER AND FAT-FREE MASS

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Background/Objectives: Body composition is important as a marker of both current and future health. Bioelectric impedance analysis (BIA) is a simple and accurate method for estimating body composition, but requires valid equations obtained from calibration studies to derive total body water (TBW) and fat free-mass(FFM) from electrical impedance. Equations for estimating FFM and TBW using this tool, with appropriate cross-validation, have been developed in Moroccan adolescents and adults. However none of the previous studies included Moroccan children.

The aim of our study was to examine the validity of published BIA-FFM and BIA-TBW equations available in the literature in the population of study and if needed to develop a new FFM-BIA and TBW-BIA equations using deuterium dilution as the reference method.

Subjects/Methods: Data were collected from 247 healthy children aged 8-11-year-old. Children were sorted by gender and age group and assigned into development and validation subgroups. The deuterium dilution was used as reference for estimating TBW and FFM. The accuracy of previous published equations was tested using Bland and Altman approach, proportional bias, pure error and effect size. BIA new equations were developed using linear regression and cross-validated using Bland and Altman approach.

Results: The previous published equations tested, showed a significant absolute and proportional bias indicating that these equations would provide biased values in estimating TBW and FFM. The above the mentioned biases detected, emphasizes the need for the development of specific equations to predict TBW and FFM with a low standard error in pre-pubertal Moroccan children.

The new equations derived provided non-significant proportional bias values, and better agreement than other tested equations. Bias and pure error values were 0.05 and 0.76l for boys and -0.12 and 0.92l for girls, for TBW equation. For FFM equation, bias values were 0.09 and -0.14, and pure errors were 1.00 kg and 1.17 kg for boys and girls, respectively.

Conclusions: The new prediction equations for TBW and FFM developed in our study are the most accurate to estimate TBW and FFM in Moroccan pre pubertal children aged 8-11 years. Further studies are needed to examine the validity of those new equations in a large sample on children.

Keywords: Keywords: Body composition; Bioelectrical impedance; Prediction equation; Total body water; Fat free mass; Moroccan children.

DEVELOPING TRANSFORMATIONAL NUTRITION LEADERS IN AFRICA

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Most African countries are burdened by undernutrition and all indications are that we are set to be particularly hard-hit by the growing burden of overnutrition. Despite significant investments, progress to optimize nutritional status is variable.

Nutrition in Africa is about change – it is a multisectoral process that has to lead. Leaders are change agents and are required throughout the whole system at all levels. Effective leaders develop a special combination of values, attitudes, orientations and behaviours in addition to their excellent technical skills.

The African Nutrition Leadership Programme (ANLP) has hosted a series of leader development events since 2002 and has built a Pan-African network of more than 380 leaders in 35 African countries working in multiple nutrition-related sectors. The ANLP's focus is on the development of the individual's leadership capabilities. Since 2010 the ANLP has also developed a number of needs-based leadership development programmes for multisectoral teams and organisations at national and subnational level who contribute towards scaling up nutrition interventions. Programmes have been hosted in Kenya, Rwanda, Uganda and Zambia with more being developed for implementation in the near future. Recognising the urgent demand, the ANLP has started developing a larger group of master trainers to facilitate the scaling up of leadership capacity building across the continent.

Leader development is also of importance to enhance the employability of science graduates. The NWU has developed a personal development programme which includes aspects of self awareness, contextualizing your behavior in the workplace and conflict resolution among others. The programme has been piloted in a cohort of graduate interns and the second cohort are now engaged with the programme. The self-awareness created set participants up for a process of life-long learning and growing. In addition the need has been identified and programme initiated to embed leadership development in the dietetics curriculum to ensure that we develop a workforce that have the ability and the necessary orientations and values to stand up and lead from where they are.

These programmes are examples of ongoing capacity development initiatives that are African-led and that impact the functional capacity of our nutrition workforce.

Keywords: Leadership, capacity building, Africa, change, ANLP

Further collaborators:

Extended team of ANLP volunteer facilitators and thought leaders.

SEEMINGLY EFFECTIVE PATHWAYS TO NUTRITION BEHAVIOUR CHANGE

THE IMPORTANCE OF COACHING AND MENTORING, POST NUTRITION EDUCATION FOR SUSTAINED BEHAVIOUR CHANGES - THE USAID SOLID APPROACH

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The approach of "coaching and mentoring following nutrition education" was the nutrition component of the USAID Supporting Opportunities in Livelihood (SOLID) project implemented

in three provinces in the dry zone of Sri Lanka. Over 2000 farm families who were part of a livelihood improvement program supported by USAID were trained on the basics of nutrition with the targeted objective of " farmers improve the quality of their diet by including more fruits and vegetables and high quality proteins in their diet". The training component was designed in consultation with the families themselves and government service providers. A 3 stage approach was used culminating with a 5 hour practical training program done using interactive methodologies and cooking. A written pre-evaluation of 24 hour recall was done coupled with a post evaluation immediately after the training, in the written form of "what am I planning as my diets in the next 24 hours. The pre and post evaluation forms were compared for increases in dietary diversity in the number of food groups as well as the percentage of participants increasing their knowledge on diversity. Follow up, mentoring and coaching was done in three intervals post training through household visits and recording observations of households randomly selected. The visits were not announced. The food diary provided as part of a nutrition manual for the family was perused as well. 67% of those targeted for training had improved their knowledge immediately post training. 61% of those visited through random selection had improved their nutrition related behaviours with respect to dietary diversity, reduction of fat, salt and sugar in the diet, increase of fresh food and improved home gardens. The conclusion is that there seems to be fairly quick improvement in nutrition related behaviour if targeted participants are closely tracked and corrected. It is important to deliver nutrition improvement programs within livelihood initiatives.

Keywords: Pre post evaluation, dietary diversity

NUTRITION BEHAVIOR CHANGES AMONG CHILDREN, MOTHERS AND COMMUNITIES!

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How do we change the eating behaviors of children, the feeding behaviors of their mothers and the understanding of communities to optimize wellbeing through nutrition? Wellbeing does not imply more food but the right food eaten at the right time, in a quantity commensurate with the person's activity. In the case of deprived communities it implies eating enough of whatever they have to avoid hunger.

As interventionists we have to understand that behavior change requires four elements coming together in synergy. 1. Knowledge which is likely to come from education. The education for its proper and desirable impact should be driven by the users based on their perceived needs, 2. Motivation for change of behavior in this case eating and feeding practices, 3. Skills required for the change and 4. Enabling environments which make change possible and sustainable.

The mantra is conducting relevant formative research to design the education which is easily understood and is interesting to

the user. The education content should be relevant and applicable and at the same time credible and scientifically sound. It should be respectful to the sensibilities of all members of the community so that there are no barriers on that account. The education should adopt formats which motivate the users so that they want to acquire skills to modify their behaviors and change their environments. The skills should be imparted by participatory methodology which makes learning easy.

The enabling environments are at several levels like the family, friends, community and the country. They all contribute to change of behavior.

A short video from Meena Communication Initiative Meena of UNICEF would demonstrate this dynamics.

Keywords: Knowledge, motivation, skills, enabling environments, interventionist

IMPROVEMENT OF NUTRITION OF CHILDREN WITH MOTHERS EMPOWERMENT THROUGH MOTHER SUPPORT GROUPS

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Even though most health indicators for Sri Lanka are satisfactory when compared to other countries of the region, indicators related to nutritional status of under five children are not in keeping with the other health indicators. To improve the nutritional status indicators further, UNICEF in collaboration with the Ministry of Health planned to implement alternate measures. The program aimed at focusing on applying several innovative activities by groups of mothers formed as a Mothers Support Groups (MSGs)) aimed at improving the nutritional status of under five children.

Programme was implemented in 5 districts out of 25 through the public health midwife (PHMs) of the respective areas. Well motivated mothers having children under five years and who had leadership qualities were invited to a 'cluster meeting' to be held at a place convenient for the mothers. About 10 -15 mothers formed a 'cluster'. The facilitators undertook the training of mothers. During the training, the concepts of health and nutrition, wellbeing and concept of nutrition promotion were focused on. Mothers were motivated to initiate the program at community level. These trained mothers shared the information with other mother's having a child/children below five years of age. These groups had regular meetings, some of them meeting once a month and some, more frequently. At these meetings they discussed the nutritional status of their children and the possible contributory factors. As a group, they discussed possible solutions to the problems identified. PHM provided relevant advice when necessary and mothers were guided to enumerate the probable solutions. Mothers developed innovative activities and relevant indicators to assess the progress. Several innovative activities conducted by mothers were; happy calendar, brain calendar, five sensation stimulation book,

hapana calendar, baby room, play house, nutrition calendar, collective feeding, weight chart, sapa and moda malla, daily expenses reduction chart, unnecessary food and beverages reduction chart, buddhi kataya, vibhaga pohora etc. After 6 months, impact was assessed.

There were 2000 MSGs were formed. It was observed evidence of weight improvements, gains in development, current wellbeing of child and family, better money and time management in families. In many of the families, the reduction of money spent on tobacco smoking and alcohol, as well as on food items that are not nutritious, was seen as a positive impact of the program. "Active" mothers from one MSG to visit another village and assist the mothers in that village to establish a mothers group and provide guidance to carry out the activities were used. The 'mini-symposia' were conducted to share success stories and plans made to further spread of the approach. Successful groups also worked out further targets, to broaden the scope of their own activities.

In conclusion linking in MSGs with the formal health system, in promoting nutrition is likely to improve the nutritional status of children thereby benefitting the community in a multitude of ways.

Keywords: Mother support groups, nutrition promotion, community empowerment, children under five

Further collaborators: Plan international

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DEVELOPMENT OF TRAINING AND RESEARCH IN NUTRITION AND DIETETICS IN FRANCOPHONE AFRICAN COUNTRIES

NUTRITION AND DIETETIC TRAINING AND RESEARCH IN AFRICAN FRENCH-SPEAKING COUNTRIES: WHERE ARE WE TODAY?

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Background and objective: More than half French-speaking people live in Africa. Sixteen of Francophone Sub-Saharan African countries (more than 21), are least-developed countries. As indicator of chronic undernutrition double by increasing prevalences of obesity, 40% of children are wasted. The main strategies of support are research and training. French speaking African countries are limited by language to access to quality training, research and scientific exchange. The objective of this work is to investigate on gap, strength and opportunities of training and research on nutrition and dietetics in Francophone African countries.

Methods: We use an inventory of available online resources in French and in English (websites, platforms), In-depth interviews with stakeholders.

Results: There are very few scientific and research support available in French. French speaking are very poorly trained in

nutrition and dietetics and related discipline. Few International Courses (PLAN in Morocco, FINSA in Benin) and related masters are available, but not really accessible for every one willing to learn. FAO is also developing online ENAF course for French speaking countries. Very limited programs are available in French. French speaking apply as well in English programs either for training or research, but are not really competitive in front of their English mate. Their application are usually rejected. There is a great lack of human capacity in the field and at the point of decision, they are absent. Refreshing courses are not sufficient to build sustainable skill in and nutrition and dietetic.

Conclusion: French resources on malnutrition are insufficient constituting a barrier to effective implementation of nutrition and dietetic programs in French-speaking countries of Africa. In order to develop a comprehensive framework to strengthen human capacity for nutrition and dietetic training and research, we appeal for a ''Inter-country Institute of Applied Nutrition and Food Science in Francophone Sub-Sahara Africa (IANFA)'' , where training and research programs will be fully implemented in French for effective nutrition interventions and relevant human capacity building.

Keywords: Training and Research, Nutrition and Dietetics, Francophone African Countries

OVERVIEW OF NEEDS AND OPPORTUNITIES IN NUTRITION TRAINING: A RAPID SITUATION ANALYSIS IN BURKINA FASO

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Background and objectives: In Burkina Faso, the nutritional disorders remain a major health problem. The prevalence of chronic and acute malnutrition was respectively 30.2% and 10.4% among children under five . A survey conducted in 2013 showed that the prevalence of high blood pressure and diabetes was respectively 17.6% and 4.9%. More than 75% of the survey participants have a low rate of HDL cholesterol2.

The nutritional disorders is a concern for the country and the national nutrition policy was developed to address the key issues that require technical and operational skills. This raise the following question: Does the training opportunities in the field of nutrition are in line with the needs for strengthening the control of nutritional disorders in Burkina Faso?

The purpose of this work is to highlight the needs in nutrition training, the existing opportunities and the measure developed to meet these needs in Burkina Faso.

Methods: A documents analysis and interview with key informants were used to conduct this situation analysis.

Results: The analysis of nutritional key problems identified by the national nutrition policy3 suggests the following needs:

- Nutrition education of parents, children, teachers and others key stakeholders involved in the valuation of local food products;

- Training in nutrition and promotion of nutrition at universities, public health schools;

- Capacity building of all the key stakeholders involved in the diagnosis, the treatment and prevention of nutritional disorders.

Regarding the opportunities of training in nutrition in Burkina Faso, progress has been achieved:

- Nutrition was included in the curricula of primary and secondary schools;

- Training and refresher training in nutrition at universities and health schools;

- Refresher training for health professional;

- Training of community health workers in nutrition (integrated management of childhood illness);

However, most of these trainings address the nutrition issues in general terms.

Conclusions: Progress was done in responding to nutrition training needs in Burkina Faso. However, some efforts are required for focusing more specifically on nutrition issues in the training programs and for strengthening the capacities of all the stakeholders giving the multi-sectoral nature of nutrition.

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THE PAST AND FUTURE OF ASIAN FOOD CULTURE AND NUTRITION SECURITY: STRENGTHS AND WEAKNESSES

GENETICALLY ENGINEERED (GE) FOODS TO MEET NUTRITIONAL & FOOD SECURITY CHALLENGES IN INDIA

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The advances in Biotechnology is gaining wide acceptance specially in relation to early diagnosis of disease profile, development of therapeutic agents, vaccines, foods, improved agricultural productions etc. The rapid development of Genetically Engineered (GE) foods using recombinant DNA technology from different species of organism like Microbes, plant and also animal is considered to be most advanced technology. The potential benefits of GE Foods are (i) Reduced use of pesticides, Herbicides, (iii) Enhanced nutrition, (iv) Enhanced shelf life, (v) Enhanced resistance to drought and other abiotic stresses etc., The role of GE foods in alleviating global macro and micro nutritional deficiencies is being recognized.

However, ensuring the safety and quality of the GE food for intended nutritional compliance is a pre-market challenge. In the world there are many GM crops like Maize, Cotton, Soybean that are in use for the last decade in several Countries. In India the success story of Bt Cotton which occupies 80% of the crop, has not only boosted the economy of farmer and country but given a scope to introduce new crops like GM. Mustard, Bt Brinjal, Bt Okra, Bt. Rice etc., The data generated in our laboratories mentioned crops have demonstrated nutritional equivalence and their safety with the native crops. This has led to harmonize the protocols (to evaluate allergencity, acute and chronic toxicity, compositional and nutritional equivalence) for pre-market safety assessment

In the current scenario in India, sub-clinical vitamin A deficiency is increasing rapidly. Therefore, the potential strategy of developing GE crop with enhanced beta carotene content has been recognized to combat the vitamin A deficiency. This approach needs to be strengthened to counter micro nutrient deficiency so as to fight the hidden hunger. Identifying the delivery of such micro nutrients through GE foods. This requires the evidence based support involving Scientists, Academia, Regulators and Civil Societies.

Keywords: Genetically Engineered (GE) foods, Recombinant DNA technology, Benefits of GE foods, Sub-clinical vitamin A deficiency .

FOOD AND NUTRITION SECURITY OF INDONESIA

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This paper is intended to reveal the food culture and nutrition security of Indonesians, the largest tropical archipelago country in Asia.. This was done through analyzing secondary data on poverty, food intake and review of the literature on food habits and nutrition status of Indonesian from the last two decades. During the last two decades, Indonesia enjoyed annual economic growth between 5 to 6.5% following by reduction of the percentage of poor people from 23.4% to 11.0% and underweight children from 31,6% to 19.6%, and anemia among pregnant women from 50.9% to 37.1%. Mayor food groups on the current Indonesian diets are similar to the traditional diet. The differences are the current diet is more from food away from home, contains more variety of foods and beverages contain more fat, sugar and sodium content. Meanwhile the intake of fruit and vegetables relatively not much change. Current Indonesian diet consists of rice as the first staple food and wheat flour products like noodle and bread as the second. Fish, egg, chicken, tempe and tofu are the side dishes commonly consumed that are usually fried. Vegetables and fruit commonly consumed are spinach, swamp cabbage, cabbage, banana, papaya, orange and water melon. Coconut milk and palm oil now are commonly used for cooking; and onions, chilies, herbs,

salt and sugar are commonly used as spices in cooking. The five most Indonesia's favorite foods are rendang, satay, nasi goreng, soto and bakso are seasoned with that spices. It is common that Indonesians consume chili sauce (sambal), soybean sauce (kecap) and crackers (kerupuk) as an appetizer. Food habits vary in different regions and ethnics. Percentage of household food expenditure for prepared food increased significantly from 12.5% to 28.08% in which mostly fatty, sugary and salty foods. In addition, currently there are about 1500 western fast food outlets in urban Indonesia, which showed changing in food culture partly. Inline with changing in food culture, accompanied by improvement in economic and access to food, obesity prevalence is increasing in Indonesia especially among women, which is increased from 23.8% in 2007 to 32.9% in 2013, while the problems of underweight, stunting and anemia among children are still prevalent. In the last two decade the main cause of death was upper respiratory infections, but now is cardiovascular diseases. This implies that Indonesia is now facing a of double burden of nutrition and health transition, which requires more innovative and comprehensive policy programs for preventing double burden of nutrition in Indonesia.

Keywords: Food culture, health transition, Indonesia culture, nutrition security

FOOD CULTURES AND NUTRITION SECURITY IN MALAYSIA: ISSUES AND CHALLENGES

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Malaysia is a multi-racial country and each ethnic groups has its own unique food culture. For centuries, it has been a melting pot of different cultures and the interaction and integration among the various ethnic groups making Malaysia unique as compared to other countries. It's often said, culture enriches life however local food cultures may have its own strengths and weaknesses in its ability to meet nutritional and health needs of the population. In addition, religion can influence food purchasing decision and eating habits. Over the last few decades Malaysia's national per capita income increased more than 25-folds from US$402 in 1970 to US$10,796 in 2014, a sizeable new middle income class has emerged, an impressive achievement but not without a cost! The increasing globalization of food systems, have resulted in a population shift from minimally processed diets rich in staple foods of vegetable origin to diets high in meat, vegetable oils, refined sugars, sodium, processed and ultra-processed foods, a significant contributor to the current and future disease burden associated with obesity and diet-related NCDs in Malaysia. From a public health perspective, the role of processed foods in nutrition transition is receiving greater scrutiny in some while others will continue to increase without policy intervention. The "mushrooming" of fast food outlets and supermarkets, aggressive advertising and marketing of cheaper industrialized products, have led to a dra-

matic rise in consumption of low nutritional quality, energy-dense, ultra-processed food and drinks, and fried snacks and sweets. The presence of "24-hour" food outlets combined with increasingly sedentary lifestyles, is a "recipe for disaster" for Malaysians, rated the highest in obesity prevalence in SEA region. A recent study (EIU, 2017) revealed total cost of obesity estimated to be between 10% and 19% of national healthcare spending. There is however renewed interest in health promoting "healing" foods and nutritional re-profiling of traditional diets to provide healthier food options for the future generation. Enhancing food security and reducing under-nutrition have been pledged since 1948 through the Universal Declaration of Human Rights. Malaysia is not likely to face food shortages but food security, especially for our staple food, rice. The food import bill in 2015 was RM45.4(US10.5) bn, with exports of RM27(US6.2)bn, with a trade deficit of over RM18(US4.2)bn. Malaysia was ranked at the 35th spot in the Global Food Security Index 2016 rankings with Singapore at third spot and highest ranked country in Asia, followed by Japan (22), South Korea (28) and China (42). Climate change is a globally important environmental issue that impacting our economic future and livelihoods and various policies are adopted to mitigate this phenomenon. The National Plan of Action for Nutrition Malaysia III (2016-2025) goes beyond improving household food security whereby element of nutrition security is given greater emphasis in line with ICN2 declaration and SDGs in the next decade.

Keywords: Food cultures, food security, Malaysia

EXPERIENCE IN REDUCING STUNTING IN VIETNAM: NUTRITION POLICY, PROGRAMS AND COMMUNITY NUTRITION INTERVENTION

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Nutrition policy and nutrition programs: During the 1980th, after a long devastated war and the pressure of high demographic rate, the nutritional status of Vietnamese, especially of children and mothers was very poor. Since 1980, when the National Institute of Nutrition of Vietnam was established and started to conduct several nutrition epidemiological studies, providing the scientific evidences of malnutrition rate and its main causes. In 1985, the rate of underweight was 51.5% and the rate of stunting was very high (59.7%). The network of nutrition has been set up in the whole country; Control of PEM and vitamin A deficiency has become national programs.

In 1995, the Prime Minister ratified the NPAN 1995-2000, where the Government asked authorities at all levels to integrate nutrition goals, reduction of malnutrition, into their local socio-economic development plans. The National Nutrition Strategy (NNS) 2001-2010 was officially ratified by the Government in February 2001; the overall goal was to improve nutritional status of children focusing mainly on underweight reduction. Then the second NNS for the period 2011-2020 was approved in February 2012 with the general objective to improve the diet of Vietnamese

population and focus on reduction of stunting and control of overweight and obesity.

The main nutrition interventions/projects up to 2010 were the national PEM control program, PAM project, High dose Vitamin A supplementation for children, Fe-folic supplementation for pregnant women and weekly Fe supplementation for adolescent girls… With purpose to reduce stunting among <5 children, besides malnutrition control program, the Food fortification projects (ILSI, GAIN projects), multi-micronutrient supplementation to the poor and disadvantaged areas, school nutrition project... were also developed and carried out during period 2011-2020.

The main intervention strategies in Vietnam were the preventive orientation- nutrition throughout the lifecycle; Prioritzing high risk groups and disadvantaged areas; and community-based and multi-sectoral approach in implementation of nutrition activities.

The Vietnam food-based Dietary Guidelines were developed for each 5 – 10 years (FBDG for period 1995-2000, 2001-2005, 2006-2010 and 2011-2020, as nutrition education tools.

Building up capacity for nutrtion has received high attention. Nutrition and food safety departments have been set up in several medical, agricultural universities. Since 1994, the MSc. training of community nutrition and in 2005 the Ph.D training in Nutrtion were implemented.

Success and challenges: Child malnutrition (underweight, stunting) prevalence as well as micronutrient deficiency has been remarkably reduced. However, Vietnam started facing with double burden of malnutrition (stunting is still high and overweight and obesity is increasing very fast).

Keywords: Nutrition policy, programs, intervention, stunting, Vietnam

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UNDERSTANDING DIETARY PATTERNS: A STEP TOWARD DEVISING A GLOBAL NUTRITION STRATEGY

PHYSIOLOGY AND PSYCHOLOGY UNDERLYING FOOD CHOICES

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The simple question of why people eat the foods they do requires answers that are both complex and interdisciplinary. Taste, cost, convenience, health, and variety are commonly cited as the main drivers of individual food choice. Collective food choices are also an expression of social identity, deeply embedded in religion and culture. Finally, food systems operate within a social, economic, and political space. Food availability – and hence food choices - can be influenced by myriad factors, from political upheavals to catastrophic weather vents, global warming, and climate change.

First, the sensory response to foods involves complex metabolic and neurochemical responses that may involve opioid peptides and dopamine. Beginning in infancy and childhood, food choices are driven by biological factors that favor foods that are both palatable and rich in calories. Whereas bitter-tasting foods are generally avoided by infants, children, and by pregnant women, sweet and umami ("delicious") tastes are sensory markers for dietary energy and nutrients. Early food choices are shaped by the desire for sweetness, calories, and variety. Food cravings in later life tend to center around foods and are energy-dense, salty, or sweet.

Second, economic factors, including the cost of foods can determine food choices as the individual or population level. The economic development of low-and-middle income countries (LMIC) has been accompanied by the nutrition transition. Cereal- and tuber-based diets (rice, corn, wheat, potato and cassava) are being replaced by more diversified diets containing more animal products, more processed foods and more added sugars and added fats. Whereas the percentage of calories from added sugars and animal and vegetable fats can vary widely, depending on country incomes, protein content of the diets remains relatively constant at 12-14%

However, plant proteins are often replaced by animal proteins from milk and dairy products or from meat, poultry, or fish. This component of the nutrition transition, called "protein transition", is very much dependent on perceptions, attitudes and on social and cultural norms. For example, populations in SE Asia derive up to 70% of energy from rice, with additional energy from leafy greens, other vegetables and some fruit. The consumption of meat and fish is low, as is the consumption of milk, whereas the consumption of yogurt and cheese is virtually non-existent. The diet is deficient in calcium, iron, and zinc and protein quality and amino acid balance are questionable. By contrast, countries in South Asia have increased milk consumption but for a variety of reasons consume little pork or beef.

Ongoing studies on the drivers of protein selection in SE Asia LMICs are directly in line with the WHO and FAO policies. One goal of the global nutrition strategy is to supply LMIC populations with high-quality protein foods that are nutrient rich, affordable, sustainable, and appealing.

Keywords: Sweet taste, energy density, food patterns, cost, affordability, protein transition, protein quality.

Conflict of Interest disclosure: AD has received grants, contracts, and honoraria from public agencies, private industry, private foundations, and commodity groups for projects involving nutrient profiling, diet quality assessments, and health outcomes

METHODS TO COLLECT AND COMPARE DATA ACROSS GEOGRAPHY

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The wide use of dietary data for researches relating diet to health and disease or in public policies planning requires that the collection of dietary information be increasingly accurate. New technologies have been developed to facilitate the food intake assessment, such as the use of internet, computers, tablets and smartphones. Although several techniques are still under development, especially in Latin America, many progresses have already been made, providing a range of possibilities for assessing food intake in both individuals and population groups.

Online platforms can help researchers determine the best way to assess diet for any study in which estimates of group intakes are required, since there is no perfect measure of diet. Understanding the key features of self-report instruments and the benefits and drawbacks of potential approaches to collecting and analyzing dietary intake data can help the researcher to make the best choices given the research question and resources.

Another possibility for the researchers is to be part of a network of cooperation with other researchers. Dietary data from several places can be compiled to provide food and nutrient intake data from countries around the world. Continuous collaborative networks are formed for gathering, validating and disseminating data on food intake of the main foods and nutrients for individuals by age, sex, household region, educational level and geocoding. These data enable to describe the global nutritional transition, ranging from nutritional deficiencies to overfeeding.

Several initiatives have been developed for customization and standardization at the food and nutrient assessments, intending to minimize systematic and random errors in nutrient intake estimations and to allow comparisons between different countries.

New methodologies applied to dietary assessment provide us with a step-change in our ability to reliably characterize food and nutrient intake in different researches. These new approaches may help to reduce measurement error and advance our understanding of diet in health and disease process.

Keywords: Food intake;diet;dietary assessment;measurement error

NUTRITION GUIDANCE IN THE AGE OF GLOBALIZED MARKETS

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Modernization, globalization and industrialization are active words used very often associated to modified nutritional habits, and to the epidemiological and nutrition stages of transition in different parts of the world. The double burden of malnutrition and obesity raises costs of health management specially in developing countries. These areas still are counting the number of malnourished inhabitants and the increasing figures of diseases related to excessive weight. At the same time, we do need to understand role of modified nutritional habits, changes in life style, with the decrease of physical activity, despite rising numbers in institutionalized system for physical activity (gyms and sport activities).

Urbanization is a well-known phenomenon seen in many countries, and food production shifts from small producers to huge corporations and large scale soil modification. Industrialized food guarantees the access to food for increasing number of dwellings in urban areas, in a practical, possibly affordable and easy way. Nonetheless this is considered an issue for some researchers, based on the fact that shifting from home made and more natural systems of food producing for the more processed items, the amount of fat, sugar and salt intake could be increased. Many surveys do associate these changes with health outcomes as obesity, hypertension and cardio vascular diseases.

But it is not easily discussed that home and away from home recipes, using the so called natural food, could have higher levels of the same constituents as fat, sugar and sodium. Nutritional education is not so easily accessed as it is possible to control food processing methods in order to reduce this combination of nutrients.

In a globalized market, food is accessible and many items anteriorly only available to higher classes, are now been bought by new population of consumers. Low cost items are usually rich in fat and energy, changing importance in the menus with ancient local and traditional food combinations.

Global brands substitute regional recipes or preparations, modifying the way that families are preparing and consuming different meals. Many families are skipping meals, specially breakfast and dinners and family meals are scarce, rising possible health hazardous outcomes.

How to cope with modern times, with the new possibility of having access to more food items, in a practical and convenient way to combine industrialized and local and traditional food is a puzzle for all health planners. But it is very important to understand that the final consumer has the final word. And he decides what is best for him and his family. Convenience, price, culture and habits do determine his choices.

Keywords: Globalization, industrialization, obesity, processed food, family meals

FOOD COMPOSITION IS CENTRAL TO A FOOD SYSTEM APPROACH FOR NUTRITION

HOW TO DESIGN, PROMOTE AND IMPLEMENT NUTRITION-SENSITIVE FOOD SYSTEMS USING FOOD COMPOSITION DATA, BIODIVERSITY AND THE NUTRIENT PRODUCTIVITY CONCEPT

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A food system covers all the elements (environment, people, inputs, processes, infrastructures, institutions, etc.) and activities that relate to the production, processing, distribution, preparation and consumption of food, and the outputs of these activities, including socioeconomic and environmental outcomes.

Making a food system nutrition-sensitive entails applying a nutrition lens to all its activities, considering all forms of malnutrition. First, an analysis of the food system and nutrition situation shall be done, based on which interventions shall be planned and implemented, explicitly designed to improve nutrition by taking the constraints of the food system into account. This shall be followed by monitoring of impacts. Possible questions can be 'Will activities improve (or harm) the nutrition situation?' or 'Which of the possible activities would best enhance better nutrition – while considering other aspects such as productivity or income?' or 'Are the currently produced and processed foods meeting the nutritional requirements of populations? If not, what needs changing, and is this feasible?'

To answer most of these questions, data are needed to design, implement and monitor nutrition-sensitive activities within the entire food system. Two important datasets are food consumption, e.g. FAO/WHO GIFT platform, or food composition data (FCD).

For example, in food production, FCD can be used to inform decision makers which agricultural products have the optimal nutrient composition to reduce malnutrition using foods. Those foods should then be included in large or small scale production, seed or research programmes and policies; or in incentives considerations to enhance production while lowering prices. A useful tool is FAO's newly developed Nutrient Productivity Scale which combines yield/production of different agricultural goods per hectare with their content of nine nutrients (energy, protein, dietary fibre, iron, zinc, calcium, vitamin A, vitamin C and folate) which is then compared to human nutritional requirements. Biodiversity needs to be considered as nutrient content differ significantly among the varieties or breeds of the same food, making the difference between nutrient adequacy and inadequacy. If foods or varieties with high micronutrient contents were produced or consumed in higher quantities they would eliminate micronutrient deficiencies worldwide. For that, FDC are needed, including data on different varieties or breeds delivered by different production systems.

During food storage and processing, some foods and nutrients are lost or wasted. FCD are key to develop new approaches to reduce food and nutrient losses or waste; enhance value chains of e.g. nutrient–dense fruits and vegetables; or develop food products being naturally enriched by adding highly nutritious foods. Food labelling is part of trade and marketing and useful in guiding food choices. Food Based Dietary Guidelines (FBDG) can inform policies, guide nutrition education, and inform consumers about healthy food choices at all ages and conditions. For all these purposes, FCD are needed on raw, cooked, processed and biodiverse foods.

Although FCD are needed to formulate and implement appropriate food system policies, they are absent for over 99% of the global foods produced and consumed. This should urgently be addressed to effectively and sustainably reduce malnutrition rates worldwide.

Keywords: Food composition, food system, nutrition-sensitive, biodiversity, Nutrient Productivity Scale

NEW PHYTATE DATA COLLECTION: IMPLICATIONS FOR NUTRIENT REFERENCE INTAKES FOR MINERALS, PROGRAMMES AND POLICIES

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In many low-income countries (LICs) staple diets are often plant-based with unrefined cereals, legumes, and oleaginous seeds providing major energy sources. These plant-based foods contain high levels of phytic acid (myo-inositol hexaphosphate, IP6) and its associated Mg, Ca, and K salts -termed phytates, which serve as a storage form of phosphorus and minerals. Phytate is the major inhibitor of iron and zinc absorption, and to a lesser extent calcium, in plant-based diets, forming insoluble complexes in the gastro-intestinal tract that cannot be digested or absorbed because of the absence of intestinal phytase enzyme in humans. The negative effect of phytate on zinc absorption in adults is much greater

than previously estimated, with a minimal ability to adaptively increase zinc absorption from high-phytate diets. FAO/INFOODS in collaboration with the International Zinc Nutrition Consultative Group (IZiNCG) have compiled a new comprehensive global repository of analytical data on the moisture, phytate, and Fe, Zn, Ca content (per 100 g edible portion on a fresh weight basis) of raw and processed plant-based foods. Values for partially dephosphorylated isomers of phytic acid (IP5-IP1) are also included, when available, together with details of analytical methods, biodiversity, origin, and food preparation and processing practices. These data will enable intakes and major food sources of phytate to be calculated from food consumption data in LIC and developed countries. Inclusion of data on dephosphorylated isomers of phytic acid (IP5-IP1) as well as phytic acid (IP6) is important because many plant-based staples in LICs undergo fermentation, germination, or soaking, all practices that can result in enzymatic degradation of phytate to lower inositol phosphates (i.e., IP4-IP1) which have a negligible adverse effect on mineral absorption. For each food, molar ratios of phytate: Fe, Zn, or Ca are also specified, which can provide estimates of the proportion of absorbable zinc or iron from foods and diet types. Diets with phytate-to-zinc molar ratios > 15, between 5 and 15, and < 5 are likely to have poor (~15%), moderate (~30%), or good (~50%) zinc bioavailability, respectively, whereas for iron, much lower molar ratios must be achieved to enhance iron absorption (i.e., phytate-to-iron <1.1). Recently dietary zinc reference values for adults have been set by the European Safety Authority for four dietary phytate levels. Unlike zinc and iron, bioavailability estimates for calcium and magnesium do not take into account dietary phytate:mineral molar ratios and any deficiency is more likely due to a low intake and not low absorption. In contrast, low absorption of iron and zinc from high phytate plant-based complementary diets is a major factor in the etiology of iron and zinc deficiency among infants and young children in LICs. Enhanced absorption of iron and zinc from such complementary diets can be achieved by enzymatic degradation of phytic acid. Implementation of such strategies has the potential to reduce the need for high levels of iron fortificants or supplements and their associated safety concerns in LICs where risk of infection is high.

Keywords: Phytic acid. bioavailability. phytate database. inositol phosphates. phytate-to-mineral molar ratios.

CONVINCING DECISION MAKERS TO INVEST IN HIGH QUALITY FOOD COMPOSITION TABLES NEEDED ALONG THE FOOD SYSTEM

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Adequate nutrition and good health of the population is a major concern of every government. The food system includes the many stages of converting natural resource and human efforts into food involving the production, processing, transport and consumption of food. Food system has also evolved over centuries into immense magnitude and complexities whereby composition of foods produced and consumed by the population vary widely affecting human health profoundly. Capturing precise nutrient intake data is critical for effective implementation of national nutrition policies and programmes. Robustness of dietary assessment by investigators depends on accuracy of database used which, if found lacking would not have the desired impact. The many potential uses of nutrient intake data impose concerns regarding the accuracy of many Food Composition Tables (FCTs) that have been constructed using data that are mostly imputed from other sources. Government expenditure to enhance food, nutrition and health depends on many factors including reliable food composition data that meets strict criteria of accuracy and appropriateness. Thus, food system investment has to be customized specific for high quality FCTs in order to utilize resources judiciously.

Food composition tables derived from exclusive analytical data are expensive to produce and maintain due to the high cost involved in food sampling and analysis of samples. Unless FCTs address important scientific questions of national relevance investment will be hard to come by. Government has the responsibility to improve the nutrition and social well-being and in order to attract investment in FCTs, the outcome should address at improving such issues. The key to attract funding for FCTs lies in challenging existing paradigms by addressing critical barriers in human development where the role of nutrition is paramount. Most food system policies and interventions are not designed with nutrition as the primary objective so the link between food systems and nutrition outcomes is difficult to trace. Nonetheless, government policies play a critical role in influencing agriculture and food system to improve nutrition as in the case of food fortification where food composition form the fundamental basis. However, to attract investment for high quality FCTs, research must align with national nutrition policies and programmes which is an important step to convince the decision makers as in the case of the new Indian FCT 2017, the details of which will be discussed.

Keywords: Investing, Food Composition Tables, IFCT2017,

BENCHMARKING GOVERNMENT POLICIES TO IMPROVE FOOD ENVIRONMENTS GLOBALLY

THE HEALTHY FOOD ENVIRONMENT POLICY INDEX (FOOD-EPI)

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INFORMAS (International Network for Obesity/NCD Research, Monitoring and Action Support) was established in 2012

and is currently measuring and benchmarking food environments and policies in more than 20 countries on all continents. One of the modules is the Food Environments Policy Index (Food-EPI) which seeks to measure progress on the implementation by governments of recommended food policies and infrastructure support systems. The Food-EPI is a participatory, evidence-based approach to measuring the 'implementation gap' compared to international best practice and prioritising actions to better implement food policies. It is being implemented in about a dozen countries which allows for comparative cross-national studies and will be repeated over time within countries. This symposium will present some of the experiences and results of Food-EPI studies in different countries.

Keywords: Food policies, food environments, governments, benchmarking

THE FOOD-EPI IN AUSTRALIA: COMPARING PROGRESS ON IMPROVING THE HEALTHINESS OF FOOD ENVIRONMENTS ACROSS STATES

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Objective: To benchmark current government actions to improve the healthiness of food environments in Australia, and to identify priority policy actions for Federal/State/Territory governments

Methods: The Healthy Food Environment Policy Index (Food-EPI) tool, developed by INFORMAS (International Network for Food and Obesity / non-communicable diseases Research, Monitoring and Action Support) to assess government progress towards good practice in improving the healthiness of food environments, was modified for the Australian context. For each of the 46 indicators in the Food-EPI tool, details of each Australian government's current policies were collected and validated by government officials. Panels of non-government public health experts were convened in each State/Territory (total number of participants = 101) to assess the extent to which current government policies meet international benchmarks. Panel members then prioritised actions for each government, taken into account their relative importance and achievability.

Results: At a national level, level of implementation was assessed as high for some indicators, such as nutrition labelling, regulating health claims on packaged foods, and monitoring of population BMI. However, most indicators received relatively low ratings. State/Territory comparisons revealed several important differences in policy across the country (such as in the area of school food and restrictions of unhealthy food marketing), and helped to identify highly achievable policy actions.

Conclusion: The Food-EPI tool provides a useful set of indicators that can focus attention on where government action is needed. The results of this study can be used to increase accountability

of governments, stimulate government action and support advocacy efforts.

Keywords: Food and nutrition, non-communicable diseases, advocacy

CONSENSUS PRIORITIES BETWEEN EXPERTS AND POLICYMAKERS FOR IMPROVING THE HEALTHINESS OF FOOD ENVIRONMENTS IN THAILAND

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Bringing together diverse groups of stakeholders, including government officials and non-government experts, to make consensus recommendations for government is important to increase awareness, accountability and commitment on policy outcomes and impacts as well as to gain support for implementation of the proposed recommendations. The objective of the study was to conduct a joint meeting between government officials (simply called state actors) and non-government experts (simply called non-state actors), and seek consensus on priority actions to create healthy food environments for obesity and non-communicable disease prevention for Thai Government.

The joint meeting was conducted after completion of assessment of level of implementation of food environment policies and of prioritization of concrete actions for the government by each of the two actor groups using the adapted Healthy Food Environment Policy Index (Food-EPI). The assessment and prioritization results from both groups were key inputs for a discussion on the priority actions in the meeting.

The meeting was facilitated by the research team with the following key steps: (i) the participants were invited to ask questions and request clarification about the study before the discussion started; (ii) the research team presented the prioritization results for both groups; (iii) the participants reviewed the proposed actions, and then had a discussion with the view of reaching consensus on the priority actions; (iv) the participants discussed if any other actions (not previously discussed) should be included as a priority; and (v) the participants approved a set of consensus priority actions for the Thai Government.

Forty-eight state and non-state actors attended the meeting. Eleven consensus actions were selected as top priorities. Four actions focused on food labeling; two were on food provision; and one each was on food composition, food promotion, leadership, monitoring and intelligence, and food trade and investment. The actions included setting standards for food and beverage products provided and sold in schools and child-care centers; promoting provision and sale of healthy foods and drinks in hospitals and other public settings; developing a Thai nutrient profiling system; establishing a marketing framework for foods and beverages, particularly promotional strategies; setting the government's clearly defined goal in limiting intake of salt, sugar and saturated

fat among the Thai population; and developing self-monitoring systems in all educational institutions and other public settings to produce primary health information, such as weight, waist circumference and blood pressure, of their related people and make follow-up actions on update of such information.

The study provided priority recommendations stemming from consensus between state and non-state actors. The process and set of agreed priorities will serve as a platform for helping to drive Thailand's future policy actions, facilitate greater collaboration between different stakeholders operating within and across sectors, and establish a baseline and targets to measure progress in the future. This forms a core part of a broader strategy for accelerating the government and stakeholders to be more responsive and accountable to their citizens.

Keywords: Healthy food environments, priority actions, obesity, non-communicable diseases, state and non-state actors

MAPPING THE EXTENT OF IMPLEMENTATION OF FOOD ENVIRONMENT POLICIES FROM THE PERSPECTIVE OF A LOW-MIDDLE-INCOME COUNTRY-MALAYSIA

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Background and objective: Unhealthy diets are associated with non-communicable diseases (NCDs) and obesity. Efforts to reduce exposure to NCD risk factors through appropriate policy development towards modulating the food environment is now been mooted. This study sets out to benchmark food environment policy (FEP) implementation for the first time in Malaysia.

Methods: The Food-Environment Policy Index tool was adapted to assess data on FEP implementation in Malaysia relating to policies and infrastructure support covering 13 domains with 47 indicators. Evidence evaluation was performed by a panel of 26 independent Experts with ratings performed for policies as per indicator according to international best practice. Policies were shortlisted by Experts for possible improvement of implementation. This process was cross-validated with government stakeholders. A prioritization process was then completed by the Experts to rank policy actions as per 'importance' and 'achievability' criteria.

Results: Experts rated 61.7% indicators as "low" implementation and 38.3% as "medium" implementation (interrater reliability = 0.65, 95%CI 0.56-0.74). Establishment of food-based dietary guidelines (70.4%), population intake targets (64.6%), monitoring nutrition status and intakes (65.8%), monitoring NCDs risk factors and prevalence (65.0%) and ingredient lists and nutrient declaration (61.2%) were the highest scored indicators. In total, 32

proposed FEP actions were prioritized with 5 identified domains. The prioritized policies were to restrict unhealthy food promotion to children, establish food composition targets in selected foods, support mandatory nutrition labelling for sodium and total sugar for package foods and display calorie labelling in fast food outlets with >20 outlets, optimize existing anthropometric monitoring system for providing feedback, and provide population nutrition budget commensurate with population health burden, and fund research related to reduction in obesity and diet-related NCDs.

Conclusions: This is the first benchmarking process performed on FEP implemented in Malaysia. Findings will stimulate strategies to fill gaps in implementation of FEP, thus strengthening advocacy to effectively address the burden of NCDs and obesity.

Keywords: Food environment, policy, nutrition, non-communicable diseases, obesity

THE FOOD ENVIRONMENT POLICY INDEX (FOOD-EPI), IN SOME LATIN AMERICAN COUNTRIES: RESULTS AND PROCESS EVALUATION

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Unhealthy food environments are a major driver of obesity and Non-Communicable Diseases (NCDs). Government actions are essential to prevent these conditions. The international network INFORMAS has developed a monitoring framework, called the Healthy Food Environment Policy Index (Food-EPI), to assess the extent of implementation of government policies and actions for creating healthy food environments, compared to international best practices. This is composed by a set of 42 indicators, divided in two components: 1) policy and 2) infrastructure support. Teams in Mexico (INSP), Guatemala (INCAP) and Chile (INTA) worked together to implement the Food-EPI in Latin America (LATAM) throughout 2016, with support of IDRC (International Development Research Centre). First, we translated and adapted the Food-EPI to the LATAM context. The tool in Spanish was tested in each country. The 42 international indicators, with additional LATAM-specific ones, were included; and evidence of implementation was gathered and validated with government officials for all of them in each country. Some of the LATAM-specific indicators explore: a) access to free drinking water both in public spaces and inside elementary schools; b) policy harmonization, c) regula-

tions on sale and promotion of unhealthy foods inside and around schools; d) governance bodies that look after for policy design, implementation and evaluation; and e) measures to prevent conflict of interest in policymaking.

To assess the indicators, we developed an on-line tool to apply an electronic questionnaire to public health experts using Red-Cap and internal web platforms. Public health experts from academia and civil society were mapped and invited to participate in the electronic assessment. Each country held workshops with the evaluators to discuss the questionnaire results and to prioritize specific actions that could address the identified policy gaps. In the case of Mexico –given the sensitive political context surrounding NCDs prevention and control policies– government officials, legislators and food industry representatives were also assessed; and an additional consensus meeting was held between academia, civil society and government relevant actors.

The most important result of this exercise is that none of the indicators received a global general aggregated score of 'highly implemented'. For the case of Mexico and Guatemala, none of the indicators was rated with a high level of implementation. Some of the challenges of the Food-EPI in LATAM were: 1) to maintain a common set of indicators to allow international comparisons in relevant policy areas, while including new relevant indicators; 2) to find a large group of experts that that could participate, for example, Guatemala still faces under-nutrition and most of the experts alleged having expertise only in this area; 3) to have all the country territories represented in the assessment. The Food-EPI process is useful to identify policy agreements and oppositions. The entire exercise could become a platform for continued policy dialogue towards effective actions to address the burden of NCDs and obesity in LATAM and other developing countries.

Keywords: Food environments, INFORMAS, obesity prevention, health policies, global health

Further collaborators:

OPPORTUNITIES AND CHALLENGES OF BENCHMARKING GOVERNMENT FOOD ENVIRONMENT POLICIES GLOBALLY

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The International Network for Food and Obesity/Non-Communicable Diseases (NCDs), Research, Monitoring and Action Support (INFORMAS) developed the Healthy Food Environment Policy Index (Food-EPI) to measure progress by governments on implementing priority policies to improve the healthiness of food environments compared to international best practice. The Food-EPI is being applied in more than 10 countries globally. National Expert Panels of public health experts, and representatives from medical associations and NGOs rate the extent of implementation of policies on food environments by their governments against international best practice. Their ratings are informed by documented evidence, validated by government officials and international best practice exemplars (benchmarks). In addition, experts propose concrete actions for implementation by their government and prioritize those according to importance and achievability. The aim of this study is to compare the extent of policy implementation on food environments by governments in different regions globally, to evaluate the Food-EPI tool and process and make recommendations for its future use and implementation.

The good practice indicators (19 for the "policy" Food-EPI component and 23 for the "infrastructure support" Food-EPI component) were grouped into "very little, if any", "low", "medium" and "high" implementation and proportions of indicators across those 4 categories were compared among countries. In addition, the Food-EPI score was calculated using weightings for impact of each of the good practice indicators on improving population nutrition as derived from a Delphi process with international food policy experts. Semi-structured interviews were organized with the different country teams applying the Food-EPI to gather insights into the major strengths and limitations of the tool and process.

The Food-EPI dashboard of indicators shows major implementation gaps in different countries globally. Key strengths of the Food-EPI include the comprehensiveness and structure of the tool, the use of evidence in the rating process, the priority setting process, the degree of engagement from experts and policymakers, and the two-way learning process. Some countries involved policymakers very extensively, e.g. policymakers compiled the evidence rather than only verifying it (Australia), or they participated in rather than observing the rating process (Thailand and Mexico). The limitations of the Food-EPI mainly relate to the benchmarks: for some indicators it is hard to find what the benchmarks are (e.g. funding, governance), some benchmarks are low since no countries are doing really well, and for some countries the benchmarks are truly aspirational while in other countries experts argue they are too far away from the ideal. Rating against the benchmarks however is more acceptable for policymakers, and it is anticipated the benchmarks will improve over time, if more countries implement the Food-EPI. The efficiency of the process could be improved as well as the time burden is considerable for people involved.

The Food-EPI allows comparing progress on policy implementation to create healthy food environments among countries and has the potential to increase accountability of governments for implementation of recommended policies. It is anticipated the Food-EPI can be used by many more countries if some of its limitations are addressed.

Keywords: Food environments, policy implementation, accountability, political priority

THE ROLE OF SMALL SCALE AQUACULTURE AND ENHANCED HOMESTEAD FOOD PRODUCTION IN IMPROVING HOUSEHOLD FOOD SECURITY AND NUTRITION

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Background and Objectives: There is scant evidence of the impact of small-scale aquaculture and homestead food production programs in Cambodia. This study evaluated the effect of aquaculture and enhanced homestead food production (EHFP) on maternal and child anemia, child anthropometry, household food security, production, and income in four districts of Prey Veng Province.

Methods: In this 22-month cluster-randomized controlled trial, 900 households were randomized to 1) plant-based EHFP; 2) plant-based EHFP and fishponds (EHFP+F); or 3) control. Household food security (HFIAS), dietary diversity, weight, length/height, hemoglobin, and self-reported estimates of production and income were measured at baseline and at 22 mo. A venous blood sample was collected in a subset (n=450) of women at baseline and endline. Differences in study outcomes between study groups were measured at endline, controlling for baseline values.

Results: We found that EHFP+F households were more likely (OR: 1.73; 95% CI: 1.09, 2.75) to be food-secure compared with control households (p=0.02). We saw significant endline differences in production among EHFP and EHFP+F groups, compared with the control group: EHFP group (mean ratio: 3.04; p<0.001); EHFP-F group (mean ratio: 4.01; p<0.001). There were significant endline differences in income from sales of HFP produce: EHFP

RESEARCH AND SCALING UP NUTRITIONALLY SENSITIVE AGRICULTURAL INNOVATIONS

EMPOWERING WOMEN & WOMEN-HEADED HOUSEHOLDS THROUGH PRODUCTION, NUTRITION EDUCATION AND CONSUMPTION STRATEGIES: LESSONS LEARNED FROM PULSE-BASED NUTRITION SENSITIVE AGRICULTURAL STRATEGIES IN ETHIOPIA

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Undernutrition remains one of the greatest human and economic development challenges, especially in developing countries. One in four children under five years of age suffers from stunting, or chronic undernutrition, which is caused by poor quality and quantity diets, inappropriate care and feeding practices in early life, and high rates of infectious disease. Poor nutrition can result in an inter-generational cycle of undernutrition, since undernourished women are more likely to give birth to children that begin life nutritionally disadvantaged by the age of five years and therefore are more likely to grow into disadvantaged adults. Recent national statistics in Ethiopia indicate a high prevalence of maternal malnutrition (30%) and food insecurity (>50%) especially among women-headed households, and very low women's autonomy and empowerment index scores. Improving nutrition requires a multi-sectoral, multi-disciplinary approach that brings together stakeholders in health, agriculture, nutrition, women's affairs, and education, among others. This talk will examine the impact of an innovative pulse-based nutrition-sensitive agricultural strategy implemented in Southern Ethiopia on empowering thousands of women and women- headed households in decision making through participation in production, nutrition education, and skills training for improved household food consumption and livelihood. It draws on data from several field research projects conducted in six districts of Southern Ethiopia over the last five years (2011-2016). Our studies on pulse-based nutrition education resulted in significant improvements in knowledge and practice scores regarding complementary feeding (p < 0.001), pulse based recipe preparation, and in improvement of the dietary diversity (p = 0.02) and nutritional status of children (p < 0.05). Women's participation in pulse production created an enabling environment for improved decision making and autonomy (p < 0.001). There was opportunity for food preparation skills training, such as household processing of pulses and trying new recipes. Taken together, pulse-based nutrition sensitive agriculture strategies have

group (mean ratio: 1.77; p<0.05); EHFP+F group (mean ratio: 1.58;p<0.001). Across all groups, income was used to buy micronutrient-rich foods such as beef, pork, chicken and fish.

Women in both intervention groups were more likely to have consumed >6 foods groups in the previous 24h, compared to women in the control group (OR: 1.63; 1.01, 2.12; p<0.01; 1.46; 1.01, 212; p=0.01, among EHFP and EHFP-F, respectively). After adjusting for hemoglobinopathies, we found no improvements in anemia prevalence among non-pregnant women and children, or maternal and child anthropometry measures.

Conclusions: EHFP both with and without fishponds improved household production, income, food security and women's dietary diversity, but there was no additional benefit to food security or dietary diversity from the addition of aquaculture to the EHFP intervention. There were no significant improvements observed in hemoglobin, nutrition biomarker concentrations, or anthropometric indices for mothers or children after 22 months.

DIETARY DIVERSITY AND SCALING UP THE PRODUCTION OF IRON AND ZINC-RICH YELLOW POTATOES IN COLOMBIA

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Food insecurity among rural Colombian households is high, reaching 90% in some regions. Almost all farmers from the Colombian-Andean region rely on potatoes as their staple food as well as their main income source. In this presentation, we will discuss an ongoing project in Nariño, a region dependent on potato farming that has high rates of food insecurity, malnutrition, and nutritional deficiencies, particularly iron and zinc. Our aim is to increase the availability of more nutritious potatoes for Colombian consumers through a strategy that integrates agriculture and nutrition. We will introduce three varieties of yellow potatoes with better agronomic properties and higher zinc and iron content compared to potatoes currently being grown.

Potatoes are a staple food for Colombians, therefore the introduction of novel high-mineral potatoes may be part of a sustainable option to combat micronutrient deficiencies when it is part of a diverse and varied diet, such as alongside increased consumption of locally produced fruits and vegetables from home gardens. Although the iron and zinc in the novel potato varieties are not as bioavailable as animal-source foods, Colombian consumers do not always have the economic resources to purchase these foods. If we are successful this may help to meet the nutritional needs of vulnerable communities in the region.

To date, we have conducted a baseline survey and one follow-up survey measuring: the production and consumption of the varieties of yellow potatoes among the families of the project; dietary diversity (dietary diversity score through 24 hour recalls. In

children under 5, we will conduct anthropometric measurements height and biochemical assessment including iron status (hemoglobin, ferritin, transferrin), zinc and vitamin A.

COST-EFFECTIVENESS OF USING SUNFLOWER OIL FORTIFIED WITH VITAMIN A: RESULTS FROM TANZANIA

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This study aims to estimate the cost-effectiveness of fortified unrefined sunflower oil produced by small and medium enterprises (SMEs). Tanzania has high levels of vitamin A deficiency which has negative consequences for morbidity and mortality especially in children under five. Although there is mandatory fortification of edible oils, until recently this has applied only to large-scale producers. However some regions prefer locally-grown and locally milled sunflower oil, and fortified oil currently does not reach many poor and remote households.

We utilize data from a three-year project piloting production of fortified oil by three SMEs in two regions of Tanzania. The data include information from the producers on costs and technology, and information from retailer surveys and from eVouchers regarding sales. Baseline and endline household surveys were conducted for intervention and control areas, which collected socio-demographic and health information from lactating women and their children under five, household oil samples which were tested for retinol content, and finger-prick blood samples from mothers and children for retinol binding protein.

Findings are as follows:

• "Gold standard" technology was used for the pilot, but a lower cost technology would need to be used for scale-up, provided regulatory approval could be obtained.

• SMEs are able to produce oil which maintains vitamin A content up to the point of consumption by households, and SMEs are key to reaching vulnerable households.

We use this information to model the cost-effectiveness of fortification by enterprises of varying scale among the SME sector.

Conclusions:

• Fortification is a key way to improve vitamin A levels for pregnant and lactating women, who are key to the vitamin A status of infants. Safety concerns mean that mega-dose supplements cannot be used for this group.

• Fortification by SMEs can – if implemented appropriately – be a cost-effective intervention.

FORTIFIED COMPLEMENTARY FOODS IN VIETNAM: VALUE CHAINS TO SUPPORT LOCAL WOMEN FARMERS AND ENTREPRENEURS

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The ECOSUN project aims to contribute to reduction of levels of food and nutrition insecurity in three northern Provinces in Vietnam by scaling up local production of fortified complementary food using locally grown crops, and local manufacturing facilities and distribution channels. Our food systems approach aims to enhance agricultural livelihoods of small scale women farmers through their integration into an agricultural value chain and increase availability of fortified complementary foods in Lao Cai, Lai Chau and Ha Giang by establishing Small Scale Food Processing (SSFP) plants. Vietnam's National Institute of Nutrition and their business subsidiary NINFoods developed and field tested fortified complementary foods made from local ingredients, developed partnerships to establish two SSFP plants and recruited and trained small scale women farmers to supply ingredients to the plants. Named after the project's ecosystem approach (ECO) and Vietnam's Little Sun maternal child counselling centres (SUN), the ECOSUN project sites were selected due to the estimated 31% (iron) and 81% (zinc) prevalence of deficiencies among children in the region. An instant rice based complementary porridge fortified with iron (0.9mg/30g) and zinc (0.45mg/30g) was developed for ease of preparation, given time constraints and limited cooking facilities accessible to the target population when their children accompany them to the field for example. Legislation requiring mandatory fortification of wheat flour was recently introduced, signaling acceptance of fortification as a cost effective and sustainable intervention. This presentation focuses on the baseline survey results of over 800 child/caregiver pairs as the first stage of the project impact evaluation. Interviews assessed KAP related to infant feeding practices, gender (Abbreviated Women's Empowerment in Agriculture Index) and standard sociodemographic indicators. Household level food security was assessed using validated HFIAS and Mean Adequate Household Food Provision scales. Nutrition Security was assessed via core IYCF indicators minimum diet diversity, meal frequency and acceptable diet), child anthropometric and hemoglobin (via Hemocue) measures. Data analysis is ongoing at the time of writing of the abstract.

TECHNOLOGY DEVELOPMENT AND SCALING UP FOR DOUBLE FORTIFICATION OF SALT WITH IODINE AND IRON

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Iodine deficiency is the largest cause of preventable developmental problems, while iron deficiency is a major cause of reduced work capacity, reduced immunity, maternal and infant mortality and impaired development in children. Iron deficiency affects some 2 billion people, mostly in the developing world.

Iron and iodine deficiency may be addressed by fortification of a food staple that is universally consumed in quantities essentially independently of economic or social status. Salt is an ideal vehicle for micronutrients, as it is centrally processed, and purchased or bartered by even the poorest rural consumers. Salt is now iodized in most countries, and iodized salt reaches nearly 85% of the world's population, resulting in significant decreases in iodine deficiency disorders.

Since iodine and iron interact, resulting in the loss of iodine and reducing the bioavailability of iron, double fortification requires technology that keeps these micronutrients separated in salt. We developed microencapsulation-based technology for producing an iron premix that can be added to iodized salt, which does not interact with iodine and remains bioavailable for at least one year. The product was tested for efficacy in two large trials in Bangalore and Darjeeling, India confirming its positive impact in improving iron status and reducing anemia and iodine deficiency. The technology was scaled up and applied in a school lunch program in Tamil State benefiting nearly 5 million school children over the past 8 years. A new program to provide double fortified salt to 24 million people in the lowest income quintiles through a subsidized food commodity distribution program in Uttar Pradesh State has been initiated this year. A baseline health and nutrition survey was completed in late 2016, and the impact of the intervention will be measured after 12 months of sustained utilization of the double fortified salt.

This talk will describe the many stages of the scale-up from 100g batches to 600ton lots of double fortified salt, resulting in a proven and feasible means of combating both iodine and iron deficiency with potential for replication across large regions of the world where these deficiencies continue to be significant problems.

FROM SUSTAINABLE FARMS TO BETTER NUTRITION: LINKING COMMITMENTS TO RESEARCH, POLICY AND PRACTICE

WHAT TO DO: FRAMEWORKS AND WAYS FORWARD FOR IMPROVING NUTRITION THROUGH AGRICULTURE AND FOOD SYSTEMS

Garrett, James.

Sr Research Fellow. Bioversity International. Italy

A more holistic focus has led to increased attention to the determinant roles played by agriculture and food systems in achieving healthy diets and improved nutrition. An integrated framework for understanding how agriculture and food systems affect diets and nutrition will be presented, particularly from the perspective of low- and middle-income countries. Impact pathways and key actions to make agriculture and food systems more nutrition sensitive will be highlighted, including specific points of entry along the stages of a value chain (from inputs to consumption) and for the food system overall. This includes special attention to production, transport and transformation, and consumption, as well as the enabling policy and program environment, gender, equity, and environmental sustainability. The issues of capacity, governance, and scaling up will also be noted. The presentation will also build a bridge between research and action, highlighting key emerging questions about choice, design, and implementation of actions to promote agriculture- and food-based approaches to creating more sustainable food systems for healthy diets and improved nutrition.

Keywords: Nutrition-sensitive agriculture, food systems, value chains, Rome-based agencies (RBAs)
Further collaborators:

Charlotte Dufour (FAO), Juliane Friedrich (IFAD), Gina Kennedy (Bioversity), Nancy Aburto and Quinn Marshall (WFP)

HOW TO DO IT BETTER: EVIDENCE AND COMMUNICATIONS FOR HEALTHY DIETS AND SUSTAINABLE AGRICULTURE AND FOOD SYSTEMS

Kennedy, Gina.

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This presentation will highlight what we already know and what we need to know in order for agriculture to contribute more effectively toward healthy diets and sustainable food production systems. The latest evidence on what works – the theory of change, the impact pathways – for how agriculture and sustainable food systems can contribute to improving nutrition will be reviewed. What we currently know about the best actions to take in agriculture and food systems to create diverse, healthy diets in a sustainable way, including areas that may not now be receiving attention,

such as the importance of agrobiodiversity, biofortification, sustainability, systems thinking, and "multi" actions (multi-sectoral, -disciplinary, -actor, -value chains, -SDGs) will be described.

The presentation will also emphasize the importance of evidence-based decision making, including the importance of strengthening monitoring and evaluation (M&E) systems and of closing the gaps between research, policymaking, and operations. It will also describe new and innovative tools and methods that are available to design more effective policies and programs.

The presentation will note where there are remaining information needs and knowledge gaps, such as data on individual and household food consumption patterns and food composition, particularly of local varieties, and appropriate and reliable project-friendly tools and indicators for nutrition-sensitive agriculture. It will also look at how national and international research and data initiatives are addressing these issues, such as the CGIAR's Research Program on Agriculture for Nutrition and Health (A4NH), GIFT, an FAO initiative for open access data on individual dietary assessment, and the RBA Working Group on Sustainable Value Chains for Nutrition. Areas for further research, such those around multisectoral governance, capacity strengthening, food safety, consumer behaviors, food environments, effects of urbanization and food system assessment will also be highlighted.

Keywords: Nutrition-sensitive agriculture, food systems, diets
Further collaborators:
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PROJECT DESIGN, IMPLEMENTATION, AND POLICY ENGAGEMENT FOR NUTRITION-SENSITIVE AGRICULTURE

Friedrich, Juliane.

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An integrated framework for understanding nutrition-sensitive agriculture, and the current evidence base, has been presented in this symposium, but practically how do we make agricultural projects and policies nutrition sensitive?

The presentation will take real-world experiences to highlight what needs to happen on the ground for effective design and implementation of nutrition-sensitive agricultural projects and policies, as well as note key challenges and gaps. It will describe specific potential interventions and enabling frameworks and look at issues of identifying appropriate point of entry, integration of nutrition into agricultural projects (rather than setting up separate stand-alone interventions), appropriate project indicators, working multisectorally, and the need for design and implementation capacities across levels.

The presentation will note the importance of working at both sectoral project and broader policy and institutional levels. Ac-

tions can be taken both to mainstream food security and nutrition in sectoral strategies and investments; and support the contribution of food and agriculture to multi-sectoral nutrition strategies. Attention to the broader policy environment is crucial since most governments allocate funds by sector, so for nutrition to receive adequate financial and operational support, a case for nutrition and agriculture must be made at a supra-sectoral level.

In addition to identification of appropriate actions, attention has to paid to capacities and funding. Without sufficient individual, organizational, and systemic capacities or without sufficient funding even well-designed projects and policies will not work. The role of organizations like the RBAs are critical here: from technical advice and policy support, to logistics, to development of evidence, and finance, these organizations can assist to develop the needed capacities and provide needed knowledge and investment funds. The rise of nutrition as a corporate priority for these organizations, and others such as the World Bank, means that there is an excellent opportunity to increase operational synergies among them on nutrition and action and provide strong, integrated support for country actions to mainstream nutrition in agricultural investments.

Keywords: Nutrition-sensitive agriculture, project design and implementation, multi-sectoral approaches, Rome-based Agencies (RBA)

Further collaborators:

James Garrett (Bioversity), Charlotte Dafour (FAO), Gina Kennedy (Bioversity), Nancy Aburto and Quinn Marshall (WFP)

GETTING IT DONE: FRAMEWORKS, APPROACHES, AND TOOLS FOR NATIONAL CAPACITIES IN AGRICULTURE AND NUTRITION

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Beyond conceptual frameworks, evidence, and field-based guidance for action on making agriculture and food systems more nutrition-sensitive, the RBAs also offer a range of knowledge and operational support to help countries achieve their commitments under ICN2, SUN, and the SDGs. This presentation will highlight the particular contributions of each RBA in the area of nutrition-sensitive agriculture and food systems, how they work together, and what they can offer to countries to support actions at global, regional, and country level.

FAO, for example, provides technical assistance to governments on mainstreaming nutrition in agricultural-related policies and investments (including agriculture, social protection, livestock, forests, and fisheries). IFAD is an international financial institution providing loans and grants primarily for development of smallholder agriculture in low- and middle-income countries, with special attention to climate change, women, youth, and indigenous peoples. WFP is the leading global humanitarian organization fighting hunger, with a focus on emergency assistance, relief and rehabilitation, development assistance and special operations

to build resilience and improve nutrition. Bioversity International is a member of the CGIAR and, along with 6 other institutions, a partner in the CGIAR's Agriculture for Nutrition and Health (A4NH) research program. It is an international research institution delivering scientific evidence, management practices and policy options to use and safeguard agricultural and tree biodiversity to attain sustainable global food and nutrition security. Just as important as the individual organizational mandates are the coordinating mechanisms such as the UNSCN, CFS and SUN, which provide a common platform and discussion space for inter-agency and international exchange of best practices.

These organizations can provide knowledge publications to build awareness of frameworks and design processes (e.g., Guidance for Nutrition-Sensitive Programming, Designing Nutrition-Sensitive Agricultural Investments, Guidance on Design of Nutrition-Sensitive Value Chain Projects, Resource Framework for Home-grown School Feeding, Meals Programme, Cost-Benefit Analysis, Fill the Nutrient Gap, Food-based Dietary Guidelines), project indicators (e.g., Compendium of Indicators for Nutrition-Sensitive Agriculture), and capacity strengthening (e.g., design and use of national food-based dietary guidelines, courses on nutrition education). They disseminate research publications and deliver capacity strengthening activities around critical areas of overlap between agriculture, food systems and nutrition, such as: food systems for healthier diets; biofortification; food safety; policies, programmes and enabling actions; and improving human health (which are also the five flagship research areas of A4NH). They also provide policy support (e.g., through country offices) and finance for agricultural investments (IFAD), knowledge generation (FAO), and operations (WFP) as well as support for country action on SUN.

Keywords: Nutrition-sensitive agriculture, food systems, value chains, Rome-based agencies (RBAs)

Further collaborators:

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THE ROLE OF AGRICULTURE IN IMPROVING NUTRITION IN THE GLOBAL CONTEXT: COMMITMENTS GUIDELINES AND THE ROME-BASED AGENCIES

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This presentation will introduce the Symposium organized by the Rome-based Agencies (RBA's) - the UN Food and Agriculture Organization (FAO), the World Food Programme (WFP), the International Fund for Agricultural Development (IFAD) and the CGIAR center Bioversity International – on the topic "From

Sustainable Farms to Better Nutrition: Linking Commitments to Research, Policy and Practice".

This presentation will describe how, over the past decade, governments and the global development community have increasingly recognized the importance of good nutrition to economic growth and social development, and introduce progress in the global governance for nutrition. The binding commitments that governments have made to eradicate malnutrition through the Second International Conference on Nutrition (ICN2), the Sustainable Development Goals, and the Scaling Up Nutrition Movement, will be presented, along with the UN Decade of Action on Nutrition, which presents a unique opportunity to promote nutrition worldwide as it pushes even more attention to global monitoring of government actions and progress on nutrition. The presentation will also describe the role of the UN Standing Committee for Nutrition (UNSCN) and the World Committee for Food Security (CFS) in supporting member states in making, implementing and reporting on commitments for nutrition will be introduced.

Linkages to other global movements of relevance to food systems and nutrition – such as the ongoing Decade on Biodiversity and the Convention on Biological Diversity, and the Save FOOD initiative – will also be made. The presentation will highlight the implications of such global commitments for country level action.

These commitments require action on agriculture and food systems, an area that governments are often not familiar with and one for which international guidance and national experiences are limited. Countries are rightfully now asking: "We've made commitments on nutrition, what do we actually need to do to fulfill them?" and "Agriculture and food systems may play roles in improving nutrition. But what are they, and what do we need to do?"

The presentation will highlight why attention to agriculture and food systems is essential to improving nutrition in today's world (and commonalities between issues in low-, middle- and high-income countries), and introduce the other presentations in the Symposium, which will describe the support that the Rome-based agencies (RBAs) can provide to help countries close the gap between commitment and action, and successfully achieve their pledged goals. The presenters will share concrete frameworks, evidence, approaches and tools that have been developed by the RBAs and others to catalyse and promote evidence-based action by governments and other stakeholders in this area, in order to fulfil those international commitments and end hunger, achieve food security and improved nutrition, and promote sustainable agriculture.

Keywords: Nutrition-sensitive agriculture, food systems, nutrition governance, political commitment, Rome-based agencies (RBAs)

FOOD AID RESEARCH: UPDATE ON FOOD AID FOR PREVENTING AND TREATING UNDERNUTRITION

FOOD AID RESEARCH: UPDATE ON FOOD AID FOR PREVENTING AND TREATING UNDERNUTRITION

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There is a current discussion if dairy protein is needed in food products for preventing and treating moderate and severe acute malnutrition (MAM, SAM), because it is an expensive ingredient. A WHO technical note (2012) on supplementary foods for the management of MAM in children 6-59mo recommends that the protein source has a PDCAAS >70%, corresponding to optimized cereal/legume mixtures, milk and animal proteins. A footnote mentions that milk powder improves the amino acid profile and bioavailability of calcium and potassium, has stimulating effect on IGF-1 and linear growth and contains no anti-nutrients. WFP (2016) specifies that at least 1/3 of the protein should come from milk powder in ready-to-use-supplemental-foods (RUSF) and lipid-based nutrient supplements, medium quantity (LNS-MQ). For ready-to-use-therapeutic-foods (RUTF) USAID (2015) specifies that at least 50% of protein must come from dairy, from either milk powder or whey protein concentrate (WPC). Specifications for fortified blended foods (FBF) also include milk protein. FBF specifications from WFP (2015) for Super Cereal plus is that 8%w/w should be dried skimmed milk (DSM). USAID (2011) specifies that 3% w/w of WPC80 is added to CSB14. DSM and WPC34 have a high content of lactose (~50%w/w) which potentially has prebiotic effects and positive effects on growth (Grenov et al, FNB 2016). Other dairy products (WPC80 and WPI) have considerably lower lactose content (10 and 1 % w/w, respectively).

Recent intervention studies have examined the effect of dairy in treatment of MAM and SAM. In a study in Malawi and Mozambique, 6-59 mo old children with MAM were randomized to a RUSF with soy or a combination of whey protein and permeate. The RUSF with dairy resulted in higher recovery and improved growth (Stobaugh et al. AJCN 2016). In a noninferiority study in Congo children with SAM aged 6-23 and 24-59mo were randomized to a RUTF with soy-maize-sorghum (SMS-RUTF) or with peanut and DSM. In children ≤23mo the recovery rate of SMS-RUTF was inferior, but it was concluded that in children ≥24mo SMS-RUTF can be used to treat SAM (Bahwere et al. 2016).

We examined the effect of different amounts of DSM in a randomized intervention study among 1609 children 6-23mo old with MAM in Burkina Faso. It was a 2x2x3 factorial design where we assessed the effectiveness of a) matrix, ie LNS vscorn-soy blend,

b) soy quality, ie dehulled soy vs soy isolate, and c) level of dry skimmed milk, ie 50 and 20% vs 0% of protein. The primary outcome was fat-free tissue accretion over a 12 week intervention, measured by deuterium dilution. Secondary outcomes included recovery rates and other anthropometric measures. The results will be presented at the meeting.

The effects of dairy on recovery and weight gain are important outcomes, but examining the effects on body composition and long-term effects on growth, development and health of using dairy in prevention and treatment of MAM and SAM should also be examined.

Keywords: Dairy, protein, acute malnutrition, food aid

RATIONALE AND EVIDENCE REGARDING SMALL-QUANTITY LIPID-BASED NUTRIENT SUPPLEMENTS FOR FOOD ASSISTANCE

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Lipid-based nutrient supplements (LNS) are a family of fortified, lipid-based products that deliver vitamins and minerals, essential fatty acids, protein and energy in a lipid matrix. The low moisture content of LNS ensures resistance to spoilage. Large- and medium-quantity LNS are being used to treat and prevent acute malnutrition. Small-quantity products (SQ-LNS, < 20 g/d, ~110-120 kcal/d) have been developed to complement the diet with key nutrients for infants and young children, and for pregnant and lactating women, with the goal of preventing undernutrition. They typically include 22 micronutrients, in addition to essential fatty acids and a small amount of high quality protein. In food assistance programs, SQ-LNS have several potential advantages. Because the quantity is small and the product is ready-to-eat by itself or mixed with other foods, the entire intended daily ration is easily consumed even by infants, ensuring that the micronutrient needs of these vulnerable target groups will be met each day. The small quantity also minimizes transport and storage costs and reduces the likelihood of sharing of the supplement with others, by comparison to larger-quantity food assistance products such as cereal-legume blends. When necessary (e.g. widespread food insecurity), provision of SQ-LNS for these target groups can be coupled with provision of staple foods or cash transfers for the entire household. Several efficacy and effectiveness trials have been conducted with SQ-LNS. Taken as a whole, the evidence suggests that prenatal SQ-LNS supplementation promotes fetal growth, and SQ-LNS for the mother and/or young child can promote child growth and development and reduce anemia, though there is heterogeneity in these effects both within and across study populations. In some settings, a growth response appears to be constrained by certain contextual factors such as frequent infections. Further research would be valuable to evaluate the effectiveness of

SQ-LNS within food assistance programs in different contexts (including acceptance, utilization and cost-effectiveness), and when integrated with other strategies to reduce infections and promote child development.

Keywords: Lipid-based nutrient supplements; infants; pregnant women; malnutrition; child growth

SCALING-UP ACCESS TO NUTRITIOUS COMPLEMENTS TO YOUNG CHILDREN'S DIETS FOR FOOD ASSISTANCE AND BEYOND

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Intake of essential nutrients, including vitamins, minerals, essential amino acids and essential fatty acids is often below required levels among populations that receive food assistance as well as among other populations whose diet has limited diversity due to availability and affordability constraints. For young children (6-23 months of age), special nutrient-rich commodities that can complement their diet of breastmilk and complementary foods are a good way to introduce them to the family diet and local foods, and at the same time ensure that their needs for essential nutrients are met. Different options for enriching the young child's diet are being developed and tested for acceptability, stability, cost as well as nutrient bioavailability and impact of its consumption on nutritional status and functional outcomes. Such options include small-quantity LNS, special fortified blended foods (also known as infant cereals), micronutrient powder and other fortified complements in powder form that contain micronutrients, high-quality protein and some essential fatty acids. Food assistance can provide access to these types of products in different ways, including in-kind distribution where the product is handed out at a specific distribution point or by a designated person (health care center, food aid distribution site, community health worker); by providing a commodity-specific voucher that can be redeemed at a distribution point, i.e. the voucher can be provided through the health center while a site that handles foods, including stores, can provide the commodity; or indirectly by providing cash or e-card together with promotion activities to stimulate purchasing of specific commodities, which hence need to be available in the area and liked by the consumer. For a sustainable supply chain to develop, there needs to be sustainable demand, which can be from both self-purchasing consumers and the public sector, whether the government, UN agencies or NGOs. This requires that the products meet a need from the consumers, i.e. they like the product and are prepared to pay for it, using their resources, including cash but also opportunity costs, i.e. the effort they have to put into obtaining, also a free, product. The use of vouchers can be considered in developing markets where manufacturers are putting different potentially suitable products on the market to meet a (growing) demand from different groups of consumers. Monitoring these initiatives for product take-up (acceptance), utilization, and impact on young children's diets and nutrient intake will be very important.

COST-EFFECTIVENESS: WHAT HAVE WE LEARNED?

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Prevention and treatment of childhood undernutrition in LMICs typically relies on supplementary foods given in quantities calibrated to the needs of the target child. Foods used in supplementary feeding programs (SFPs) include fortified blended flours (FBF), prepared as porridge often with vegetable oil, multiple micronutrient powders (MNP) added to children's food, or lipid-based ready-to-use supplementary food (RUSF), consumed directly from individual single-dose packets. Controlled trials have assessed the efficacy of such foods, but their effectiveness depends on their programmatic context. Proper preparation and feeding to the target child per protocol determine effectiveness, beyond the composition of the food.

In the context of SFPs, cost-effectiveness (CE) is the cost of achieving the desired nutritional or health outcome. CE can vary widely depending on the outcome. CE depends on the cost of the daily ration, but also on the number of doses required to achieve the outcome and the amount needed for a sufficient quantity to reach the target child. Other program costs that affect CE include transportation, storage, distribution, and the losses incurred at each stage. Packaging affects shelf life and resistance to infestation and contamination; appropriate packaging can also affect the time required, and therefore staff cost, of distribution. As behavior change communication affects correct preparation and feeding, the planning, labor, and other costs of delivering it, are part of the CE calculation; indeed, program costs can be larger than product costs. Costs include the value of resources provided without charge: volunteer labor and (importantly) caregiver time.

Current FAQR studies in Burkina Faso and Sierra Leone assess the CE of four supplementary foods to treat wasting (Sierra Leone) or prevent wasting and stunting (Burkina Faso). The foods are three FBFs and one RUSF. Two of the FBFs require preparation with added oil; two (including one that does not require added oil) contain a dairy component; the RUSF contains dairy, and has high lipid density, comparable to the FBF if prepared with added oil in the recommended ratio of 30 g oil: 100 g FBF. In Burkina Faso, children received a food supplement from ages 6 – 23 months; CE was measured in terms of the percentage of children treated with each food who were not stunted by 24 months of age, and who experienced no episodes of wasting during the treatment period. In Sierra Leone, the primary outcome is recovery from MAM, but lean mass accretion and neurological performance are additional outcomes. Costs include the cost of the food and all programmatic costs.

CE requires investment in data collection and analysis, but is essential to decision-making about the most appropriate foods to include in SFPs and the most efficient way to deliver them. One food may be more effective, but less cost-effective; in the face of limited program resources, the more cost-effective product will allow successful treatment of more children. More broadly, CE gives a concrete basis for choosing cost-effective investments in health and nutrition.

COST-EFFECTIVENESS: HOW CAN WE USE WHAT WE KNOW?

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Background: At a time when the world's nutrition care is moving toward accountable care, cost-effectiveness in food aid research offers an innovative approach to reducing cost and increasing quality of nutrition intervention. It empowers practitioners to prevent and treat undernutrition by informing both the cost and outcomes of nutrition interventions. It also provides evidence by comparative evaluation of the costs and consequences of using different food aid products to prevent and treat undernutrition.

Objective: The aim of this presentation is to review implications of findings from cost-effectiveness studies in food aid research for impactful nutrition practice.

Methods: The presentation provides: (1) application of the main concepts and key steps in integrating cost-effectiveness re-

search with practice, and (2) a summary of the lessons learned about interventions inspired by findings from cost-effectiveness in food aid research to evaluate nutrition interventions compared to current practice.

Discussion: Empirical research from cost-effectiveness on food aid suggests that linking programmatic costs with effectiveness outcomes are critical to influencing the impact of nutrition interventions. Different factors influence this link, including: determining cost of items, characteristics of beneficiaries, food system environment; food aid mechanism and amount; and approaches to handling cost and addressing administrative, operational, and contextual complexity. Experiences show that results of cost-effectiveness food aid evaluations influence resource allocation decisions, support advocacy efforts, improve policy design, highlight partner and community contributions, inform programmatic evaluation and learning, improve the quality and efficiency of delivering nutrition care, and estimate future nutrition care expenses.

Conclusion: Cost-effectiveness research impose both a systemic challenge and a growing opportunity to encourage global action on reducing malnutrition and realizing a world of zero hunger by 2030. Efforts to draw on lessons learned from cost-effectiveness food aid research suggest a set of practice options that are paramount to guiding practitioners and informing the global practice and policy debate with considerations to the underlying determinants of food and nutrition, strategic and operational context, cross-cultural adaptation, and gender-responsiveness. Advances in cost-effectiveness methodology, expanding use of technology for data collection and utilization, partnership coordination, and addressing socioeconomic, cultural, and institutional factors are needed, in addition to greater systematic integration of cost-effectiveness approaches into mainstream programming to affect nutrition and population health response.

Keywords: Cost-effectiveness, food aid, practice implication, nutrition care, response

Conflict of Interest disclosure: Since June 2016, I have assumed several positions within Action Against Hunger. I currently coordinate strategic nutrition policy efforts for Action Against Hunger in Lebanon.

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POTENTIAL OF MONITORING FOOD ENVIRONMENTS FOR IMPROVING ACCOUNTABILITY AND POLICY

USES OF FOOD ENVIRONMENT DATA FOR POLICYMAKING: OVERVIEW OF CASE STUDIES FROM CANADA

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Monitoring the food environment over time is essential for informed policy-making. Data that examines a number of aspects related to the quality of the food environment serve several purposes throughout the policymaking process: it provides policymakers with evidence regarding the need for development of new policies to address gaps; needed updates to existing policies; and can be used to help shape and evaluate a number of different policy options to address the above. Finally, information on the food environment is essential in policy implementation, whether it be through education, guidelines or regulations, as it can help inform the potential effectiveness of proposed policies that are under consideration by governments, and then can help to evaluate the effectiveness of large-scale policies on influencing the quality of the food environment after they have been rolled out. Examples will be provided from the Canadian context on how food environment data has been used by government officials to inform policy decisions in Canada, and by researchers and NGOs to help shape the policy agenda. Examples include information on the nutritional quality of the packaged foods before and after voluntary sodium and trans fat reduction targets, modelling the proposed benefits of including information on added sugars to the Nutrition Facts table, the impact of provincial menu labelling legislation on the quality of restaurant foods before and after implementation, and the potential efficacy of proposed nutrient profiling systems for front-of-package labelling regulations and and for restricting marketing to children, among others. These case studies provide examples of the important role of collaboration between food environment researchers, NGOs and policy makers to understand the food environment and interpret the implications of policy on it, and highlight the importance of collecting historical data to track changes over time.

Keywords: Food environment, monitoring, food policy,

GLOBAL BENCHMARKING OF THE COMPOSITION OF FOOD PRODUCTS

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Background: Non-communicable diseases now account for more than 60% of total deaths globally. Governments from a number of countries are now calling for population-wide preventive measures based upon an improved food supply. Improvements will only be achieved if there are definitive data describing the food supply and how it can be improved. A number of nutrient profiling schemes exist which aim to determine the healthiness of packaged food products. The Health Star Rating is one such system which assigns a product a value between 0.5 and 5.0 stars, in half star increments, with a higher number of stars indicating a healthier product.

Objective: Our primary objective will be to compare the overall healthiness of packaged foods in supermarkets across a range of countries using the Health Star Rating system. Secondary objective will be to examine the levels of energy, saturated fat, total sugars and sodium per 100g of product.

Methods: Nutrient content data will be obtained for a sample of 10 countries currently involved in the INFORMAS network for

which existing data are available. A range of high, middle and low income countries will be included. Products will be categorised into 18 major food categories developed by the Food Monitoring Group. For our primary objective, the Health Star Rating will be calculated for all eligible food and beverage products. For our secondary objective, means (SD) levels of energy, saturated fat, total sugars and sodium per 100g will be calculated. If the data are found to be skewed, the median and range will be reported. Differences between countries will be examined.

Results: The data used for each country analysis will be summarized. The mean Health Star Rating for foods in each country overall and in each major food category will be reported and compared. Countries will be ranked by mean Health Star Rating and by mean levels of each nutrient. Examples of how the data have been used by government to inform policy development, as well as by industry to inform internal product reformulation will also be presented.

Conclusions: With processed foods playing a central causative role in diet-related disease burden, understanding differences in the global food supply is central to the prevention effort. Standardised data that can be collected in the same way over time and across jurisdictions can support this goal. Outputs can be tailored to support food manufacturers, retailers, government and consumers in a diverse range of strategies targeting improvements in the world's food supply. Data can also be used to prepare media releases that highlight the issue to the population at large.

Keywords: Food labels; processed foods; public health nutrition; nutrient profiling, diet related disease, food supply

Conflict of Interest disclosure: ED and BN have no conflicts of interest.

Further collaborators:
INFORMAS

BENCHMARKING FOOD ADVERTISING ON TELEVISION AMONG COUNTRIES GLOBALLY

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Children's exposure to unhealthy food promotions contributes to poor diets and has been identified as a global priority issue for obesity and non-communicable disease prevention. Monitoring of unhealthy food promotions is necessary to: identify the extent of children's exposure and the need for policy interventions; inform the basis of policy specifications, such as marketing media and techniques that are restricted; and, over time and across places, to evaluate the impact of policy interventions on reducing children's exposure to this marketing and its persuasive power. This study aims to compare the extent and nature of unhealthy food and non-alcoholic beverage advertising to children on television

across countries and/or regions with different types and strengths of regulations in place.

A literature review was undertaken to identify studies that had captured data on children's exposure to television food advertising. Corresponding authors were contacted and asked if they would be willing to contribute their data for a global comparison of food advertising to children. Researchers were required to reclassify information on advertised foods according to the World Health Organization European Nutrient Profile Model. All included datasets needed to include information on the hours during which the adverts occurred, to enable estimates of the frequency of advertising per hour. Sample days (weekdays/weekends) were weighted to give mean advertising frequencies. Researchers who were also known to have collected data on television food advertising using the INFORMAS protocol (but had not yet published their data) were also approached. A review of included countries' food marketing policies was undertaken to compare food advertising rates by policy types.

Around 15 research groups, spanning countries from Australasia, Europe, North America, and South America agreed to contribute television advertising data. Mean frequencies of food and unhealthy food advertising (per hour/per channel) will be described across countries and regions. Rates will be analysed according to peak viewing times of children, during regulated hours and during popular children's programs. For a subset of countries were data are available, the 'persuasive power' of food promotion will be determined, including the use of promotional characters and premium offers. Finally, the 'impact' (no. ads per timeslot x no. children watching) of unhealthy food advertising to children will be determined, including how this impact could be reduced through different policy scenarios.

This global comparison of children's exposures to television food promotions highlights the potential of INFORMAS for benchmarking food environments across countries and regions, and for evaluating the potential for policy actions in reducing children's exposure to unhealthy television food advertising.

Keywords: Marketing, Advertising, Child, Food, Beverage

IMPLEMENTATION OF THE ADVERTISING AND LABELLING LAW IN CHILE: EARLY RESULTS OF IMPACT ON FOOD REFORMULATION

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Background and objectives: In 2012 Chile passed the Law of Food Labeling and Advertising (Law 20.606). The law specifies limits for solids (per 100g) and liquids (per 100ml) for critical nutrients (sodium, sugars, and saturated fats) and energy; applying only to products with added sodium, sugars and/or saturated fat. A product can have up to four "High in" front-of-pack warning la-

bels, one for each critical nutrient and calories. The study objective was to evaluate potential anticipatory changes ahead of the implementation of this law in June 2016 by examining food composition changes. Specifically, if food product reformulation occurred regarding selected nutrients between early 2015 and early 2016.

Methods: The INFORMAS framework for monitoring the composition of the food supply was used. In February 2015 and 2016, fieldworkers photographed a representative sample of packaged food products (n=5421 and n=5479) from 6 different supermarkets in Santiago, Chile. Foods were excluded if they required reconstitution, had missing information or if total labeled energy was estimated as incorrect. To study reformulation, only the food products collected in both data collection rounds were included in the analysis (n=2,428). Foods were grouped into 17 categories, consisting of 141 subcategories. The average change in energy and each critical nutrient was estimated for each food category averaging the change of each product; the food subcategories with the largest decreases between 2015 and 2016 were identified. Finally, foods were classified based on whether they would receive a "High in" Calories, Sodium, Sugars and/or Saturated Fats warning (solids/liquids: >350/100 kcal; >800/100 mg sodium; >22.5/6 g total sugars; >6/3 g saturated fats) and prevalence compared between 2015 and 2016.

Results: Between 2015 and 2016, 12 of the 17 (70%) food categories had overall reductions in calories (kcal) and sodium, 11 food categories experienced declines in average total sugar levels, while only two food categories (cereal-based products and salty snacks) experienced a decline in average saturated fat levels. The greatest declines in critical nutrient levels observed were with respect to sodium levels; especially, in the subcategories of instant rice (-192.4 mg/100 g) and frozen marinated fish (-164 mg/100 g). The largest reductions regarding energy and the other critical nutrients were: instant rice (-35.7 kcal / 100 g), pastry icing (-3 g sugars / 100 g) and hamburger buns (-.5 g saturated fats / 100 g). These overall reductions illustrate a low impact in terms of the new labeling as the prevalence of "High in" food products declined >1% in less than half of the food categories ("High in saturated fats" in 6 food categories, "High in sugars" (n=4), "High in sodium" (n=3) and "High in calories" (n=1)).

Conclusions: From 2015 to 2016, modest changes in food product reformulation were observed prior the implementation of the regulation. It is uncertain whether the notable reductions in sodium levels can be attributed to law 20.606 or overall global trends in sodium reduction. Data collected after the implementation of the law will serve to assess the actual impact of the new regulatory norms.

Keywords: Reformulation, INFORMAS, critical nutrients, food environment, Chile

UNHEALTHY FOOD ENVIRONMENTS IN GUATEMALA AND COSTA RICA. ARE REGULATIONS NEEDED?

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Background and objectives: The Central American region is facing the nutrition transition and excess body weight and diet-related non-communicable diseases –NCD´s are highly prevalent. An unhealthy food environment –FE- is considered the prevailing driver of population unhealthy weight gain. Our objective was to measure the healthiness of the FE in Guatemala and Costa Rica, using standardized methodology from the International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support (INFORMAS) on Food Composition (FC), Food Labelling (FL), Food promotion on TV (FP), and the extent of implementation of FE policies through the Healthy Food Environment Policy Index (Food-Epi).

Methods: For FC and FL, we extracted levels of critical nutrients, persuasive marketing techniques (PMT) and health and nutritional claims (HNC), from pictures of foods products sold in the major supermarkets in Guatemala City (n=3459) and San Jose (n=2469). FP was analyzed recording TV advertising in cable and national channels with the highest child audience during 864 hours in Guatemala and 576 hours in Costa Rica (weekends and weekdays). Food products were classified using the WHO nutrient profile (European system) to indicate whether they were marketing permitted or not-permitted. The Food-Epi was calculated with the perception of non-government experts, on the level of implementation of food policies, and priority actions were identified.

Results: In Guatemala and Costa Rica, FC and FL measures revealed that products with an excess of critical nutrients use PMT, HNC and poor labelling practices. FP measures revealed that TV advertising of food products with marketing restrictions, according with WHO nutrient profile, is higher compared with those with a healthier nutrient profile (p<0.05). In Guatemala, the Food-Epi index revealed low implementation of food policies by the government to prevent obesity and NCD´s.

Conclusions: Guatemala and Costa Rica have an unhealthy FE characterized by persuasive marketing and availability of energy-dense low-nutrient food products targeted to children. In Guatemala, current actions from the public sector are not tackling unhealthy FE. National regulatory actions such as a front-of-pack food labelling system and the limitation of child-oriented promotion are needed in order to prevent childhood obesity and NCD´s.

PS_144/1009

HEALTHY CONSUMPTION PATTERNS AND SUSTAINABLE PRODUCTION: EXPLORING THE LINKS BETWEEN AGRICULTURE, DIET AND LIFESTYLE USING ORGANIC AS AN EXAMPLE

THE ORGANIC FOOD SYSTEM AS A MODEL LINKS AGRICULTURE, DIET AND LIFESTYLE – PRESENTING THE CASE

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Today's understanding of food systems includes product-specific values (e.g. palatability, taste, nutritional and safety values, health promotion) and process-oriented values (e.g. environmental impact, animal welfare and social fairness). These values are currently challenged and changing. Food habits, cultural, social, ethical, economic and political criteria play an increasingly important role as values. Dietary patterns are becoming more Westernized worldwide. This has tremendous impact on food consumption, the environment, society and individual human as well as public health. The socio-cultural context of food consumption and production has been recognized as an essential part of a sustainable food system. A sustainable food system comprises agriculture, environment, nutrition and human health. Indeed, it has been suggested that food systems as well as diets or dietary patterns should be assessed in all different dimensions of sustainability including impacts on health (nutrition). The central questions can be described as: how can we transform the whole food system to be more sustainable by a combination of sustainable consumption and sustainable production. For understanding, measuring and improving a system approach in food and nutrition research is required. This includes the description of the system boundaries, the actors and activities on different levels and scales. One crucial question is how to link measurable parameters to system scales

or dimensions. Furthermore models are needed for conceptualization and simulation. The organic food system offers such an example of successfully combining sustainable food production and sustainable consumption patterns within one system. Based on central findings through surveys and other studies around the world, consumers and producers of organic products share specific attitudes to food that are mainly oriented towards health and environment. Drivers of system transformation process towards enhanced sustainability including better nutrition needs to be identified and evaluated as well as translated into tools that enhance and reinforce the necessary changes in lifestyle. Another requirement for a system approach is interdisciplinary working, taking natural and social science perspectives together. The presentation will contribute with conceptualize the food system approach, taking organic food system as a model as well as present examples from different entry point of food systems. Furthermore future research challenges in taking a system approach in food and nutrition science will be discussed.

Keywords: Food system approach, sustainability, organic food systems

Further collaborators:

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PUBLIC PROCUREMENT AS A MEANS TO LINK SUSTAINABLE PRODUCTION WITH DIET AND LIFESTYLE – THE NEW NORDIC DIET WAY

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The Danish Government has made a goal about doubling the agricultural area used for organic production in 2020 compared to 2007. Therefore the government supports a number of initiatives which increases the production, export and consumption of more organic products. One of these initiatives is the transition from conventional products to organic products in public procurement in Denmark.

The municipality of Copenhagen decided in 2001 that by 2011 75% of food served by public kitchens should be from organic production. In 2007 the goal was raised to 90%. The aim of this presentation is to show how transformation to organic produce without increasing costs can change diets to more healthy and sustainable diets.

Governmental support of organic agriculture, mandatory change from conventional food products to organic food products in public food service in the Municipality of Copenhagen without increasing the costs. Designation of Københavns Madhus to be the driving force behind the transition supporting the public kitchens with knowledge, motivation, education, ideas etc to make the changes.

Today that goal that 90% of public meals should be made from organic produce has been reached. Not only because it was a political decision, but also because the staff in the public kitchens have

replaced whole and semi-finished products with seasonal produce and have limited waste. The transition has been done without increasing costs. This has resulted in kitchens using more seasonal produce and more vegetables, legumes and fruits and less meat.

Mandatory change to organic food, without increasing cost, results in changes towards more healthy diets. The Copenhagen model is exported to other municipalities in Denmark, but it still remains to be shown that the transition to organic produce also transfers to people not dependent on public food service and if the transition has health promoting effects in the Danish population.

Keywords: Sustainability, organic food, public procurement
Further collaborators:
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SUSTAINABILITY IN DIETARY PATTERNS ACCOUNTING FOR FARMING PRACTICES: FINDINGS FROM THE BIONUTRINET PROJECT

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Sustainable food market is developing and consumers' growing concerns for food quality is more and more prominent. However, little is known about the potential sustainability of the organic diet at the individual level. The aim of the study was to address the sustainability, using numerous indicators, of individual diets according to contribution of organic food to the diet.

Conventional and organic food intakes of 29,210 French adults included in the NutriNet-Santé cohort were assessed using an organic food frequency questionnaire. Weighted (on French census data) quintiles of the contribution of organic food to the diet were calculated.

Quality of the diet was estimated using two indexes (mPNNS-GS andPANDiet) evaluating the adherence to food-based and nutritional guidelines.

Daily dietary GHGEs (expressed in kgCO2eq/year) and energy uses (at production level) of the diet were computed, taking into account farming practices (organic or conventional production) using mostly data from the Dialecte database.

Diet costs were also calculated accounting for food consumption, mode of production and place of purchase.

Adjusted means were compared between weighted quintiles (Q) of contribution of organic food, using ANCOVA models. For environmental impact, scenarios (100% organic and 100% conventional) were computed to disentangle the effect of organic diet from those of composition of the diet.

In our sample, 20% of participants were never or little consumers of organic food while 20% consumed at least 50% of their diet in the organic form.

High organic consumers were more often women (Q5 versus Q1: 55.3 versus 45.1%), highly educated (Q5 versus Q1: 30.9 versus 15.6% postgraduate), and living more often in rural area (Q5 versus Q1: 29.62 versus 22.86%).

They exhibited healthier lifestyle (no smoking, low alcohol consumption, elevated physical activity) and high consumption of plant food. Plant to animal protein ratio was 13.42 in the Q5 and 0.46 in the Q1. Energy intake was 2,125 and 2,040 Kcal/d in the Q5 and Q1 respectively. Heme iron intake was 1.02 and 1.91 mg/d in the Q5 and Q1 respectively.

After adjustment for age, energy intake and sex mean mPNNS-GS (/13.5) and mean PANDiet (/100) were 8.83 and 69.18 in the Q5 and 7.80 and 62.52 in the Q1.

Diet cost (euro/d) was 8.79 in the Q5 and 7 in the Q1.

A decrease in GHGe was observed across quintiles with 1,158 in Q5 versus 1,850 kg CO2eq/year in Q1. Similar findings were observed for Primary energy consumption (Q5 versus Q1: 5,359 vs 7,202 MJ/year).

Model scenarios revealed that for GHGe, the structure of the diet was mostly responsible for the observed association; whereas for primary energy consumption, mode of production was also an important lever.

Using observational data, our study provides new arguments concerning the potential of organic diet to contribute to sustainable diets, in particular through the modification of the diet composition.

Our results highlight the importance of promoting holistic changes in dietary patterns to meet future environmental challenges, including the mitigation of global warming.

Keywords: Climate change, Dietary pattern, greenhouse gas emissions, organic food
Further collaborators:
Julia Baudry, Louise Seconda, Pilar Galan, Serge Hercberg, Benjamin Allès, Philippe Pointereau, Brigitte Langevin, Marie-Josèphe Amiot, Jean-Pierre Cravedi, Laurent Debrauwer, Rodolphe Vidal, Bruno Taupier-Letage, Louis Georges Soler, Denis Lairon

LINKING A FOOD SYSTEM WITH PUBLIC HEALTH NUTRITION: WHAT DO WE LEARN FROM ORGANIC?

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Background and objectives: Organic food and farming can be described as a food system and it can be studied as such due to its legally defined production and processing methods, as well as the ability to follow organic products from farm to fork via independently audited labelling schemes in more than 80 countries worldwide. The aim of this study is to examine for any evidence of effects of the organic food system on public health nutrition. Methods: Linkages between organic agriculture, food, nutrition, and public health overall and in particular settings were explored

in literature. Results: Organic increasingly plays a role in public policy: Many countries or regions have subsidy schemes for organic agriculture for differing reasons and some of these integrate organic food products into (sustainable) public procurement goals. In particular, organic foods have been included in school meal systems. Studies in Europe show that schools with a healthy-food policy also support organic food; alternatively, an organic school policy can promote healthy eating. Consumer studies show that organic is believed to be healthier for humans and better for the environment, also providing the reasons for its selection. Recently it has been shown in national nutrition surveys that regular consumers of organic products make healthier and more sustainable food choices, including choosing a more plant-based diet. Field observations from foodservice consultancy suggest a similar pattern for so-called large-scale consumers. Here, too, buying and using organic foodstuffs seems to be associated with better diet and better knowledge of foods. On the production side, promoting health at various levels, from the individual to communities, is considered one of four central principles of organic agriculture (health, ecology, fairness, care). It aims to produce high quality, nutritious food that contributes to preventive health care and well-being. The organic process has significant impacts on the quality of organic foods compared to non-organic foods. At the same time some developed organic markets may be showing a product range increase in processed foods above other categories. In this connection the limitations on product formulation and applied processing technologies given by organic frameworks need further study. Conclusions: The nexus between public procurement, public diet and public health nutrition can be studied within the frame of organic food systems in varying geo-socio-cultural regions worldwide. Further studies are needed to validate or counter initial findings.

Keywords: Organic food system, public diet, organic processing, school meals, public procurement

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PS_144/144

SWEETENERS: ADVANTAGES AND APPLICATIONS IN THE 21ST CENTURY

SWEETENERS AND NEW FLAVORS

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World Health Organization (WHO) recomends no more than 10% of daily calories from added sugars or "free sugars" like syrup, honey or juices. Excesive consumption is linked to cardiometabolic diseases and certain cancers. However, desirable taste for sweet flavors is innate. Health recommendations limit the use of caloric sweeteners as sucrose, high fructose corn syrup (HFCS), molasses, honey, agave nectar, maple syrup or brown rice syrup.

However perception of consummers of them as "healthy or unhealthy" is not uniform and can be deceiving when one of them is viewed as more "natural" in its source. This idea can produce overconsumption.

HFCS obtained through enzymatic processing of corn syrup to increase the fructose content increase its sweetness, being the main caloric sweetener in the soft drink industry. There is debate concerning whether HFCS presents greater risks than the other sugars concerning metabolic disorders.

WHO and other health organizations recommendations increased the debate of sugars substitution by non caloric sweeteners. Intense sweeteners are food additives containing significantly less or none calories compared to sugar. These additives may be derived from natural or synthetic sources.

Other option used by food industry are sugar alcohols like sorbitol, mannitol, xylitol and more recently erythritol, with some advantages over their predecesors because of its neutral metabolic profile, and very low energy density. Erythritol, xylitol and sorbitol have been studied as alternatives to sugars against dental caries.

Artificial sweeteners are into two categories. The first one is the chemically synthesized: sucralose, alitame, cyclamate, aspartame, neotame, potassium acesulfame, and sacharin (discovered in 1878). The second is intense sweeteners extracted from plants: Stevia rebaudiana, Luo Han Guo and glycyrrhizin. Sweet tasting proteins from fruits includes thaumantin, monellin and brazzein. Lisozyme is a protein from egg whites. High intensity sweeteners have differienciated characteristics related to their structure: show delay the onset of sweetness, lingering, bitter or metalic aftertaste, non-linear sweetener consentration to sweetness equivalency ratio, adaptation or desensitizing, and a lack of mouthfeel or body, compared with sucrose.

Flavor enhancers are used to make the high intensity sweeteners taste more like sucrose: maltol, ethyl-maltol, strawberry furanone and vanillyls. Sugar alcohols and other polyols are used to provide mouthfeel, viscosity or cooling effect.

Sacharine is a coal tar derivative sold as powder and used in a variety of foods, beverages and baked products. It has a bitter aftertaste. Aspartame is composed of two amino acids: aspartate and fenylalanine. It is 200 times sweeter than sucrose. Its caloric value is insignificant. Acesulfame-K has similar sweetening power, but resist the heat. Sucralose is 600 times sweetener than sucrose, formulated by clorination of glucose, with great stability. Cyclamates are 30 times sweeterthan sugar, with little afterstaste and are heat resistant. Stevia is 250 times sweeter than the reference, and it is shelf stable when dry. Has a bitter taste when consumed in high quantities.

Formulation of food and beverages with sugars substitutes is a complex task which requieres combination of some of the intense sweeteners with other modifiers of taste and texture.

Keywords: Sweeteners, artificial non caloric sweeteners, flavors, food, formulation

Conflict of Interest disclosure: Received honorarium as scientific advisor or invited speaker for both pharmaceutical and food industry.

Track 1: Advances in Nutrition Research

SS_144/159
COHORT STUDIES IN IBERO-AMERICA

A LOOK INTO PREGNANCIES IN VENEZUELA: THE IMPACT OF ADVERSE CONDITIONS IN PREGNANCY DEVELOPMENT AND NEWBORNS

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Nutrition and wellbeing conditions during pregnancy and early infancy are relevant in defining short and long term health. The Developmental Origins of health and Disease (DOHaD) paradigm provides a framework to assess the effect of early exposures (adequate or not) on long term health. Based on the evidence that adequate nutrition and good environmental conditions including those social determinants of health that ensure the wellbeing of population; it is expected that advantageous consequences in the predictive adaptive responses will show, thus preparing the fetus for the later environment that is anticipated based on its developmental experience (Uauy, 2011).

Low and middle income countries are showing an increase in chronic diseases prevalence all of which are associated with poor environmental conditions at the beginning of life.

In consequence, impairment of pre-conceptional and during pregnancy nutrition status, living within a food insecure household and having an income below the line of poverty level are adverse conditions that might promote the development of diseases in the long term.

The last decade Venezuela has been facing a severe economic crisis that has promoted important alterations for the quality of life of Venezuelans (ENCOVI, 2014,2015, 2016)

A pilot for a cohort study was conducted in a low income urban area within the Venezuelan Capital city, Caracas. During 2013 a sample of 171 pregnant women was recruited from the ambulatory clinics of Sucre Municipality in Caracas, and the follow up of neonates was completed for 70. Of those women, 44% had it first pregnancy before age 17, and the majority of pregnant women (66%) were categorized as IV Graffar Méndez Castellano SEL (low). Impairment of pre-conceptional nutrition status was reported in 40% of women, 30% started pregnancy with a BMI > 25, and 10% with a BMI that showed undernutrition. 20.8% has a history of abortion (Mercadante, 2016). 49.8% of pregnant women with excess weight had 4 or more pregnancies and pre-conceptional nutrition status of the late pregnancy was associated with number of pregnancies. 15% of neonates were small for gestational age. It should be highlighted that 69% of the households had at least one characteristic of food insecurity and 30% of the sample reported no income at all. 15% of women referred going to bed at night with hunger because there was no money to buy foods and, an inverse significant association was found between the experience of hunger and family income. Logistic regression analysis showed that the probability of living in a food secure household diminished if there was a pregnant woman living in there and if the household family income was below the poverty line. In conclusion: The conditions in which Venezuelan women are facing pregnancies do not guarantee their wellbeing and their neonate's. These conditions: food insecurity, living in a household with an income below the poverty line and multiple pregnancies are factors that require effective policies for implementing strategies to guarantee a good lifestyle standard for Venezuelans and for preventing diseases in the future.

Keywords: Venezuela, Food security, pregnant women, low income households

EARLY LIFE FACTORS AND CHILDHOOD HABITS INFLUENCING EXCESS BODY WEIGHT IN A SPANISH MULTICULTURAL COHORT (CALINA COHORT)

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Childhood obesity is a major public health problem. Despite the reported stabilization of its prevalence in developed countries, overall trends in childhood obesity mask significant and increasing differences between children from upper and lower socioeconomic status (SES) backgrounds and in those who accumulate more early life risk factors and family predisposition (a mixture of cultural, genetic or behaviour habits). Differences in obesity prevalence among vulnerable groups exist but it remains unclear

whether these differences may be partly determined by SES, parental adiposity or pregnancy and infancy risk factors. Several early-life risk factors have been identified in the literature, including maternal pre-pregnancy overweight/obesity, smoking during pregnancy, excess gestational weight gain, prematurity, high and low birth weight, caesarean section, not being breastfed and rapid early infant weight gain.

To explore early-life risk factors of overweight/obesity at age 6y and their cumulative effect on overweight/obesity at ages 2-,4- and 6y. To investigate longitudinal associations between belonging to a minority group and being overweight/obese at 6 years old, as well as between accumulation of social vulnerabilities.

Study design: 1,031 children were evaluated at birth and re-examined during a 6-year follow-up in a representative cohort of Aragon (Spain). Maternal smoking during pregnancy, gestational weight gain, gestational age, birth weight, caesarean section, breastfeeding practices and rapid infant weight gain from birth to 6 months of age were the factors studied. Parental body mass index (BMI), maternal education, parental/ethnicity origin were defined as main confounders. Children from minority groups (vulnerable groups) included Spanish Roma/gypsies, Eastern Europeans, Latin Americans and Africans. Two more vulnerable groups were defined at baseline as children whose parents reported low occupational status and low education. We used logistic mixed-effects models to assess the associations investigated.

Parental BMI and parental ethnicity/origin were the strongest predictors of overweight/obesity and they confounded several associations. Among early life factors, rapid infant weight gain (OR=2.29;[1.54-3.42]99%CI) and smoking during pregnancy (OR=1.61;[1.01-2.59]99%CI) remained statistically significant as predictors of overweight/obesity at the age of 6y after adjusting for confounders. A higher number of early-life risk factors was associated with higher odds of being overweight/obese at the age of 6; two early-life risk factors (OR=2.72;[1.54-3.42]99%CI); three early-life risk factors (OR=5.02;[2.28-11.04]99%CI) and four to six early-life risk factors (OR=7.33;[3.01-17.84]99%CI). Roma/gypsy children (OR=4.30;[1.13-16.23]99%CI) and with Latin American background (OR=2.93;[1.26-6.79]99%CI) were more likely to be overweight/obese at age 6 compared with non-gypsy Spanish group. Children with three social vulnerabilities (OR=2.08;[1.08-4.04]99%CI) were more likely to be overweight/obese at age 6 compared with children with no vulnerabilities. No associations were found at earlier ages.

Rapid infant weight gain, parental BMI and origin/ethnicity are important determinants of childhood obesity. Those with a higher number of early risk factors had elevated odds for obesity at age 6 suggesting cumulative effects. Monitoring children with rapid infant weight gain is especially important for childhood obesity prevention. Early interventions should be developed targeting Roma/gypsy children, Latin American children and those who accumulate more social vulnerabilities as they are at higher risk of being overweight/obese later in life.

Keywords: Overweight, early life factors, sociocultural, feeding, growth

ASSESSING THE IMPACT OF GROWTH TRAJECTORY OF VERY LOW BIRTH WEIGHT INFANTS ON EXECUTIVE FUNCTIONS AT 11 YEARS OF AGE

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Background and objectives: Several studies on preterm-born children have identified birth weight (BW) as a potent predictor of later cognitive functioning and academic success, with poorer outcomes in those born SGA (small for gestational age) compared with those appropriate for GA (AGA). The objective of the study was to compare SGA and AGA born preterm (<=1500g) children between 10-12 years old (y/o) on growth at 1 and 2 years of life and on the outcomes of the rings subtest (RSubt) of the ENFEN (Evaluación Neuropsicológica de las Funciones Ejecutivas en Niños).

Methods: 92 born preterm (<1500g) children between 10-12 y/o (53 girls, 39 boys) were studied. Children with congenital malformations, genetic syndromes, studied intrauterine infections or cerebral palsy were excluded. Instruments: Growth chart and outcomes on the rings subtest (RSubt) of the ENFEN. This test depends more on the cognitive resources that children have and less on culture, education or socioeconomic influence. It requires high attention span, efficient working memory and inhibition of interference. It is one of the tests that requires more executive functions subtasks including: ability to program behavior to facilitate sequencing (only and in sequence it leads to a specific goal), behavior planning and previewing, ability to break down a problem into stages by trying to discover the rules of the processes, cognitive flexibility; abstraction ability (estimation), prospective memory, motor skills and working memory. The child must follow certain rules in order to copy 14 colored-rings and axis figures of increasing difficulty by moving the rings from one axis to another. Statistical analysis: Outcomes range from 1-10 (lower to higher performance). RSubt performance scores were divided in 2 categories: 1-4 and 5-10. Low RSubt score was defined as a score less than 4. Normal RSubt score was defined as a score >=5. Categorical data was analyzed using Chi2 or Fisher test. Significance level was set at $p < 0.05$.

Results: 92 born preterm children (10-12 y/o) were studied. 31.52 % were SGA (n=29) and 68.47 % AGA (n=63). There were 68.96% of girls in SGA group and 52.38% in the AGA group. Mean+/-SD of BW and GA by group are shown in table 1. Table 2 shows the Chi2 results of the RSubt scores (<4 and >=5) for each group (SGA and AGA) and for each growth z score group at 1 and 2 years of life (YOL). There were no statistically significant differences between AGA children z score´s groups at 1 or 2 YOL. However, the Chi2 test resulted significant between SGA z score´s groups at 1 and 2 YOL (p<0.05).

Conclusions: Preterm SGA children are at special risk for cognitive impairment. We found that SGA preterm (<1500g) children with growth restriction at 1 and 2 years of life was associated to lower scores in the RSubt of the ENFEN (p<0.05).

Keywords: Prematurity, small for gestational age (SGA), executive functions, growth trajectory, nutrition.

Further collaborators: Gisela Germotta Educational Psichology; Victoria de la Fuente Educational Psichology; Mónica Brundi Medical Doctor

THE LIMACHE BIRTH COHORT STUDY IN CHILE

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Background: By the seventies, the health and nutritional profile in Chile was of high infant mortality (>50/1000 live births) and high prevalence of nutritional and infectious diseases, but over a couple of decades birth weight increased markedly, malnutrition dropped to less than 1% and infant mortality fell to 14.6 by 1991. The current rate is 7/1000 live births.

Objective: The Limache cohort aims at assessing life course events –cardiovascular risk factors and chronic respiratory conditions– under the Developmental Origins of Health and Disease (DOHaD) paradigm in two stages of development in Chile: before and after an unprecedented economic growth and remarkable epidemiological and nutritional change.

Method: Ambidirectional follow-up study (non concurrent up to participants 22 years old, concurrent thereafter), with two birth cohorts born 12 years apart: Cohort A, a representative sample of 1232 subjects born between 1974 and 1978 –impoverished prone period– in the main public hospital of Limache and measured at 22 to 28 years (2000-2002) and at 32 to 38 years (2010-2012); Cohort B (n=1000), a representative sample of new-borns between 1988-1992 –wealthier prone period– of mothers residing in the same counties, evaluated during at 22-28 (2014-2017). Equal methods were applied to register anthropometry at birth, over the first year and in adulthood, socioeconomic position (SEP), demographic and life style traits along with respiratory, cardiovascular and mental health parameters measured in each contact in adulthood.

Results: Cohort A: Metabolic syndrome increased from 9.3% (95% CI:7.5-11.1) to 27.3 (95% CI: 25.0 to 31.0) from 1st to 2nd measurement, twofold for triglycerides, threefold for waist circumference and fivefold for blood glucose. People without risk factors fell from 32.5%; (95% CI:27.4-37.6) to 14.6% (95% CI:9.3-19.9). Median BMI was 27.8 (IQR:25.0-31.1) at 2nd measurement, an increase of three units over 10 years. Increases were also ascertained in cardiovascular risk factors: glycaemia ≥110 mg/dL from 5 (95% CI:4-7) to 24% (95%CI:22 to 27); triglycerides ≥150 mg/dL from 18 (95% CI:15-20) to 35.3% (95% CI:32.0-38.0); elevated waist circumference from 17 (95% CI:15-19) to 42% (95% CI:39-45). We found inverse associations between birth weight and gly-

caemia, blood pressure, and cholesterol in adult life but not between birth weight and insulin resistance or metabolic syndrome. Also, there were no association between weight at 12 months and blood pressure or lipids in adulthood.

Cohort B: Median BMI at 22-28 years (ongoing follow-up, completing data) is being estimated in 26.3 (IQR:23.4-30.1), almost the level reached by Cohort A when had 10 years older.

Discussion: Results show the unfavorable evolution of cardiovascular risk factors in young adults over time, still maintained in a younger generation. This evidence supports prevention policies directed to early ages without neglecting young adults, which currently, is not a target for health nutrition programs. This will allow to delay the onset of chronic diseases and improve the quality of life of adults.

Keywords: Cohort study, young adult, Chile
Further collaborators: Ximena Vasquez. Nutrition Department, Faculty of Medicine. University of Chile

RETROSPECTIVE COHORTS STUDIES IN CHILE

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I have been involved in three retrospective cohort studies performed in Chile. All retrospective cohorts studies presented here were designed by linking present data of children with perinatal records which were complete for about 98% of the cases. The individual identification number is recorded in the birth certificate and also in the identification card of the children; its presence enabled us to link the live birth and childhood files. This unique identification number has been recorded at birth in Chile since the 1990s.

Two publications reported results of one of our studies with a sample of about 3,300 children, with mean age of 11 years, attending public schools in a county from Santiago, Chile; a much smaller sub-sample of 156 children from that study was informed in the third publication. These three reports were the following: A) Mardones F et al. J Devel Orig Health Dis 2012;3(4):237-244. B) Mardones F et al. Biomed Research International 2014:472017. doi: 10.1155/2014/472017. C) Krause BJ et al. PLoS ONE 2015;10(6): e0128140. doi:10.1371/journal.pone.0128140. 1-18). In the first two papers we showed that some indicators of the metabolic syndrome and insulin resistance were U-shaped or J-shaped associated to birth weight, in a similar manner to findings of previous studies that have established that infants at the normal extremes of birth weight are more likely to develop chronic disease (Hales & Barker DJ. Int J Epidemiol. 2013; 42(5): 1215-22; Cnattingius S , et al. Int J Obes (Lond). 2012; 36(10):1320-4. In the third publication, it was concluded that micro-RNAs Let7e and 126 can be considered as early markers of metabolic disease; linear associations were found between those variables and U-Shaped or J-shaped

associations could not be tested due to the small sample size under consideration. The remaining two studies were respectively related to child obesity and school performance (1. Mardones F, et al.Int J Epidemiol 2008;37:902-910. 2. Villarroel L et al. J Dev Orig Health Dis 2013; 4(3):232-238). The first one covered the whole school-age population of Chile and the second one covered around 90% of it. Our findings on child obesity showed that just high birth weight values were related to that outcome during childhood; this was also the case for the association with obesity in our previously commented study of 3,300 children. Given that those studies have been done in school age populations, it is important to consider information from previous studies, notably the 1958 birth cohort in the United Kingdom which was able to assess birth weight in relation to body mass index at five different time points in the lifecourse from 7 to 33 years old (Parsons TJ et al. BMJ. 2001; 323(7325):1331-5). That analysis showed a direct association between infant birth weight and BMI, becoming more j-shaped by the age of 33. The study of the association of school performance with perinatal variables showed a positive association of birth weight and birth length with higher scores of school achievement.

Keywords: Cohort studies, children, obesity, metabolyc syndrome, birth weight

CRITICAL WINDOWS FOR PREVENTION OF OBESITY AND ASSOCIATED CONDITIONS: THE GOCS AND CHIMINO CHILEAN COHORTS

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Although obesity and related chronic diseases are observed in adulthood, there is now consistent evidence that originate in early life. In 2006 initiated the longitudinal follow-up of 1195 Chilean children -The Growth and Obesity Cohort Study (GOCS)- with the support of the Chilean National Preschool Program. All children 2.6 to 4.0 y of age attending public nursery schools of six counties in Santiago and who met the inclusion criteria were invited to participate. The main aim was to assess the association between early weight and linear growth and BMI trajectories in preschool children. Retrospective weight and height measurements were abstracted from health records. From age of 3 years, children had annual appointment at INTA to collect standardized anthropometric measurements. A second follow-up was initiated in 2009 aimed to assess the relation between early growth and adiposity, metabolic/inflammatory, and hormonal markers during adrenarche. We added skeletal maturation, bio-impedance and body composition measurements, blood samples (insulin, glucose, lipid profile, adiponectin, leptin, and IGF1) and physical activity. Since 2011, GOCS aimed to assess the role of early growth and adrenarche on mammary development and putative markers of breast development. We also added measurements of diet, EDC, inflammatory markers, and DNA methylation. GOCs results showed that pregestational obesity and excessive gestational weight gain related to obesity and associated metabolic conditions for both mother and offspring. Based on GOCS findings, in 2012, INTA initiated collaboration with the South East Health Area of Santiago to establish -the Chilean Maternal and Child Health Observatory (CHIMINO). This observatory aims to provide evidence (at the population, clinical and basic science level) for achieving healthy nutrition for mothers and infants during the 1000-day early life window. The study optimizes data collection in the real world, through data linkage of electronic primary care and hospital records. The first initiative of this collaboration was the CHIMINCs study. CHiMINCs is a cluster randomized controlled trial in 12 primary health care centers that aimed to assess the effectiveness of a low intensity by high coverage intervention that enhances the implementation of updated nutritional health care standards (diet, physical activity, and breastfeeding promotion) during pregnancy on maternal weight gain and infant growth. The nutritional intervention was delivered through the national health care system under standard operating conditions. 4781 pregnant women were recruited. The second initiative of CHIMINO is the MIGHT study who aimed to assess the effectiveness of two prenatal nutritional interventions (home-based diet and physical activity counseling and/or n3LC-PUFAs supplementation) delivered to obese/overweight pregnant women in achieving better metabolic control in both the mother (lower incidence of gestational diabetes mellitus) and the offspring (lower incidence of macrosomia and lower prevalence of insulin resistance at birth). A substudy of the MIGHT study will evaluate if neonates born from obese mothers supplemented with n3LC-PUFA during pregnancy show a lower percent of body fat at birth and at 4 months of age, as well as the reversion of functional and epigenetic changes in neonatal monocytes at birth, compared to neonates from obese mothers with low n3LC-PUFA intake.

Keywords: Obesity, Chronic Diseases, Prevention, Cohort, Chile

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Track 2: Nutrition Through Life Course

PROMOTION AND CONSUMPTION OF COMMERCIALLY-PRODUCED SNACKS DURING THE COMPLEMENTARY FEEDING PERIOD: COUNTRY EXPERIENCES, POLICY IMPLICATIONS

SNACKS AND NUTRITION DURING THE COMPLEMENTARY FEEDING PERIOD: A CROSS-SECTIONAL STUDY AMONG CHILDREN 12-23 MONTHS OF AGE IN KATHMANDU VALLEY, NEPAL

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The availability of snack foods and sugar-sweetened beverages (SSBs) has grown rapidly in recent decades, with consumption of these foods increasing globally, noted across both high-income and low and middle income countries (LMIC). Consumption of snack foods and SSBs has also increased among children, including infants and young children below two years of age. While snacks can provide energy and potentially micronutrients during the nutritionally vital complementary feeding period, consumption of unhealthy snacks and SSBs, which are typically high in sugar and salt, is cause for concern, because they could displace nutrient-rich foods in diets of young children. Complementary feeding diets high in sugar and salt could also result in excess energy intakes and contribute to over-nutrition among young children. More research is needed in this area, given the limited information on the role of unhealthy snack foods and SSBs in the diets and nutrition of infants and young children in LMIC contexts. Therefore, this study in Kathmandu, Nepal aimed to assess the association between high consumption of unhealthy snack foods and SSBs and the nutritional status of children during the complementary feeding period, and to investigate factors associated with consumption of these products. A cross-sectional survey was conducted from February to April, 2017 on a representative sample of 12-23 month old children (n=702) living in Kathmandu Valley. Dietary intake (24-hour recalls), anthropometric (length and weight) and micronutrient status (vitamin A and iron) data were collected; and are currently being analysed. Preliminary findings related to the children's nutritional status and snack consumption patterns will be presented. This study intends to increase awareness of snack consumption patterns in a LMIC context and to inform policies and programs aimed at improving infant and young child nutrition in Nepal.

Keywords: Snacks, IYCF, Nepal, nutrition, double burden

POINT-OF-SALE PROMOTION OF FOODS FOR CHILDREN UNDER THREE YEARS OF AGE ACROSS RETAIL OUTLETS IN BANDUNG CITY, INDONESIA

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Background and objectives: Caregivers of young children should be able to make decisions about breastfeeding and complementary feeding free from commercial pressure. Preventing promotion of breastmilk substitutes (BMS), curbing inappropriate promotion of complementary foods, and discouraging use of unhealthy commercial snacks are important to protect child nutrition.

Methods: A cross-sectional survey of retail outlets was conducted to document the prevalence of point-of-sale (POS) promotions of commercial foods fed to children under three years of age in Bandung City, Indonesia. Researchers compiled a comprehensive list of all BMS and commercial complementary foods for sale in Bandung, and then visited 33 purposively selected small stores in closest walking distance to public sector health facilities and ten large retail outlets purposively selected for their high volume of products. Promotional activity for any BMS and commercial complementary foods in these stores was recorded and photographed using an electronic mobile data collection system. The proportion of sampled stores which had POS promotions for each product category and the total number of POS promotions for BMS and commercial complementary foods were calculated. Any POS promotions for select categories of commercial snacks (sweet biscuits, savory snacks, jellies, candies/chocolates and sweetened milks) were also documented and assessed for child-targeted marketing elements including images of children, free gifts, or statements directed to caregivers about young children.

Results: In the 43 stores, a total of 147 BMS products and 218 commercial complementary foods were for sale. A preliminary total of 3000 promotions for BMS, commercial complementary foods and select snack categories were documented. A single promotion often featured multiple products; overall, the 3000 promotions featured approximately 900 BMS, 700 complementary foods, 2400 sweet biscuits, 1400 savory snacks, 2900 candies/chocolates, 80 jellies, and 1700 sweetened milks.

Conclusions: These findings will contribute to the Indonesian government's efforts to strengthen policies regulating promotion of products fed to young children.

Keywords: Breastmilk substitute, infant formula, snacks, promotion, complementary feeding

SNACK CONSUMPTION DURING THE COMPLEMENTARY FEEDING PERIOD: A CROSS-SECTIONAL STUDY AMONG CHILDREN 6-23 MONTHS OF AGE IN URBAN SENEGAL, TANZANIA, NEPAL AND CAMBODIA

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Background and objectives: Dietary patterns associated with the nutrition transition have resulted in increases in consumption of commercially produced snack foods in many low and middle-income countries. Many snack foods are nutrient-poor and high in salt, sugar, and/or transfats making them inappropriate for young child feeding. This survey assessed consumption of foods and liquids including commercially produced snack foods among children 6-23 months of age and mothers' exposure to promotions for these products.

Methods: Health facility-based interviews were conducted among 218 randomly sampled mothers utilizing child health services in Dakar, Senegal; 229 in Dar es Salaam, Tanzania; 228 in Kathmandu Valley, Nepal; and 222 in Phnom Penh, Cambodia.

Results: In the day prior to the interview, 58.7% of 6-23 month olds in Dakar, 23.1% in Dar es Salaam, 74.1% in Kathmandu Valley, and 55.0% in Phnom Penh had consumed a commercially produced snack food. In the previous week, the majority of children in Dakar (79.8%), Kathmandu Valley (91.2%) and Phnom Penh (80.6%) had consumed such products. Among 12-23 month olds, snack foods were the second most commonly consumed food group in Dakar, and third most common in Kathmandu Valley and Phnom Penh. Sweet snack foods, such as cookies and candy, were the most commonly consumed snack products in Kathmandu Valley and Dar es Salaam, while savoury snack foods, such as chips or crisps, were the most commonly consumed in Phnom Penh and Dakar. In all four sites, the primary reason reported among mothers was because the child liked the snack food. Over one-third of mothers in Kathmandu Valley reported feeding commercially produced cookies (40.4%), candy (33.8%) or cakes (34.4%) because they were convenient food options and one-fifth (21.5%) of Phnom Penh mothers reported feeding cookies because they believed they were healthy for their child. Observations of promotions for snack foods were reported by almost all mothers in Dakar and Phnom Penh, over 3/4ths in Kathmandu and half in Dar es Salaam.

Conclusions: Snack consumption during the critical complementary feeding period demands attention. Overconsumption of commercial snack foods may contribute to undernutrition and may also lead to excess energy intake and increased risk for childhood overweight.

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FIRST-FOODS: ACCELERATING PROGRESS TO IMPROVE THE QUALITY OF COMPLEMENTARY FOODS AND FEEDING PRACTICES FOR CHILDREN

COMPLEMENTARY FEEDING PRACTICES: CURRENT GLOBAL AND REGIONAL ESTIMATES AND ASSOCIATION WITH STUNTING AMONG YOUNG CHILDREN IN LOW- AND MIDDLE-INCOME COUNTRIES

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Adequate quantities and quality of complementary foods, together with age-appropriate feeding practices are essential for children's health and nutrition. We use the UNICEF global database to report on complementary feeding at the global and regional levels as sufficient data to generate estimates only became available recently. We also examined the association between two indictors of dietary quality - dietary diversity and animal source food (ASF) consumption - and stunting (length-for-age z-score) employing existing data from 39 Demographic and Health Surveys. Data for children aged 6-23 months were pooled and multiple logistic regression models, adjusting for child, maternal, and household characteristics, employed to assess the association between dietary quality and stunting. We found that children 6-11 months old had the lowest rates of minimum dietary diversity (MDD) than any other age group (~17 per cent compared to 31.5 and 37.6 per cent for the 12-15 and 16-23 months old, respectively). The rate for MDD among children in the richest households was two times higher than children in the poorest households at the global level. Across regions, consumption of fruits and vegetables and animal source foods was particularly low. Children who had consumed zero food groups in the previous day had a 1.345 higher odds of being stunted when compared to the reference group ($\geq$ 5 food

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groups); those who did not consume any ASF in the previous day had a 1.436 higher odds of being stunted compared to children consuming all 3 types of ASF (egg, meat and dairy). In summary, far too few children are benefitting from minimum complementary feeding practices and meeting the minimum dietary diversity is particularly of concern. Dietary diversity and ASF consumption were associated with stunting. Efforts are needed to improve children's diets for their survival, growth and development.

Keywords: Infant and young child feeding. Diet diversity. Animal source foods. Complementary feeding. Child growth.

CONSUMPTION OF COMMERCIAL SNACK FOOD PRODUCTS AMONG YOUNG CHILDREN

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The global food system has been marked by increased production and availability of processed foods. Commercially produced snack foods and sugar-sweetened beverages (SSBs) have become common in children's diets across high-income countries and are increasingly noted in the diets of infants and young children in low- and middle-income countries (LMIC). A recent cross-sectional survey among mothers found high consumption of sweet and savory snack food products among children 6-23 months of age in urban Cambodia (55.0%), Nepal (74.1%), Senegal (58.7%), and Tanzania (23.1%), and other studies have noted similar consumption rates in Central and South America. Snacks can be an important source of energy and potentially nutrients for young children; however, this prevalent consumption of commercial snack food and beverage products, often energy-dense and nutrient-poor, among young children in LMIC is concerning. There is a need to understand the role of such foods in young children's diets and their influence on dietary adequacy and nutritional status. In 2016, a literature review was conducted to identify studies assessing snack food and SSB consumption among children in Asian LMIC, and associations between this consumption and nutritional status; 68 articles resulted from this search. While studies detailing snack food and SSB consumption among preschool- and school-age children were common, only 9 studies assessed the contribution of such foods to diets during the complementary feeding period. Across these studies among children below two years of age, snack food and beverage consumption rates increased with age, and consumption of snack foods was more common than consumption of SSB. Only 4 of the studies including infants and young children gathered quantitative dietary intake data. Of these, the contribution of energy intake from snack food and beverages among young children ranged from 25-42%, comparable to snack food and beverage consumption among children in high-income settings. Twenty-one of the 68 studies included in this review assessed associations between snack food and beverage consumption and nutritional status among pre-school/school-age children. Those investigating over-nutrition among children noted positive associations with overweight/obesity or waist circumference, while those considering undernutrition found negative associations with wasting, underweight and HAZ. However, only one study assessing these associations included children below two years of age. This review indicates a large gap in the literature regarding the contribution of commercial snack food and beverages products to diets of young children in LMIC, as well as the associations between consumption of these products and diet adequacy, micronutrient status, and linear and ponderal growth among children below two years of age. Further research is needed in order to understand how consumption of nutrient-poor snack foods influences both under- and over-nutrition in young children during the complementary feeding period.

Keywords: Snacks, IYCF, nutrition, double burden

USING BEHAVIOR CHANGE TO IMPROVE COMPLEMENTARY FEEDING PRACTICES

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There are few well-documented program experiences that can provide insights on operational steps needed to improve complementary feeding practices. This paper compares four examples of complementary feeding programs from Bangladesh, Malawi, Peru and Zambia to document different context-specific ways of designing and implementing programs. After searching published and unpublished reports, four programs met the criteria for inclusion: scalability and impact on complementary feeding practices, and detailed documentation including impact evaluation. This paper identifies similarities and differences in the program designs and in operational strategies that were used for implementation. All programs applied social and behavior change principles and used diverse, multiple program delivery platforms. The contexts in each country were different and also the challenges encountered. This provides a rich source of lessons learned for future programs. The results show that complementary feeding practices can be improved rapidly in a variety of settings using available program channels. To achieve success, interventions should systematically address specific constraints to food access and should apply effective behavior change strategies to encourage caregivers to prepare and feed appropriate foods. Programs can use a five-step process to develop effective programs: 1. Select a few practices to focus the strategy based on best potential to benefit the population, using criteria such as high efficacy, low baseline levels and high acceptability and feasibility to improve; 2. fill knowledge gaps and obtain an understanding of the determinants of complementary feeding, investing in activities that address underlying barriers and build on the facilitating factors for behavior change in the community;

3. thoroughly test and verify concepts, recipes, messages, processes and tools before large scale implementation; 4. work through channels of service delivery and communication that reach mothers repeatedly at the right ages and also engage key influential groups; and, 5. maintain high reach and frequency for at least two years while making rapid mid-course corrections as indicated by monitoring data.

Keywords: Complementary feeding, child nutrition, behavior change, implementation research, framework for scaling up

TIME TO REVISE THE COMPLEMENTARY FEEDING GUIDELINES?

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In 2003 and 2005, WHO published the Guiding Principles for Complementary Feeding of the Breastfed Child and Guiding Principles for Feeding Non-Breastfed Children 6-24 Months of Age. These documents were largely focused on ensuring that young children received enough of the nutrients they need for optimal health and development. The primary outcomes of interest were prevention of wasting and stunting. Over the past decade, the growing problem of childhood obesity and the establishment of dietary patterns that predispose toward non-communicable diseases have increasingly been recognized as important issues for infant and young child feeding. In addition, new evidence has emerged on key issues of feeding, including the importance of quality and quantity of protein, animal source foods, fat quality, and sugar intake. New issues on the effect of the young child's diet on body composition and gastrointestinal microbiota may also be important.

With this backdrop, WHO is embarking on a process to develop new guidelines on complementary feeding. The WHO guidelines process is very rigorous and includes steps to scope the coverage of the guideline, create a diverse external Guideline Development Group, screen members for conflicts of interest, formulate key questions for systematic literature reviews, conduct evidence reviews, formulate recommendations, conduct external peer review, and finally publish the guideline. For complex guidelines that include a number of recommendations, such as complementary feeding, this process can take a couple of years.

Nutrition in the first 1000 days of life is critically important for child development and prevention of health problems related to both undernutrition and non-communicable diseases. Thus, it is important that we develop evidence-based feeding recommendations that will lead to optimal health and development.

Keywords: Complementary feeding, infant and young child feeding

Track 3: Public Health Nutrition and Environment

SCALING UP RICE FORTIFICATION IN LATIN AMERICA AND THE CARIBBEAN

SCALING UP RICE FORTIFICATION IN LATIN AMERICA AND THE CARIBBEAN: TRANSLATING EVIDENCE TO PRACTICE FOR DEMAND CREATION AND EFFECTIVE PROGRAMMING

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Fortification of staple foods with essential vitamins and minerals is the most cost-efficient public health tool for the prevention and control of micronutrient deficiencies. Micronutrient deficiencies such as iron deficiency anemia, zinc deficiency and vitamin A deficiency remain a serious public health concern in most Latin American and Caribbean countries, particularly amongst women of reproductive age, children and indigenous groups. Most countries mandate wheat flour and salt fortification; fortification of other products like corn flour and sugar is voluntary in others. There are currently 125 national programs addressing micronutrient deficiencies across the region, most of them through supplementation. Known challenges, such as lack of reliable data, poor acceptability and adherence, weak monitoring and evaluation, limit their impact.

Rice is the staple food to a third of humanity, and represent a sizeable part of energy intake in South America and the Caribbean sub-regions. While milled rice is a good source of energy, it is a poor source of micronutrients. In countries with widespread micronutrient deficiencies and large per capita rice consumption, making rice more nutritious can effectively increase micronutrient intake, and improve nutritional status. Only six countries globally have passed legislation for the mandatory fortification of rice, including three in Central America. In practice, only Costa Rica has a standing, successful, mandatory rice fortification programme in the region. Over the years, one of the key challenges to the implementation rice fortification in country was technological limitations; today, affordable technology exists to produce fortified rice kernels that look and taste like non-fortified rice.

The World Food Programme's Rice Fortification Initiative started in 2016 and supports seven countries in the region to advance towards the mandatory fortification of rice, through technical assistance for stakeholder engagement and policy making, transfer of technology, behavior change communication, social

marketing, monitoring systems, and feasibility trials. As part of this initiative a Special Supplement on Rice Fortification for Latin America, available in Spanish and English, was published together with the Sight and Life Magazine.

In this symposium, we will present three country case studies and discuss effective policy and programme planning options taken to introduce rice fortification in the region.

Keywords: Rice fortification, food fortification, Latin America and the Caribbean, micronutrients, public health.

Conflict of Interest disclosure: The World Food Programme and DSM Nutritional Products have an ongoing global partnership. WFP does not endorse any product or service.

LEVERAGING FOOD SYSTEMS TO IMPROVE FOOD SYSTEMS AND NUTRITION

FOOD SYSTEMS ROLE IN ACHIEVING GOALS OF THE DECADE OF ACTION FOR NUTRITION

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Although global food production has increased, addressing malnutrition remains a huge challenge. About one in three persons suffers from some form of malnutrition. The current food system is contributing to worsening the nutrition situation by not delivering on healthy diets. Unhealthy diets have become the number one risk factor for the global burden of disease for adults. Concerns about the global nutrition situation was an impetus for the United Nations declaration of the period 2016 to 2025 as the UN Decade of Action on Nutrition. The aim of the Nutrition Decade is to accelerate action on implementation of commitments to achieve global nutrition and diet-related targets by 2025, and contribute to the realization of the 2030 Agenda of the Sustainable Development Goals (SDG); and leaving no one behind. The Nutrition Decade provides a momentum and direction in global action to address all forms of malnutrition. A Decade is rather short but what are the low-hanging fruits to harvest to achieve the goals of the Decade? Transforming the food system is an absolute necessity. We need functioning food systems that would deliver the diverse, safe and nutritious foods all year round. Transforming the food system is integral to the goals of the Decade and the SDGs. Transforming the food system will require a change in national policies to ensure that nutrition objectives are embedded in agriculture, trade and other sectors policies; consumers are empowered to make healthy food choices the easier choice and above all, governments must plan cities with a food systems perspective.

Keywords: Food systems, Decade of Action on Nutrition, Goals

LESSONS LEARNED FROM MULTI-SECTORAL IMPLEMENTATION OF NUTRITION PROGRAMS

WHY IS A MULTI-SECTORAL APPROACH NEEDED FOR NUTRITION, AND WHY IS IT SO HARD TO ACTUALLY PUT THAT IT INTO PRACTICE?

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John Snow Incorporated (JSI). USA.

The World Health Organization estimates that child undernutrition is associated to 45% of under-five death and that maternal short stature and iron deficiency anemia contribute to at least 20% of maternal deaths. The landmark Lancet Series on Maternal and Child Undernutrition, published in 2008 and updated in 2013 reviewed global data from randomized control trials and confirmed that if implemented at scale during the window of opportunity (from conception up to 24 months of age) packages of nutrition-specific and nutrition-sensitive interventions can significantly reduce nutrition related mortality and related morbidity and disability. In addition in 2013 the World Health Organization (WHO) released a guide entitled, Essential Nutrition Actions: improving maternal, newborn, infant and young child health and nutrition, which also draws on the findings of systematic reviews such as those of the Lancet to highlight the proven actions that need to be taken to scale within the health sector.

This Satellite Symposium attempts to be a technical forum on "Lessons from multi-sectoral implementation of nutrition programs". During this symposium, JSI and its partner agencies will share results, insights and lessons from a broad range of nutrition State of the Art Implementation practices. Three renowned experts will present the latest technical information and current trends and key lessons learned for nutrition implementation within and across sectors: programming nutrition sensitive agriculture, nutrition within the health sector, and WASH in nutrition programs. Following presentations, participants will experience two interactive knowledge coffee sessions in break-out groups, facilitated by guest experts who will share expertise, facilitate discussion and answer questions., Some of these sessions will be:

1. District approach on the control of anemia: training and programming activities and tools – Experiences from Ghana, Nepal and Uganda

2. Different approaches to Farmer Field Schools for improved nutrition – Experiences from Bangladesh and Ghana

3. Multi-sectoral approach of engaging district government in joint planning, budgeting, implementation – Experience from Ghana

4. Pathways for better nutrition: a tool to track country nutrition budgets across sectors – Experiences from Nepal and Uganda

5. Multiple behavioral themes in one strategy and one program – Experiences from multiple countries

6. A successful integrated approach – The Suaahara Project in Nepal

7. Programmatic approaches to impact dietary diversity – Experiences from multiple countries

8. Gender transformative approaches critical to achieving the goals of multi-sectoral nutrition programming – Experiences from multiple countries

9. Marketing of complementary foods: Findings from multiple countries – The ARCH Project

10. Use of applied technology to monitor nutrition outcomes

11. Platforms to reach adolescents to improve nutrition

At the end of the knowledge coffee sessions, participants will share their take-away messages and a guest expert will summarize how to move forward the successes shared on implementing nutrition programs across sectors.

Keywords: Guest speakers and knowledge coffee

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WHAT HAVE WE LEARNED ON PROGRAMMING NUTRITION SENSITIVE AGRICULTURE?

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A multi-sectoral approach is needed to meet the global targets for nutrition, including scaled-up, proven nutrition-specific and nutrition-sensitive interventions.(1) But the literature has been weak on how investments have bridged the often siloed agriculture and nutrition interventions and goals. In 2012, SPRING conducted a landscape analysis of activities of the U.S. Government's global hunger and food security initiative, Feed the Future, in 19 focus countries in Africa, Asia, and Latin America, and the Caribbean.(2) The findings of the landscape analysis pointed to specific gaps in implementing nutrition-sensitive agriculture, including the lack of:

• effective approaches for multi-sectoral coordination;

• appropriate context assessments to inform design of nutrition-sensitive agriculture interventions;

• indicators that track the intermediate steps along the agriculture-to-nutrition pathways; and

• effective behavior change interventions that target the actors along value chains and agriculture-nutrition pathways.

This presentation will review the work SPRING has done since the publication of the landscape analysis to help fill these gaps, especially related to how to make multisectoral collaboration operationally feasible.

In developing guidance and resources to address the gaps listed above, SPRING found key areas of convergence and tension between the agriculture and nutrition sectors related to the design and implementation of nutrition-sensitive agriculture programs including beneficiary targeting, intervention approaches, commercialization of food, and monitoring and evaluation. (3) These observations underscored the need for better design guidance to reconcile the tensions and leverage convergences to maximize agriculture's contribution to nutrition. We therefore developed a range of materials and tools, beginning with a database of resources for conducting a context assessment specifically for nutrition-sensitive agriculture. We also developed process guidance to enable agriculture market development activities to identify appropriate intermediate outcomes and develop custom indicators to monitor agriculture's contribution to nutrition. Finally, SPRING created an online training course, called Accelerating Behavior Change in Nutrition-Sensitive Agriculture, for designing behavior centered practices. The training helps implementers select, prioritize and then increase use of nutrition-sensitive agriculture practices.

At the same time, SPRING conducted research to better understand existing efforts to coordinate nutrition across USAID portfolios in Bangladesh, Guatemala, and Rwanda. Our findings resulted in a set of recommendations for multi-sectoral collaboration strategies for nutrition organized along a project life cycle.

SPRING has learned that not every agriculture investment can or should focus on nutrition. However, nearly all have some contribution they can make towards improving nutrition. We hope our resources help donors and practitioners design, deliver, and document their unique 'win' for nutrition.

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Keywords: Nutrition-sensitive, multi-sectoral, agriculture, coordination

WHY IS IT SO IMPORTANT TO INCLUDE WASH IN NUTRITION PROGRAMS?

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The 2013 Lancet Series on Maternal and Child Undernutrition estimated that if the full package of 10 evidenced-base nutrition-specific interventions were delivered at 90 percent coverage across the countries with the highest burden of undernutrition,

stunting prevalence could be reduced by 20 percent and severe wasting by 61 percent. This leaves a considerable proportion of the burden that must be overcome using other strategies.

Poor water, sanitation and hygiene (WASH) conditions and practices also contribute significantly to undernutrition. Contaminated water, soils and hands cause diarrheal disease, parasitic infections, foodborne infections and many other illnesses that contribute to nutritional deficiencies. These infections cause blood loss, diminished appetite, reduced absorption and increased permeability of the intestinal lining, and trigger immune responses that divert nutrients from fueling growth to fighting infection. Both human and animal feces contain high levels of dangerous pathogens, and are often in the vicinity of living and cooking quarters. Infections can result from eating with unwashed hands, eating inadequately washed plants grown in contaminated soils or foods on which mycotoxins have grown, and by walking barefoot. In addition, flies carry pathogens from feces to foods, and microbes quickly multiply in foods that are stored at ambient temperature or insufficiently cooked or reheated. Toddlers crawl on the ground and explore their environment by putting hands and objects into their mouths, greatly increasing their exposure to dangerous pathogens. Infants and young children are especially vulnerable because their immune systems are still immature, and pregnant women also have decreased immune function.

There are many WASH interventions, most of which, like nutrition interventions, require changes in behavior, habits and norms that are challenging to achieve. These include promoting the appreciation and practice handwashing with soap, community-wide latrine construction and utilization strategies, household water treatment and safe storage techniques, food and utensil hygiene and storage, designating safe play areas for young children, and keeping animals at a remove from living spaces. While the pathways from contamination to undernutrition are clear, there is still a limited evidence base for the impact of these interventions on nutritional outcomes, thus innovative intervention strategies and further research are needed.

Keywords: Handwashing, water treatment, food hygiene

Further collaborators: Agnes Guyon, Director of the Maternal and Child Health Center, John Snow Incorporated (JSI).

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MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN LATIN AMERICA: WHO ARE MORE AFFECTED?

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN ARGENTINA

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Background: Malnutrition during critical stages of life as infancy, childhood, reproductive age and pregnancy, are associated with significant functional impairment as well as health and socioeconomic consequences.

Objective: The aim of this analysis was to assess the prevalence of five forms of malnutrition (wasting/underweight, overweight, obesity, stunting/short stature and anemia) by socio economic status and education level among children, adolescents and women of reproductive age from Argentina.

Design: Cross-sectional analysis of the National Survey of Health and Nutrition carried out in 2005. Anthropometric indicators and anemia were estimated from 27015 children (aged <5y), 1729 girls (11-19y) and 4401 women (20-49y). Socioeconomic level was classified according to the proportion of contributors in the household, educational level, employment status and medical coverage.

Results: In Argentina 26% of households lived with unsatisfied basic needs and 23% receives at least one food assistance in 2005. The 23% of children, 36% of girls 10-19y and 56% of women were affected from any form of malnutrition.

Children were specially affected by anemia, overweight/obesity and stunting (15.2, 9.9, 7.4% respectively). Girls were affected by overweight/obesity, anemia and stunting (22.5, 15.2, 6.2% respectively). Women were strongly affected by overweight/obesity, anemia and stunting (43.8, 19.8, 10.5%). Stunting or short stature was higher in lower SES, doubling the prevalence between low and high level, reaching the quadruple among women in reproductive age (p<0.05). In children excess weight increased when improved SES, meanwhile in women the tendency was inverse. Anemia showed different tendency according SES.

Conclusions: The data showed high rates of excess weight and anemia, moderate prevalence of stunting and low frequency of wasting/underweight. Public health policies to date have been focalized in wasting/underweight, but have not responded adequately to the increase in overweight and obesity.

Keywords: Argentina, malnutrition, obesity, stunting, anemia

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN BOLIVIA

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Background: Malnutrition in all its forms is a growing public health problem in many developing countries. In Bolivia main public policies are mainly directed to control stunting and anemia, with few efforts to address the already high prevalence of overweight and obesity. In a country with substantial socioeconomic inequalities the current burden of malnutrition denotes a difficult challenge.

Objective: The aim of this study was to describe the characteristics of all forms of malnutrition and its association with socioeconomic status in Bolivia in order to recommend effective public health and nutrition policies to appropriately address this burden.

Design: By using the 2008 nationally representative Bolivian DHS, we estimated malnutrition's prevalence by socioeconomic status. The study comprised 8.432 children <5y, 3.258 women adolescents (15–19 y), and 12.297 women (20–49 y) with available information on anthropometric measurements. The socioeconomic status was calculated based on the DHS wealth index and nutritional status by using WHO 2006 and 2007 standards.

Results: Main prevalent problems found in this study were: underfive stunting 23% (95% CI: 22,14-24,29) and anemia 63.11% (95% CI: 60,82-65,40); overweight/obesity in women of 20-49 years old 56,88% (95% CI: 56,01; 57,76). Considering socioeconomic status lower terciles showed the higher prevalence of stunting (>30%) and anemia (>40%) in all ages. Prevalence of overweight/obesity had an upward trend from 10.81% (95% CI:10.02;11.60) in childhood to 29.46% (95% CI: 27,90;31,03) in adolescents women and 56.88% (95% CI: 56,01; 57,76) in women 20 to 49 years; with significant differences (p<0.05) across lower and high terciles (27.69% compared with 32,56%) in adolescent and low and medium terciles (p<0.05) in women (50,92 % compared with 63.08%, respectively).

Conclusions: The results reaffirms the existing double burden of malnutrition in Bolivia with high prevalence of overweight and obesity increasing throughout the course of life. Lower socioeconomic terciles have the worst situation of malnutrition. This study calls for public specific policies which need to keep in mind the differential characteristics of malnutrition across the levels of socioeconomic status.

Keywords: Bolivia, malnutrition, socioeconomic status

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN BRAZIL

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Background and objectives: Despite worldwide progress in undernutrition, the condition is still present in a few countries and among some socioeconomic and age groups. At the same time, obesity levels are growing across the globe, including in low- and middle-income countries. The objective of this study was to describe malnutrition (over and undernutrition) by socioeconomic status (SES), level of education, and race/ethnicity in Brazil.

Methods: We used nationally representative data from the Brazilian Household Budget Survey conducted in 2008-2009 in the analysis. Measures of weight (kg) and height (cm) were collected by trained interviewers. Anthropometric indicators (overweight; obesity; overweight or obesity – excess weight; wasting or underweight; stunting or short stature) were estimated for children aged <5 years old, adolescent girls aged 11-19 years old, and women aged 20-49 years old using the World Health Organization recommendations. Prevalence of each indicator was presented by tertiles of socioeconomic status (per capita household income), level of education (years of schooling of the head of the household for children and adolescents and of the women themselves for adults, grouped in low [0-6y], medium [7-12y] and high [>12y]), and race/ethnicity (white, black, mixed-race, Asian, and indigenous). Results: The sample was composed by 73,620 individuals (n=14,580 children <5y; n=15,606 girls 11-19y; n=43,434 women 20-49y). Among children, the prevalence of excess weight, wasting and stunting was 16.91%, 2.75% and 5.97%, respectively. Differences related to SES, education, and race/ethnicity were verified, except for the prevalence of child wasting by the education level. Adolescent girls presented 18.40% of excess weight, 2.80% of underweight, and 5.52% of stunting. Prevalence of excess weight varied by SES and race/ethnicity, while stunting varied by SES and education level. Stunting prevalence was lower among white girls, as compared with mixed-race adolescent girls. Over three quarters of women aged 20-49 y presented excess weight (42.17%), 13.75% were found to be obese obesity, 3.86% of underweight, and 5.71% of short stature. Prevalence of excess weight was higher among lower educated and black women aged 20-49 y, as compared with highly educated and white women. Short stature was also more prevalent among black and mixed-race, low educated, and low-income women. Underweight prevalence was higher among lower educated and black and mixed-race women, as compared with highly educated and white women. Conclusions: In Brazil, the prevalence of excess weight was at least 3-fold higher than that of undernutrition for children and for adolescent girls. In adult women, the prevalence of excess weight was at least 7-fold higher than that of undernutrition. Lower income, less educated, as well as black and mixed-race women presented both more obesity and

stunting as compared with more privileged women. Public policies were successful at reducing undernutrition, however, controlling or reducing obesity is still a challenge.

Keywords: Malnutrition; socioeconomic status; education; race relations; health status disparities; Brazi.

IS INEQUALITY AFFECTING THE NUTRITIONAL STATUS OF ADULT CHILEAN POPULATION? NUTRITIONAL STATUS IN ADULT CHILEAN POPULATION: INEQUALITIES IN A POST-TRANSITIONAL COUNTRY

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Background and objectives: Previous research in Latin America shows that socioeconomic status (SES) influences dietary patterns and obesity distribution. However, it is unclear how SES impacts overall nutrition status, in a post-transitional country such as Chile. The objective of this study was to assess the relationship between nutritional status (overweight, short stature and anemia), and two key aspects of SES-income and educational level in adult Chilean population.

Methods: Nationally representative data of 1,413 women (20-49y) and 819 men (>49y) from the 2003 and the 2009-2010 Chilean National Health Surveys were included in these secondary analyses. Body mass index (BMI) was categorized as underweight, overweight and obesity according to WHO criteria. Overnutrition was defined as BMI ≥25 kg/m2. Short stature (height <1.49m) and anemia (hemoglobin concentration <12 mg/L) data were assessed only for women. Descriptive statistical analysis and Chi square tests were used to compare prevalence (%; 95% CI) by educational level (low=0-7 y, middle=8-12y, and high>12y) and income tertiles.

Results: Overweight [(34.0% (30.1%-38.2%) in women] and [47.8% (41.5-54.1) in men] and, as well as, obesity [(27.1% (23.5%-30.9) in women] and [28.9 (23.7-34.8) in men], were high while underweight was negligible. Less educated women had higher prevalence of overnutrition (80.2%; 68.8%-88.1%) and short stature (14.9%; 8.5%-13.7%) than higher educated women (49.2%; 40.9%-57.5% and 3.7%; 2.0%-6.9%, respectively) (P<0.05 for both). Poorer women had higher prevalence of short stature (10.1%, 7.4%-13.8%) than richer women (2.2%, 1.0%-5.0%) (P<0.05). Anemia did not differ by SES. In men, nutritional status did not vary by income or educational level (all p>0.05).

Conclusions: In a post-transitional country such as Chile we observed SES and gender inequalities in adult nutritional status; this poses important challenges for future nutrition policies.

Keywords: Chile, nutritional status, inequalities

MALNUTRITION IN ALL ITS FORMS BY SOCIOECONOMIC STATUS IN COLOMBIA

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Background and objectives: Understanding the socio-economic inequalities of malnutrition in Colombian population is important in order to effectively address the double burden of malnutrition and associated health consequences. This study examined the association of all forms of malnutrition by socio-economic status (SES) in preschools and non-pregnant women, in Colombia.

Methods: A Secondary analysis of data from the 2010 Colombian National Nutrition Survey was conducted. Sample for this analysis comprised children less than 5 y (preschools), and non-pregnant women (11-49 y). Criteria for malnutrition were: overweight/obesity (preschools: BMI-for-age-z-score >2; non-pregnants 11-19: BMI-for-age-z-score >2; non-pregnants 20-49: BMI ≥25kg/m2), wasting/underweight (preschools: weight-for-age-z-score <-2; non-pregnants 11-19: BMI-for-age-z-score <-2: non-pregnants 20-49; BMI <18.5kg/m2), stunting/short-statute (preschools: height-for-age-z-score <-2; non-pregnants 11-19: height-for-age-z-score <-2; non-pregnants 20-49: height<1.49m) and anemia (preschools: hemoglobin <110g/L; non-pregnants: hemoglobin <120g/L). SES was stratified in terciles. Individual sample weights were applied to all regression analysis of malnutrition variables and their association with SES.

Results: Prevalence of overweight/obesity was 45.2% in non-pregnants 20-49 y, 16.2% in non-pregnants 11-19 y and 5.2% in preschools. Prevalence of wasting/underweight was: 2.9% in non-pregnants 20-49 y, 1.8% in non-pregnants 11-19 y and 1.2% in preschools. Prevalence of stunting/short-statute was: 13.8% in preschools, 11.3% women 20-49y and 11% in women 11-19y. While, prevalence of anemia was 27.4% in preschools, 12.4% in non-pregnants 20-49y, and 7.8% in non-pregnants 11-19 y. Preschools from the lowest tercile of SES presented the lowest prevalence of overweight/obesity (4.4%), but the highest prevalence of wasting (1.5%), stunting (17.3%), and anemia (30.8%) (p<0.05). On the other hand, non-pregnants 11-19 y in the lowest tercile of SES presented the highest prevalence of overweight/obesity (17.0%), underweight (2.1%), short-statute (13.7%), and anemia (10.3%) (p<0.05). Similarly, non-pregnants 20-49y in the lowest tercile of SES presented the highest prevalence of overweight/obesity (47.6%), underweight (3.5%), short-statute (15.1%), and anemia (15.4%) (p<0.05).

Conclusions: Socioeconomic inequalities are present in the epidemiological context of the double burden of malnutrition. Public health nutrition policies should address these inequalities.

Keywords: Colombia, socioeconomic status, malnutrition, inequalities

MALNUTRITION IN ALL ITS FORMS DIFFERS BY SOCIOECONOMIC STATUS, EDUCATION LEVEL AND RACE/ETHNICITY IN ECUADOR

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Background: In Ecuador, undernutrition in the form of stunting has modestly declined but remains high in some regions and subpopulations, whereas overweight and obesity have increased at alarming rates in all age, racial, and socioeconomic groups. Objective: Describe the prevalence and distribution of malnutrition in all its forms (stunting, wasting, anemia, overweight, and obesity) by ethnicity/race, level of education, and socioeconomic status.
Methods: We analyzed data of the last National Health and Nutrition Survey to estimate national prevalences for stunting, wasting, anemia, overweight, and obesity in children <5 y, adolescent women 11-19 y, and women 20-49 y. Level of education was defined by the mother's or the woman years of schooling: low (0 to 6 y; primary school or less); medium (7 to 12 y; secondary to high school); and high (more than 12 y; more than high school). Socioeconomic status was divided into tertiles and measured by using a multidimensional poverty index, which identifies deprivations across three dimensions (health, education, and standard of living). Results: In children<5 y and adolescent women the prevalence of stunting and anemia is significantly higher in indigenous groups and among children and adolescent women of low level of education and of low socioeconomic status. Indigenous women have the highest prevalence of overweight (41.3%) compared to Afro-Ecuadorian (31.8%) and Mestizo (38.9%), whereas obesity is higher in Afro-Ecuadorian women (34.9%) compared to Indigenous and Mestizas (13.3% and 25.4%, respectively). Conclusions: Stunting, anemia, overweight and obesity significantly differ by race and by socio-economic status. Racial minorities are proportionally more affected by malnutrition than mestizo children and women in Ecuador.
Keywords: Malnutrition, double burden, overweight, obesity, Ecuador, SES

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC INDICATORS IN GUATEMALA

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Background and objectives: Malnutrition results from the interaction of poor-quality diets and healthcare environments, and unhealthy behaviors, all of which are shaped by political instability, poor economic development, social inequalities, and globalization. Socioeconomic disparities in malnutrition denote the degree to which the prevalence of malnutrition in all its forms (MAF) differ between more or less social and economically advantaged groups. In Guatemala, data is lacking about how MAF distributes across socioeconomic indicators for the subsequent identification of health disparities. Therefore, our objective was to reveal disparities of MAF by socioeconomic indicators in children <5y, adolescents, and women of reproductive age (WRA).
Methods: We used the 2008 National Maternal and Child Health Survey conducted in Guatemala. We estimated the prevalence (95%CI) of MAF: stunting/short stature, anemia and overweight/obesity in children <5 y (n=10,645), adolescent girls (15-19 y) (n=2,894), and WRA (20-49 y) (n=13,925). Then we evaluated whether the prevalence of MAF differed according to SES tertiles, educational level (classified as low for 0-6 y, middle for 6-12 y, and high for ≥12y), and ethnicity. Disparities are shown as the ratio of low to high-SES, and low to high educational level and the ratio of indigenous to non-indigenous. Results: Stunting/short stature national prevalence was 48.0% (45.8,50.2) among children, 51.1% (48.4,53.8) among adolescents, and 29.0% (27.5,30.1) among WRA. The prevalence of stunting in these age groups was 3.1, 1.9, and 3.0 times significantly higher in the poorest SES compared to the richest tertile; 3.4, 1.9 and 3.5 times significantly higher in the lower educational level than in the highest level; and 1.8, 1.9 and 2.6 times significantly higher in indigenous than in non-indigenous population. Anemia national prevalence was 49.2% (47.1,51.3) among children, 25.1% (22.7,27.7) among adolescents, and 26.9% (25.3,28.5) among WRA. The prevalence of anemia in these age groups was 1.3, 1.8 and 1.7 times significantly higher in the poorest SES compared to the richest tertile; 1.2, 1.7 and 1.7 times significantly higher in the lower educational level than in the highest level. The prevalence of anemia was 1.2 times higher in indigenous vs. non-indigenous only in WRA. Overweight/obesity national prevalence was 6.0% (5.3,6.6) among children, 21.3% (19.3,23.4) among adolescents and 57.8% (56.5,59.2) among WRA. Overweight/obesity prevalence between SES and educational level was only significantly different in WRA (richest SES tertile was 1.4 higher compared to the poorest tertile; the medium educational level was 1.1 higher than the lower level). Among adolescents, overweight/obesity was 1.3 significantly higher in indigenous than in non-indigenous; whereas for WRA run in the opposite direction as the higher prevalence was 1.1 times among the non-in-

digenous. Conclusions: In Guatemala, stunting/short stature and anemia were more prevalent among low-income, low education level, and indigenous population. Overweight/obesity was more prevalent in high-income, medium educational level, and non-indigenous WRA. These outcomes demonstrate socio-economic and ethnic disparities for MAF. Therefore, a national priority should be given to a set of the most cost-effective interventions which can be scaled up immediately. Not addressing malnutrition disparities has social, economic and moral implications.

Keywords: Malnutrition, socioeconomic status, ethnicity, educational level, nutrition policy

MALNUTRITION IN ALL ITS FORMS BY SOCIOECONOMIC STATUS IN MEXICO

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Background: In Mexico, undernutrition has declined and overnutrition has become a public health concern. However, the distribution of both conditions is not equal throughout the population, therefore it is important to document disparities by socioeconomic indicators, particularly among the most vulnerable populations such as children and women of reproductive age.

Objective: Compare the prevalence of malnutrition (over and undernutrition) by socioeconomic indicators in Mexican children and women of reproductive age.

Methods: We included children <5 y old (n=10 658) and non-pregnant women of reproductive age (n=8,044 for women 11—19 y; n=14,542 for women 20—49 y) from the Mexican National Health and Nutrition Survey 2012. We defined overweight, obesity, wasting/underweight, stunting/short stature following the World Health Organization criteria, and anemia as altitude-adjusted hemoglobin <110 g/L for children <5 y; and <120 g/L for women 11—49 y. We compared the prevalence of malnutrition by tertiles of SES, education level (of the mother in the case of children and adolescents), and ethnicity (indigenous/non-indigenous).

Results: In all age groups those with low SES, low education and indigenous compared to high SES, high education and non-indigenous had 2.8—4.4 times higher prevalence of stunting or short stature, and those with low SES had 1.1—1.4 times higher prevalence of anemia. For overweight and obesity, among children <5 y old the prevalence was similar across groups; among women 11-19 y those with low SES and indigenous had 1.3—1.5 times lower prevalence; and among women 20-49 y those with low education had 1.3 times higher prevalence.

Conclusions: Disadvantaged populations (low SES, low education and indigenous) have a higher prevalence of malnutrition,

whereas the prevalence of overnutrition is either equal (children <5 y), slightly lower (women 11-19 y) or even higher (women 20-49 y with lower education). These results highlight the need for specific actions to address nutrition inequalities in the Mexican population.

Keywords: Undernutrition, overnutrition, socioeconomic indicators, Mexico

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN PERU

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Background and objectives: Peru is undergoing the double burden of malnutrition. There is an unequal distribution among subgroups of the population between the increase in overweight and the persistence of undernutrition that are likely explained by social disparities. We compared the distribution of malnutrition in children under five, adolescents (15-19 y) and women of childbearing age (WCA; 20-49 y) by socioeconomic status (SES), education and ethnicity.

Method: The 2015 Peruvian National Demographic and Family Health Survey were used for the present analysis. We calculated the prevalence of overweight and obesity combined (OW), wasting/underweight, stunting/short stature and anemia in children under 5 y, adolescents and WCA as per WHO standards. A crude prevalence ratio (PR) was calculated dividing the prevalence of the highest stratum to that of the lowest stratum for SES, education or ethnicity. A t-test for complex surveys was used to identify if the differences in prevalence were statistically significant (p<0.05).

Results: In children the prevalence of OW, wasting, stunting and anemia was 9.1% (8.5-9.8), 0.9 % (0.7-1.1), 14.1% (13.4-14.9) and 32.0% (31.0-33.0), respectively. OW was higher in children from households with high SES and whose mother´s education was high [PR=3.5 and 2.6, respectively] and lower in indigenous children [PR=0.4]; wasting, stunting and anemia was higher among indigenous children [PR=2.3, 2.8 and 1.5, respectively] and lower in children from households with high SES [PR=0.3, 0.2 and 0.6, respectively] and whose mother´s education is high [PR=0.1, 0.1 and 0.6, respectively]. In adolescents the prevalence of OW, underweight, stunting and anemia was 31.7% (29.5, 33.9), 0.5% (0.2, 0.9), 22.9% (21.1, 24.6) and 20.6% (18.7, 22.5), respectively. OW was higher among high SES adolescents [PR=1.4] and lower in those with indigenous ethnicity [PR=0.7], whereas stunting was higher among indigenous adolescents [PR=1.6] and lower in high SES and educated adolescents [PR=0.4 and 0.2, respectively]. In WCA the prevalence of OW, underweight, short stature and anemia was 65.2% (64.3-66.2), 0.9% (0.8-1.1), 34.5% (33.5-35.6) and 21.7% (20.8-22.6), respectively. OW was higher among women with high SES [PR=1.1], and lower among indigenous and high educated women [PR=0.8 for both]; underweight was higher among highly educated women [PR=2.6]; stunting was higher among indigenous woman [PR=1.5] and lower in women with

high SES and high education [PR=0.5 and 0.3; respectively] and anemia was higher among indigenous woman [PR=1.2].

Conclusions: The double burden of malnutrition is still prevalent in Peru. Anemia remains the most prevalent indicator of undernutrition for children and WCA, and OW is most prevalent among WCA. There was a significant difference in the distribution of malnutrition by social indicators. In general, undernutrition is negatively associated to SES, education and being indigenous, whereas OW is positively associated to SES.

Keywords: Malnutrition, social disparities, children and women nutritional status in Peru.

MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN URUGUAY

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Objective: to describe the forms of malnutrition in children under 4 y.o and women 20 -49 by SES.

Method: two data bases were used, National Survey of Nutrition, Health and Development, carried on 2013 (<4 y.o) and the Second National Survey of Noncommunicable Disease Risk Factors (20 to 49 y.o) carried on 2013. To know the degree of association of the quantitative variables, Pearson Chi-square hypothesis test (chi2) was used. All tests were considered statistically significant with a status (α) of 0.05 (p <0.005). Income was studied in terciles in the first data base and in ranges of income in the second.

Results: Regarding the socioeconomic characteristics of Uruguayan households, it could be highlight that their general conditions are good, since it was observed that almost 100% of households have electric light (99.25%), drinking water (94.83%), motor vehicle (94.37%), television (97.12%), Computer (93.98%) and refrigerator (97.48%). No significant differences were found either by income tertile or by mothers´educational level.

In the only situation it was found significant differences in the first tercile of income was the health system that children were attended.

From a nutritional point of view in children under 4 years old, the public health problem what is stands out is overweight and obesity, (17.73%), finding no significant differences by income tercile or mother´s educational level.

Under weight does not seemed to be a public health problem although there are significant differences in the lowest tertiles of socioeconomic satus (SES) and educational level, although the percentages are very low (0.84% and 0.38%). As short stature is around 5%, there are significant differences in the third tertile of income and the second and third mothers´educational level.

Regarding to women from 20 to 49 y.o it was found that 53% were overweight or obese (29.8% overweight and 23.3% obese), while on the other hand, 2.7% were low weight and 2.1% had short stature.

The women educational level, was low in the 15.8%, 57.1% had the medium level, and 27% had a high level.

While in the study of the level of income, 46% were found in the lowest income range, 27.4% were within the second level of income (medium-low), 13.5% in the third (medium), 9.2% in the fourth (medium high) and 4.0% in the highest level of income.

A statistically significant association was found between obesity in the low SES (25.6%) with the medium and high level (17.0%) (p <0.005). As well as a significant association between malnutrition due to overweight and obesity in the low SES (55.4%) vs. medium (43.5%) and medium high (44.5%) (p <0.005).

Regarding the analysis of nutritional status and educational level, it was found a positive association between overweight or obesity with low educational level (61.5%) in relation to a high level (36.2%). (P <0.005). In the case of obesity, it is observed that a lower level of education, increase the probability of developing obesity in all cases (33.8% in the first level of education, 24.2% in middle and 15.6% in high level) (p < 0.005).

Keywords: Forms of malnutrition, age, socio economic level

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MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC STATUS IN CHILE

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Background and objectives: Previous research in Latin America shows that socioeconomic status (SES) influences dietary patterns and obesity distribution in population. However, it is unclear how SES impacts overall nutrition status, in a post-transitional country such as Chile. The objective of this study was to assess the relationship between nutritional status (overweight, short stature and anemia), and two key aspects of the socio-economic status (SES), monthly income and educational level, in adult Chilean population.

Methods: Nationally representative data of 2574 women and 1695 men (>20 years) from the 2003 and the 2009-2010 Chilean National Health Surveys were included in this secondary analyses. Body mass index (BMI) was categorized as underweight, overweight and obesity according to WHO criteria. Over-nutrition was defined as BMI ≥25 kg/m2. Short stature was considered as a height <1.49m for women and <1.62m for men. Women with he-

moglobin <12 mg/L were classified as anemic. Descriptive statistical analysis and Chi square tests were used to compare prevalence (%; 95% CI) by educational level (low=0-7 y, middle=8-12y, and high>12y) and income tertiles.

Results: Overweight [(34.6% (31.6%-37.7%) in women] and [48.3% (44.1-52.2) in men] and, as well as, obesity [(32.7% (29.7%-35.8) in women] and [21.3% (18.4-24.6) in men], were high while underweight was negligible. Less educated women had higher prevalence of overnutrition [(82.0% (77.3%-85.8%)] and short stature [14.9% (8.5%-13.7%)] than higher educated women [(50.3% (42.8%-57.8%)] and [3.7% (2.0%-6.9%)], respectively) (P<0.05 for both). Poorer women had higher prevalence of short stature [10.1% (7.4%-13.8%)] than richer women [2.2% (1.0%-5.0%)] (P<0.05). Anemia did not differ by SES or educational level. High educated men showed a higher prevalence of overweight [(55.1% (46.2-63.7%)] compared with those with a medium educational level (all p>0.05).

Conclusions: Chile, considered as a post-transitional country, faces a significant SES and gender inequality which affects the nutritional status of the adult population. This situation is a challenge for future public nutritional policies.

Keywords: Malnutrition, anemia , inequalities, obesity, Chile

Conflict of Interest disclosure: Deborah Navarro-Rosenblatt, MF Mujica-Coopman, Sandra Lopez-Arana and Camila Corvalan have no conflicts of interest.

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ADVANCES AND CONTROVERSIES OF NUTRITION IN LATIN AMERICA

BREAKFAST, PERFORMANCE AND DIETARY BALANCE: HOW IS BREAKFAST INTAKE IN SPANISH PEOPLE?

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Breakfast is the first intake of the day and must provide the energy needed to start daily activities. Scientific evidence supports that adequate breakfast consumption induces metabolic and neurohormonal changes in the short and medium term that favor a better performance of cognitive capacities, attention and even help to better physical performance throughout the morning. Breakfast consumption also contributes to nutritional balance and adequate intake of several nutrients. Studies conducted in schoolchildren as well as in adults have investigated associations between breakfast consumption and cognitive effects, exploring outcomes such as attention, sensorimotor responses, recent memory, problem solving or verbal capacity. Results are not conclusive, but they provide some evidence of a positive effect on sensorial-motor responses and problem solving. Different studies have shown an association between usual consumption of adequate breakfast with a lower risk of obesity, lower risk of inadequacy of calcium intake and other nutrients.

In Spain recent data show that 92% of men and 93% of women usually have breakfast. This intake on average yields 18% of the calories of the day, 18% in men and 17% in women. Some 8% of the Spanish school age population age does not take any food or beverage before beginning their school tasks. There is unequal distribution of the proportion of usual breakfast consumers across age groups, gender and socioeconomic level, with a higher rate of non-consumers in adolescents and lower socioeconomic level.

Among Spanish people, foods and beverages consumed with this first intake of the day are similar on working days and weekend days. It usually consists of milk (76% usual consumers), coffee (54%), bread (45%), with optional added oil (16%), tomato (7%), butter (11.8%), margarine (3%) and / or marmalade (9.8%). Other options include cookies (25%), bakery products and pastries (17%) or breakfast cereals (13.5%). Less frequent options can be cold meats and sausages (11%), cheese (4.4%) or yogurt (3%). Fruit is usually consumed by 9% and/or natural freshly pressed juices 10.4%, or to a lesser extent bottled juices (6.5%). The proportion of schoolchildren who complete an adequate breakfast, including a dairy food or beverage, a choice of either bread or cereal and a portion of fruit is below 10%, even lower (3%) in adolescents. Correlates of adequate breakfast consumption include having breakfast in the company of other family members, sitting at the table and dedicating enough time, at least 10 minutes, for consumption.

Keywords: Breakfast. Population studies. Diet adequacy. Health inequalities

BREAKFAST HABITS IN VENEZUELA AND COLOMBIA: A REVEALING COMPARISON

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Colombia and Venezuela have a similar geography, tropical climate and influence of Spain and Africa for their food pattern. Traditionally, both countries share similar foods, preparations and customs, such as arepa based on corn flour. Breakfast is similar in both regions with foods such as coffee, arepa, cheese and egg. According to ENSIN 2010, 91.8% of Colombians eat breakfast. The Nielsen study showed how Colombians keep the tradition at breakfast of consuming eggs, bread, homemade arepa, coffee and chocolate. These foods are consumed by 7 out of 10 Colombians in their households. A Colombian breakfast is made up of 37% for beverages and 61% for solid foods. Within the solids, about 3/4 of the food is processed at homes. According to the ENCOVI 2016 study in Venezuela, of the three main daily meals, breakfast is omitted by 22% of the population, but also is the most absent meal. From 2014, 11.3% of the population was reported to eat only two or fewer meals a day. 80% of the population and 88.7% of the poorest do not have resources for the weekly purchase of food,

which affects the quality and quantity of the diet. A recent report from the NGO Caritas shows how the Venezuelan diet has deteriorated at an accelerated rate, in the last 5 years. This NGO evidenced that 61% of households have changed their usual pattern of meals, more than 71% of families have deteriorated their diet and 80% have had some food deprivation. 8% of these households have resorted to eating in the street and 3% have requested food on the street. The Food and Nutrition Security Outlook for Latin America and the Caribbean reported by FAO in 2016, remarked that food inflation reached 315% in Venezuela, the highest in the region for several decades, while in Colombia it has reached 10.8% for the same period. Moreover, the price of breakfast has increased more than 2210% in the last 3 years, according to the ENCOVI 2016 study. More than five years ago there were concordances between the breakfasts of Colombians and Venezuelans. Today, the Colombians maintain their traditions, quantity and quality in the first meal of the day, while the breakfast of Venezuelans is submerged between food shortages, low quality and high prices. In Venezuela there is an unprecedented food crisis. The FAO Global Information and Early Warning System, which lists and updates the list of countries requiring external assistance for food, has placed Venezuela on its list of warning since 2017.

Keywords: Breakfast, Morning meal, Meals, Venezuela, Colombia

BREAKFAST HABIT AND NUTRITIONAL QUALITY, IN STUDENTS OF THE LICENCIATE IN NUTRITION, ATTENDING TO UNIVERSIDAD NACIONAL DE CÓRDOBA, ARGENTINA

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Breakfast is the first daily meal used to interrupt with the overnight fast. Etymologically the term "breakfast" means "to break the fast."

It has been demonstrated that the breakfast habit contributes significantly to the nutritional balance of food as a whole.

Breakfast must pay 20-25% of the total daily energy; its quality depends largely on the variety of elements which is composed. It has been suggested that a good breakfast should contain, at least 3 food groups: dairy, cereals and derivatives and fruit.

A nutritionally adequate breakfast is associated with a better physical and intellectual performance, better health and the prevention of certain pathologies (overweight/obesity).

Objective: To inquire into the habit, nutritional quality and conditioning factors during breakfast in 2nd to 5th year students attending the Licentiate in Nutrition at Universidad Nacional de Córdoba in 2015.

Material and Methods: Cross-sectional descriptive study. Universe 1287 students. Random sampling n = 98 students (8%) who gave consent. Variables: age (years old) <24 and ≥24, origin (Córdoba-capital, Córdoba-interior, other provinces), habits (frequency, composition, time, use of electronic devices). Instruments: Alibefis-Glanc Project Questionnaire (reduced) Habits, Uses and Habits of Food, Recreation and Physical Activity in Latin America (SENC). Approved by the Ethics Committee of the Hospital Nacional de Clínicas, UNC (REPIS No. 2706/15). Nutritional quality of the usual breakfast: Adapted Breakfast Quality Index (BQI-a) whose total score = 10. Quality categories: deficient, average and adequate. Statistical analysis: Infostat.

Results: The average student's age was 22.93±3.07 years old. 6.1% of respondents never had breakfast and 39.8% did not daily. The main causes were: lack of time (50%), lack of appetite (33.3%) and feeling of discomfort at breakfast time (16.7%). 64.1% of those students who used to have breakfast, recognized doing so using an electronic device. The average breakfast time was 17.5±7.5 minutes (max. 45, min. 3). 61.4% consumed dairy drinks, and 94.7% bakery products derived from cereals. Only 15.8% consumed fruits. 14% exceeded the recommendation about the daily intake of free sugars according to WHO only during breakfast and 54.9% used artificial sweeteners. Breakfast did not cover energy recommendation in 80.7% of the cases.

Usual breakfast quality obtained from BQI-a showed that most students do not have adequate nutritional qualities breakfast (p <0.01), only 10.5% were at this level, and almost ¼ presented deficient quality breakfast. The average score was 5.28±1.63. No ideal score breakfast was recorded. The group of students ≥24 years old, from Córdoba Capital who did not attend classes regularly showed better quality.

Conclusion: 60.2% of the surveyed students had breakfast daily. None presented ideal nutritional quality and only 10.5% showed adequate quality, showing very low fruits intake. The rest did not have breakfast or did it infrequently

Keywords: Breakfast, nutritional quality, University students, eating habits

Further collaborators: Acknowledgment: Canale, MG.

BREAKFAST FOOD CONSUMPTION IN PERUVIAN SCHOOLCHILDREN: A COMPARISON BETWEEN RURAL AND URBAN AREAS

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Background: An unbalanced diet, whether due to excess or deficit of ingested calories, is one of the main causes of (overweight and obesity) malnutrition. Breakfast is considered the most

important meal of the day and should contribute to 20-25% of nutritional needs. In developing countries, as Peru, the prevalence of overweight among children is increasing every year. However, few studies have assessed the associations between breakfast intake and overweight/malnutrition.

Objective: To assess breakfast intake in two Peruvian zones: rural-area in extreme poverty with a state food-aid program and urban-area in nutritional transition without program.

Methods: Cross-sectional descriptive study. 451 school children, 171 from rural and 280 urban areas. Socioeconomic characteristics, anthropometric measures (weight and height, z-score, BMI, Age) and food consumption at breakfast and at day (24-hour recall) were evaluated.

Results: The rate of literacy was 70.8% and an average income of 268 soles/month, being higher in the urban-area (95% and 349.6 soles/month) than the rural-area (46.5% and 185.5 soles/month) (p<0.001). Nevertheless the prevalence of thinness (23.3%) and overweight (19.4%) was higher in the urban-area than in the rural-area (4.7%, 8.8% respectively) (p<0.001).

In both areas, children eat breakfast at school about 10:30 in the morning, 2 hours after school starts. Children in the rural area do not bring home breakfast since they receive food from the state school feeding program "QALI WARMA", consisting of a glass of milk with a cereal (bread, cracker with kiwicha or quinoa). Breakfast is carried out within a daily pattern consumption, characterized by : milk (593.41±335.18g), blue fish (18.3±16.5g), legumes (50.3±62.2g), cereals (150.85±71.59g) and tubers (156.7± 142.0g).

Schoolchildren in the urban area mostly (95%) bought breakfast at food kiosks in schools and less frequently (5%) it was brought from home. In the kiosk there were: Breaded fried chicken, fried sausage, boiled or fried eggs; as accompaniment: potatoes, mainly fried or boiled; or sandwiches (fresh unpasteurized cheese, sweet ham or egg) and juices or soft drinks. No fruits were dispensed at school, although they were occasionally bought out. The breakfast they brought home was mainly made up of eggs, boiled potatoes and occasionally season's fruit. This breakfast is made in a food pattern characterized by meat (67.78±61.32g/day), sausages (5.03±14.38g/day) and superfluous foods (sugar/sweets/cakes/chocolate/soft drinks) (80.52±32.32g/day).

Conclusions: Schoolchildren in both areas eat very few fruits and vegetables at breakfast, especially in the rural area. However, rural schoolchildren's breakfasts represent a healthier eating choice, due to state food- aid program, while breakfasts in the urban area are less healthy due to their high content of fat and sugar.

Keywords: Food consumption, breakfast, schoolchildren, Peru, overweight, malnutrition

BREAKFAST IN PARAGUAY: QUANTITATIVE AND QUALITATIVE ASPECTS

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According to O'Neil et al. "Breakfast is the first meal of the day that breaks the fast after the long period of sleep and is consumed within 2 to 3 hours of waking; It is comprised of food or beverage from at least one food group, and may be consumed at any location ".

Breakfast is considered one of the most important meals of the day, because it provides essential nutrients and produces pleasant sensations that are maintained throughout the day. In addition, different investigations have shown that breakfast helps to improve eating habits and the cardio-metabolic risk profile.

According to the first National Nutrition Survey, traditional Paraguayan food is comprised of three important meals per day. Breakfast was one of them and varied according to the urban or rural area. In urban areas, breakfast included milk that was generally not drunk alone, but accompanied by infusions (infusion of yerba mate called "cocido", or coffee). It was accompanied by baked goods (biscuits), made with wheat flour. In rural areas the "cocido" with milk was accompanied by manioc which is a tuber consumed very much in Paraguay. Milk could also be accompanied by ground coconut or peanuts in a "Mortar and pestle".

However, different factors have influenced this traditional feed pattern to change substantially. The accelerated urbanization experienced by the Paraguayan population; The change of working hours from a double shift schedule with a break at noon to a continuous schedule, where workers who move appreciable distances, consume one or two meals outside the home, globalization with a promotion of foods rich in Calories, sugars and saturated fats, and with devaluation of the consumption of traditional foods like seasonal fruits and vegetables, are factors that have influenced the change.

One of the main problems in relation to the food consumption habits of the Paraguayan population, especially the young population living in urban areas, is the high percentage of people who have insufficient and inadequate breakfast before going to work or to study.

In a pilot study investigating breakfast-related habits among 50 students in medical and nutrition careers in Asuncion, we have shown that 60% of the students had adequate breakfast, 35% ate insufficiently at breakfast and 5% did not eat breakfast. Insufficient breakfast is a very frequent habit in our young population. It generally consists of a portion, represented by a glass or cup, of milk or fruit juice, without any other food. These figures are similar to the findings of other studies in the school population.

We are currently developing research in different populations (schoolchildren, university students, pregnant women and the elderly) to determine the severity of the changes experienced in the habits related to breakfast of the Paraguayan population.

Keywords: Breakfast, Paraguay

MEASURING FOOD AND NUTRITION VULNERABILITY IN THE ELDERLY

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The number of people aged 65 or older is projected to grow from 524 million in 2010 to nearly 1.5 billion in 2050. According

to the UN, the proportion of those over 80 and over 100 years are also rapidly increasing. The elder adult is among the most vulnerable in the population. Regardless of their socio-economic status, the old may have difficulty buying, preparing, consuming, and assimilating food. Restrictions in their autonomy, lack of care, changes in feeding priorities, organic, emotional and economic problems are some of the factors that interfere with their access to food and maintenance of their nutritional status. Studies carried out in Venezuela, based on mixed-methods, have identified a method that captures the food and nutritional vulnerability in people over 60 years of age. The qualitative instrument allows a simple, fast and economical initial screening. The dimensions of the vulnerability capture food insufficiency, lack of autonomy to provide food, cognitive, psycho-social, socio-cultural, alteration of appetite, solidarity and physical factors. These 19-items are related with: 1. Unhealthy meals. 2. Low quantity of food 3. Skip one of the main daily meals (breakfast, lunch and / or dinner), 4. Limited meals for lack of money. 5. Still hungry after your meals. 6. Changes in your body weight. 7.Physical problems that interfere with chewing, swallowing, or feeding yourself. 8. Avoid preparing your meals because of lack of energy or motivation. 9. Forget to eat your meals. 10. Forget to buy your food. 11. Skip a meal, when you are alone, sad, or nervous. 12. Need support from a relative or other person to take your meals. 13. Need financial aid to buy food. 14. Avoid some foods because of religion, custom or health problems. 15. You feel you need to eat better to overcome pain and combat sickness. 16. Is more important to buy your medicines than your food. 17. Loose your appetite if you are not in your usual place. 18. Share your food with others. 19. Buy little food when shopping so as not to carry heavy bags home. The instrument is responded by the elderly, without any physical manipulation. The instrument was used in Venezuelan communities with a good reliability of 0.78 of alpha-Cronbach's. It needs to continue being validated in diverse communities. This instrument allows: to identify vulnerable older adults, focus on programmed actions and evaluation of social programs for the improvement of the quality of life, especially the nutritional status. The overall goal for a healthy aging is the reduction of disability due to diseases, where food and nutrition plays an important role.

Keywords: Aged, Aged 80 and over, Nutrition policy, Nutrition assessment, Feeding behavior

NUTRITIONAL ASSESSMENT OF THE ELDERLY POPULATION OF RURAL COMMUNITIES OF CHIAPAS

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Older adults are at increased risk for malnutrition diseases, with an incidence in women. Globally, the number of elderly people has increased; The United Nations in 2002 projected for 2025 figures of 1200 million people over 60 years and by 2050 will amount to 2 billion. In Mexico, life expectancy has increased in recent years (73 years for males and 77.9 years for females), in addition to the increase in rates of chronic degenerative diseases.

The National Health and Nutrition Survey (2012) indicates that rural and indigenous women have a higher prevalence of deficiency diseases (iron and folic acid), coupled with the presence of obesity, metabolic syndrome and other diseases of old age. The rural diet shows high energy density and low nutrient content, giving preference to volume, low cost of the product and to alleviate hunger, legumes being the source of protein, with low consumption of dairy products, meat and vegetables, a situation prevailing in the zones Of Mexico

The prevalence of abdominal obesity is significantly higher in the 40-79 years of age, with an incidence in the 70-79 years - 80% (males) /93.9% (females) - with a tendency to decrease with age; In rural Chiapas the prevalence of overweight and obesity is lower, but tending to increase.

The evaluation of the nutritional status of a sample of elderly adults from rural communities in the central zone of Chiapas, aims to present the longitudinal, descriptive study in 365 individuals older than 60 years of age (180 women / 185 men), free-living, without mental disabilities, with a collaborative attitude; Anthropometric information was recorded: weight, height, waist circumference and brachial, as well as application of the questionnaire "The Mini Nutritional Assessment (MNA)", the latter using a directed interview, being used for measurements: digital scale, ultrasonic stadiometer (ADE) and flexible tape measure (SECA); With percentage analysis and test for independent samples (t-students), 95% confidence interval.

The results show a population with mean age of 74 + 7.4 years, with body weight (kg) per centimeter (cm) of height by age and gender located in 50th percentile —weight: 57.22 + 13.50 (women), 64.50 + 14.85 men's)-, presence of low size; Waist circumference in women showed a higher risk for metabolic diseases (91.79 ± 14.22 cm) than men (91.13 ± 18.26 cm), brachial circumference according to the NHANES III women located in 75th percentile (25.64 + 8.47), men in percentile 50 (25.34 + 7.82); With respect to body mass index (BMI), both genders are within the parameters of normality: 24.04 + 8.49 (women) and 23.61 + 7.40 (men). The MNA indicates that 43.5% are at risk of malnutrition, 49.7% are well nourished and 6.8% are malnourished.

In conclusion the integral evaluation in the older adult favors to emit a better diagnosis of the nutritional situation, as in this study, where the population despite the fact that it reflects a normal BMI, there is the risk of malnutrition on the one hand and waist circumference Denotes metabolic risk, being observed thin people but with predominant waist.

Keywords: Elderly, nutritional evaluation, rural population

RISK ASSESSMENT AND NUTRITIONAL VULNERABILITY AND FUNCTIONALITY OF MUSCULO-SKELETAL TISSUE, IN ELDERLY HOSPITALIZED IN SANATORIO LA TRINIDAD DURING FEBRUARY – MARCH, 2017

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Background: Malnutrition is a very frequent situation in the elderly. Aging conditions increase the risk of suffering from changes in body composition (fat mass increase, lean mass decrease and function loss) along with pathophysiological characteristic factors that are added to basic nutritional status. One of the central facts that comes along aging are body composition changes, and the most significant phenomenon of aging is sarcopenia, which is defined as muscle mass loss and strength that occurs from the 50´s at a rate of approximately 1-2% per year. Is very difficult to recover nutritionally an elderly deteriorated, hence the importance of valuing nutritionally this group and detecting early risks to take measures of action.

Objectives: To assess the risk and nutritional vulnerability and functionality of musculo-skeletal tissue, in elderly hospitalized in Sanatorio La Trinidad during February – March, 2017.

Methods: Quantitative, descriptive, observational, correlational and transverse. Population= Adults ≥ 75 years hospitalized in Sanatorio La Trinidad, excluding patients who had pathologies that by itself altered the base nutritional status. Sample = 141, not probabilistic. The selected sample was evaluated by different methods and tools: Mini Nutritional Assessment Questionnaire (MNA), Geriatric Nutritional Risk Index (GNRI), Nutritional Vulnerability Survey and Dynamometry Grip Force. Results were tabulated and a database was generated with the program Microsoft Excel® 2016. Description was made by proportions or percentages for quantitative and qualitative variables. Data were correlated by means of Chi-square test with yacht corrector, a significance value of 0.05 (5%) was adopted.

Results: Average age 82 years (SD±6). 61% was female. 74% lived with relatives and/or caregivers at the time of the internment, 25% lived alone and 1% in private geriatrics. The Nutritional Risk obtained by MNA: 43% normal, 45% risk and 12% malnutrition; according GNRI: 50% without risk, 18% under, 20% moderate and 11% high. Nutritional Vulnerability Degree: 3% didn´t present, 91% mild, 6% moderate. Grip Force: 41% weak, 38% normal, 21% strong. Positive correlation between MNA and GNRI (p =

1.77131E-09), GNRI and Grip Force (p = 0.001), Grip Force and Calf Circumference (p = p = 0.003) and GNRI and CP (p = 0.000).

Conclusions: The elderly are vulnerable individuals. Detecting the needs, difficulties and challenges that they live in order to obtain food along with the nutritional status evaluation and functioning of the skeletal muscle tissue is fundamental at the moment of the hospitalization for the decision making during the same and also for patient following after hospitalization.

Keywords: Elderly; Food Vulnerability; Malnutrition; Muscle-skeletal functionality.

Further collaborators: Service of Nutrition Sanatorios de la Trinidad Palermo y San Isidro Thames y Fleming

DIETARY AND NUTRITIONAL ADEQUACY IN BREAKFAST AND IN DIETARY SUPPLY OFFERED TO OLDER ADULTS: A LOOK INTO THE FUTURE

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Throughout life, an adequate breakfast should provide 20-25% of the daily energy intake. In the Spanish context, considering the most common eating habits in the population, breakfast should consist of three main food groups: a portion of dairy or equivalent food, a portion of bread or other cereal based food and a portion of fruit. Optionally, depending on the type of activities to be carried out and on usual daily intake, items from other food groups can also be added, adjusting portion sizes and amounts of foods consumed.

Social and demographic changes along increased life expectancy have led to a progressive aging of the population, so that, at present, the group of people aged over 65 y. represents approximately 18% of the Spanish population, expected to reach up to 20% by 2020. Although it is currently under debate which is the best and most efficient model to provide quality care services for the elderly, the trend so far in Spain has been towards professional residential care in institutions that accommodate more than 100 elderly people.

The group of elderly people is very heterogeneous, and so are their nutritional needs. Aging processes as well as other frequent circumstances in the elderly influence food habits, food intake and nutritional status in senior people. Estimates of the prevalence of malnutrition in the elderly are variable, but it is a frequent problem in institutionalized elderly.

Suffering multiple pathologies and use of multiple pharmaceutical prescriptions are common in this population group. Older people often show difficulty in chewing food due to dental or oral cavity problems, loss of dental pieces or use of poorly fitting prostheses, as well as problems in swallowing solids and / or fluids. Mobility problems and/or sensorial decline are even more frequent difficulties that contribute to limit the autonomy for food and beverages consumption. Anorexia and depression are com-

mon as well. Due to all the above, the elderly group is typified as a group at nutritional risk.

According to the Spanish report White Paper on Food for the Elderly, in only 9% of geriatric institutions food supply is supervised by a dietitian. The wide interpersonal variability in nutritional requirements in older people requires the prescription of individualized guidelines, taking into account the health status, underlying pathology, drug consumption, alcohol consumption, sociocultural characteristics, degree of autonomy, physical activity and eating habits. Overall, it is advised a universal basic diet for the elderly, based on a prudent and healthy diet and strategies to promote personal autonomy, active life and prevention of dependence.

Keywords: Breakfast. Elderly. Nutritional risk. Malnutrition. Personal autonomy

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TOOLS TO PROMOTE TAILORED INTERVENTION PROGRAMS IN NUTRITIONAL DEPRIVED ELDERLY LIVING COMMUNITIES

TOOLS TO PROMOTE TAILORED INTERVENTION PROGRAMS IN NUTRITION FOR ELDERLY

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Introduction to the symposium:

According to the United Nations*, the ageing of the world population (that is, the increasing proportion of older people in the population) is one of the most significant social transformations of the 21st century spanning all countries, regardless of their developmental stage. It is expected that in 2050, nearly half of the world's population will live in countries or areas where at least 20 per cent of the population is aged 60 years or over. This phenomenon has implications for most sectors of the society, including the demand for goods and services,as well as family structures and intergenerational ties. Amongst those, the health and food provision sectors play an important role to the maintenance of independence and quality of life in old age. The outcomes of the PRONUTRISENIOR project constitute the basis for the symposium. The methodologies designed and applied aiming to create and disseminate among health professionals, caregivers and elderly, simple tools to assess elderly nutritional status and to promote healthy eating will be explored. Such tools originated from a detailed evaluation of elderly within their living space (environmental, social and economic features), at a local scale and with a cohesive combination of multidisciplinary theoretical and methodological frameworks. This symposium also addresses the key issues of food, eating and meals in elderly everyday life as well as interventions tailored specifically to improve the nutritional status, physical function and quality of life of elderly citizens, in order to avoid further events and complications.

HOLISTIC APPROACH TO THE STUDY OF FREE LIVING ELDERLY: LESSONS FROM THE PRONUTRISENIOR PROJECT

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Countries worldwide face an increasingly elderly population. An important public health goal is to support healthy ageing, where adequate nutrition and prevention of malnutrition plays a key role.

The Pronutrisenior project was conducted by the University of Porto in collaboration with Oslo and Akershus University College and the University of Iceland, within the catchment area of the Nova Via Health Unit. It was funded by an EEA grant. The aim of the project was to develop tools for assessing and monitoring the food and nutrition situation among free-living elderly in the north of Portugal, and to develop training materials for health and other professionals working in gerontology and elderly. The project was designed to have an holistic and interdisciplinary approach and used a range of quantitative and qualitative methods. For assessing health and nutritional status, questionnaires and anthropometric measurements were used. Dietary intake was assessed by 24-h recall and FFQ. Geocode mapping was used in a geographic information system (GIS) to identify the elderly and to map both their food environment, the built environment and their social environment. Their socio-economic situation, cognitive status, food-related quality of life (QoL) and other information was also collected using interview assisted questionnaires.

Out of 602 elderly (> 64 years), 27% were malnourished or at risk of malnutrition. The most important predictors of malnutrition were low social support and low food-related QoL. The study also shed light over important factors for healthy ageing, such as possibilities of maintaining a social network, distance to health center and places to buy food, as well as to what extent the environment supported physical activity and walking outside, for example by having safe sidewalks.

The approach used in ProNutriSenior gives a holistic understanding of several aspects of the elderly's health and nutritional situation including food-related QoL. This provides a good basis for developing tailored interventions. The data collected in this

project was extensive, and the experiences could be used for further developing simpler and more targeted tools in Portugal and other countries, for monitoring and for multi-country comparisons. The interdisciplinary approach involving geography, nutrition and bio-statistics proved to be most useful and could be applied also in other settings.

Keywords: Elderly, nutritional status, geographic information system, holistic approach

Further collaborators: Ana Monteiro, Cláudia Afonso, Anzhela Sorokina, Rui Poínhos. Bruno Oliveira, Luís Fonseca, Miguel Sousa, Flora Correia, Bela Franchini, Bárbara Pereira, Ada Rocha, Margarida Liz and Inga Thorsdottir

RESULTS FROM A RESISTANT TRAINING INTERVENTION IN ELDERLY PEOPLE AND HOW TO STIMULATE PARTICIPATION

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Background and objectives: The aim of the present work was to identify baseline predictors of drop out with particular focus on physical function; and to compare changes in physical outcomes after a resistance exercise program between elderly men and women.

Methods: Subjects (N=236, 73.7 ± 5.7yrs, 58.2% female) participated in a supervised 12-week resistance exercise program (REP) designed to increase muscle mass and -strength. Body composition (DXA), quadriceps- and grip strength, physical function as 6-minutes-walk-for-distance (6MWD) and timed-up-and-go (TUG) were measured before and after the REP. Quality of life (QoL) was assessed.

Results: Neither drop-out (11.9%) nor the attendance rate (91%) were different between genders. Although absolute gains in lean body mass (LBM) (1.10 ± 1.30 vs 0.61 ± 1.21kg, P<0.001) and appendicular skeletal mass (ASM) (0.67 ± 0.81 vs 0.42 ± 0.62kg, P<0.001) were higher in men than in women, relative gains were similar (LBM: 1.9 ± 2.2 vs 1.6 ± 2.9%; ASM: 2.3 ± 2.8 vs 2.1 ± 3.0%). Both men and women improved similarly in quadriceps strength (55 ± 57 vs. 52 ± 49), grip strength (3.2 ± 6.2 vs. 3.0 ± 5.4lb), 6MWD (31 ± 38 vs. 35 ± 32m), and TUG (-0.55 ± 0.98 vs. -0.72 ± 1.22sec). In comparison to completers, participants who dropped out were older and had poorer physical function at baseline than the completers. They also exercised less at baseline,

however, neither body composition, QoL nor MMSE were related to drop out.

Keywords: Resistant training. Physical function. Elderly. Intervention.

NUTRITIONAL STATUS OF HEART FAILURE OUTPATIENTS IN ICELAND – FOOD, FUNCTION AND FEELINGS

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Introduction: Malnutrition is associated with increased length of stay in hospital and further complications, consequentially increasing the cost of care. Heart failure is a disease prevalent in older adults, characterized by chronic symptoms, such as fluid retention, dyspnea and fatigue. Therefore patients suffering from heart failure are a delicate group that can be susceptible to malnutrition. Evaluation of nutritional status has never been performed for this group in Iceland.

Aim: To assess the risk of malnutrition in heart failure outpatients using the Simple Screening tool for Malnutrition (SSM) as well as assessing the nutritional status of a smaller sample of the same population using estimations of: appetite and dietary intake; body mass index, reported weight loss and fluid retention; biochemical measurements; grip strength and quality of life.

Methods: This was a cross-sectional study. All patients with an appointment at the outpatient clinic of heart failure at Landspitali University Hospital were screened for malnutrition (n=84). A total of 60 patients were invited to participate, whereof 33 signed an informed consent (55%). Participation consisted of answering three questionnaires, as well as undergoing blood sampling and measurement of grip strength. Information on the results of SSM, ICD-10 diagnoses, medication, height, weight, blood pressure and edema were collected from electronic medical records.

Results: Screening for all patients (n=84) showed that around 30% were at medium or severe risk of malnutrition. Participants in the current study (n=33) were of both sexes, thereof 27% (n=9) women and medium age was 76 (25th, 75th; 70, 80) years. The participants' diet turned out to be rather rich in protein, with majority reporting to eat at least one warm meal per day. A total of 23% of participants reported loss of appetite and 27% reached reference values for grip strength. Mean T-score for quality of life was 43.8 (±10.4), with the norm being 50±10. Using diagnostic criteria from ASPEN, in tota, 19% (n=6) of participants were diagnosed

with malnutrition and are in need of nutritional intervention, whilst 16% were defined at risk and need supervision.

Conclusion: One third of all patients were at risk of malnutrition and grip strength of participants proved to be impaired. Health related quality of life was significantly lower than among healthy older adults. It is of importance to routinely monitor nutritional status of all patients for timely interventions. Such interventions are valuable to improve both nutritional status and quality of life, as well as to preclude further events and complications. The outpatient clinic of heart failure provides high level of services, which likely plays a big role in maintaining the quality of life of patients.

Keywords: Nutrition, malnutrition, heart failure, food, quality of life

Further collaborators: Birgisdottir BE1, Faculty of Food Science and Nutrition, University of Iceland

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'FILL THE NUTRIENT GAP' WITH 'COST OF THE DIET' TO INFORM NUTRITION POLICY AND PROGRAMMING

'FILL THE NUTRIENT GAP' APPROACH TO SITUATION ANALYSIS AND DECISION-MAKING FOR IMPROVING NUTRITION

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Advancing national multi-sectoral nutrition policies and programming can greatly benefit from an assessment of opportunities and challenges to meeting nutrient requirements of key target groups, because meeting nutrient intake requirements is a key prerequisite for preventing malnutrition. The Fill the Nutrient Gap (FNG) tool for situation analysis and decision making analyses context-specific secondary sources of information on factors that directly or indirectly impact on whether people can access and consume nutritious foods and whether they meet recommended nutrient intakes. The aim of the FNG is to formulate recommendations for policies and programming in agriculture, food systems, health, social protection, education and other sectors that can contribute to improving nutrition. The tool has been developed by WFP, with inputs from UNICEF, IFPRI, University of California Davis, Harvard University Boston, Epicentre Paris and Mahidol University Bangkok.

The FNG analysis focuses on different target groups, such as young children, pregnant and lactating women and adolescent girls, in different situations, by distinguishing for example whether they live in urban or rural areas, in food-secure or -insecure areas, belong to higher or lower socio-economic groups etc. The

analysis seeks information (and identifies gaps) on food system related information, such as access to markets, availability of nutritious foods, affordability of nutritious foods based on price relative to income (using Cost of the Diet analysis, CotD) and (public-) private sector initiatives to improve availability and affordability of nutritious foods; social protection system related information such as coverage, targeting and design of social safety nets programs; health system related information, such as coverage of supplements, home-fortification and nutrition education; education system related information; and also information on food choice and preparation practices, intra-household food distribution, and infant and young child feeding practices, from surveys as well as qualitative enquiries. The CotD analysis is also used for modeling the impact on affordability of a nutritious diet of approaches that increase availability and affordability of nutrients from affordable nutritious foods, fortified foods and supplements and/or improve purchasing power.

The analysis is designed and conducted together with in-country stakeholders from different constituency groups (government, UN, academia, private sector, civil society) that work in the food system, health system and/or social protection system, and concludes with recommendations for improvements to be made to policies and programs across these sectors that are most needed, relevant and feasible in the country's context. Since its development in 2015, the FNG and CotD has been used in 10 countries and several more are planned for 2017 and 2018.

Keywords: Fill the Nutrient Gap; Nutrition situation analysis; Multi-stakeholder decision making; Cost of the Diet; Nutritious foods

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IMPLEMENTING THE FILL THE NUTRIENT GAP – IN COUNTRY PROCESS AND DATA SOURCING

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The Fill the Nutrient Gap (FNG) has been developed to gain greater insights into and develop strategies to address one of the two prerequisites to prevent the immediate causes of malnutrition - adequate nutrient intake. It includes a framework for analysis, based on secondary data and linear programming (Cost of the Diet), and a process for multi-stakeholder engagement at country level.

Secondary sources used for FNG analysis include data and other relevant information (reports, grey literature, peer reviewed papers, socio-ethnographic studies and formative research) on nutrition indicators, food access and availability, dietary intake, preferences and practices, food security, household food expenditure and socio-economic conditions, together with analysis of affordability of nutritious diets and intervention modelling using the Cost of Diet (CotD) tool. The secondary data review is extensive, for example, in Pakistan 190 and in Lao PDR 112 sources were reviewed.

Analysis and triangulation of different data sources is used to cross-check findings. National stakeholders contribute to identify and validate data and information sources, and to provide insights on the interpretation of finding inconsistencies. Where available, information from market and consumer surveys on complementary and fortified foods (e.g. Ghana, Indonesia), purchasing patterns of different food commodities by various population segments and, on local supply chains for nutritious foods provide useful insights as to opportunities to be leveraged, on both the demand and supply sides of the food system.

Through this iterative process, the 'nutrient gap' within a country can be better defined in terms of who (vulnerable population groups), where (regions, urban/rural), when (seasonality), why (compounding factors) and how (quantity and/or quality of nutrient intake). Secondary data also contributes to an analysis of the enabling environment, including national legal and regulatory framework, policy, programmes and partnerships relevant to nutrition, to inform entry points for sustainable action. The analysis then identifies and models the potential economic and nutritional impact of possible interventions to address the defined gaps, across the identified sectors and entry points, using CotD (see Deptford et al. and Bose et al.).

The multi-stakeholder engagement process at country level, starts with the identification of key target groups (e.g. children under two, pregnant and lactating women, adolescent girls) and determines the level of analysis (e.g. national, sub-national). Consultation continues throughout the data consolidation and analysis of secondary data and CotD phases, ending with the joint identification of a prioritized set of recommended interventions and policy measures across the food system to improve intake and access to a nutritious diet engaging multiple sectors. Where possible (e.g. Pakistan, Madagascar, Lao PDR, Tanzania), SUN country platforms are used to leverage the multi-sectoral, multi-stakeholder process, involving health, agriculture, social protection, education and the private sector.

Keywords: Fill the Nutrient Gap, Nutrition Situation Analysis, secondary sources and linear programming, multi-stakeholder, affordability of nutritious diets

WHAT CAN COTD ANALYSES TELL US?

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The Cost of the Diet is a method and software developed by Save the Children in 2004 to estimate the cost of a nutritious diet in different contexts. The software uses linear programming to calculate the amount, combination and overall cost of local foods that are needed to provide individuals or typical families with their average needs for energy and their recommended intakes of protein, fat and micronutrients. The software was developed in response to research which showed that the poorest households could not afford the diets being promoted and to better understand the extent to which poverty affects nutrition.

The software uses three streams of information: nutrients from foods (from food composition tables); human requirements for nutrients (from WHO/FAO dietary recommendations) and the local cost of food (collected via market surveys). The software pulls these three streams of information together to find the cheapest combination of foods that meet human nutrient requirements. The software generates four standard low cost diets: 1) an Energy-only diet, which only meets the family's energy requirements; 2) a Macronutrients diet which meets the family's energy, protein and fat requirements; 3) a Minimum-cost nutritious diet, which meets the family's energy, macro and micronutrient requirements and 4) the Food habits diet, which meets the family's energy and macro- and micronutrient requirements, while also reflecting people's typical dietary habits e.g. main staple food and food taboos. The software tells us whether poor households can afford a nutritious diet, what the gap is between the cost of a nutritious diet and what they can afford (their income minus essential non food items). It also allows modelling to be done to identify interventions that would reduce the affordability gap e.g cash transfers, supplementary food, food fortification, and the most cost nutrient efficient diets to promote in different contexts.

A review of Cost of the Diet assessments in Asia found that the affordability gap was 48% and 22% for very poor and poor households respectively. This means that on average very poor households would need to increase their annual income by almost 1.5 times to be able to afford a nutritious diet in addition to other essential non-food expenditures (Save the Children, 2017). In Malawi and Nigeria, national recipes were tested and adjusted to increase their nutrient content at a lower cost using local foods.

In 2016, Save the Children released the Cost of the Diet software Version 2 (rewritten in Delphi XE4©) which is more stable, reliable, and adaptable and the method was published and endorsed in BMC Nutrition (Deptford A, 2017). The software is freely available for use on request, but can only be used by trained practitioners. http://www.heawebsite.org/countries/reports/cotd-software-version-2-2016

Keywords: Cost, Diet, poverty, software

HOW ARE COST OF THE DIET ANALYSES CONDUCTED?

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A Cost of the Diet (CotD) analyses requires the following information: a list of all foods available in the assessment area; the average cost per 100g of these foods during a season(s) or given time point; the energy and nutrient composition and typical dietary habits of these foods; the typical size of households in the assessment area; and the estimated average requirements for energy and recommended nutrient intakes for the individuals included within the typical household. If the affordability of the diet is to be estimated, data on household or per capita income or expenditure is required.

For the list, cost and typical dietary habits of locally available foods, primary data collection using the CotD standardised methods should be used. Alternatively, secondary data sources such as market price monitoring surveys and household consumption and expenditure surveys could be used. In order to determine household size, income or expenditure, household consumption and expenditure surveys could be used. Secondary data can save time and resources and has been previously validated by stakeholders in-country. However, it is important that this data is reviewed for its quality, access rights and appropriateness. Although a more costly and resource intensive option, primary data is current and purposefully collected based upon the objectives of the CotD assessment and the local context.

The CotD software contains numerous databases: the energy and nutrient content for 3,500 foods, their portion sizes and the energy and nutrient specifications for 237 individuals. The CotD software applies these parameters to the data collected through primary or secondary sources and the linear programming solver calculates the least expensive combination of foods to meet the nutrient specifications for the selected household.

The software summarises the results for each diet in terms of the costs, quantity and proportion of nutrient specifications provided by all the foods selected for a given individual/target group or household by day, week, season and year. A study conducted in Ntchisi district in Malawi found that the cost of a nutritious diet that was adjusted to include staple preferences for a household of 5 people was 44,212 MWK a month, for which an adolescent girl was the most expensive individual. Only 59% of the population could afford this diet. The software selected maize, cowpea, green leafy vegetables, liver and dried fish as inexpensive sources of essential nutrients but found calcium, iron and zinc the most difficult nutrients to meet specifications for, using foods available in the market.

Depending on the scope of the assessment and the type of data used, a CotD analysis can take between 3-6 weeks. The process should begin with a consensus on the objectives and scope of the assessment. If primary data collection is to be undertaken, enumerators will need to be hired and trained. CotD analyses should be conducted by certified practitioners. These are nutrition or food security personnel who have attended the 5 day practitioners training and completed an assessment for which the data and report has been reviewed by an independent, certified practitioner.

Keywords: Data, cost, diet, linear programming

HOW IS A COST OF THE DIET ASSESSMENT CONDUCTED?

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The Cost of the Diet (CotD) is a method and software developed by Save the Children to calculate the lowest cost of meeting specifications for energy, protein, fat and micronutrients from local foods. A CotD assessment requires the following information: a list of all local foods; the average cost per 100g of the foods in a season(s); the energy and nutrient composition of the foods; the typical dietary habits of people in the area; the size and composition of a typical household; and the estimated average requirement for energy and the recommended nutrient intakes for the individuals included within the typical household. If the affordability of the diet is to be estimated, data on household or per capita income or expenditure will be required.

Standard methods are used to create the list of foods, record their cost, assess the typical dietary habits of local people, and estimate the typical household size. Alternatively, secondary data from market price monitoring surveys or household consumption and expenditure surveys could be used. This is less costly and labour intensive than collecting primary data but it is important that these data are reviewed in terms of their quality, validity, access rights and appropriateness.

The CotD software contains two main databases: the energy and nutrient content of 3,500 foods with their edible portion sizes, and the energy and nutrient specifications for 237 individuals. The CotD software applies these values with the cost of local foods to a linear programming solver which calculates the least expensive combination of foods to meet the energy and nutrient specifications of the individuals in the household selected. The software presents the results for four standard diets in terms of their costs, quantity and proportion of nutrient specifications provided by the foods selected by the software for all individuals in the household separately and collectively by day, week, season and year.

An assessment done in Ntchisi district in Malawi found that the cost of a nutritious diet that was adjusted to include a preferred staple for a household of 5 people was 44,212 MWK a month, and was most costly for an adolescent girl. The software selected maize, cowpeas, green leafy vegetables, liver and dried fish as inexpensive sources of essential nutrients but found calcium, iron and zinc the most difficult specifications to meet. Only about 60% of the population were estimated to be able to afford this diet.

Depending on the scope of the assessment and the type of data used, a CotD analysis can take between 3-6 weeks. The process should begin by defining the objectives and scope of the assessment. If primary data are to be collected, enumerators need to be hired and trained. A CotD assessment should be conducted by a certified practitioner. This is a nutritionist or food security expert who has attended a 5-day practitioners' training course and has completed an independent assessment for which the data and report has been reviewed by a certified practitioner.

Keywords: Data, cost, diet, linear programming

MODELLING WITH COST OF THE DIET AND INFORMING FILL THE NUTRIENT GAP (FNG) ANALYSIS

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Many households cannot afford to meet the nutrient needs of all its members, which has been shown by Fill the Nutrient Gap (FNG) analyses and Cost of the Diet (CotD) studies in numerous different countries across the world. In particular household members with high nutrient needs relative to their energy needs such as children aged 6-23 months, pregnant and lactating women (PLW) and adolescent girls, are often the most expensive household members and/or require specific foods in addition to those consumed by the rest of the family so it is especially difficult to meet their nutrient needs. In order to address this issue solutions are required that reduce the cost of nutritious foods, make nutritious foods more available (e.g. in cases where certain foods do not exist or the availability of foods meeting nutrient needs are highly seasonal), and/or increase purchasing power. Using the Cost of the Diet tool different solutions to improve affordability can be modelled to help inform the FNG analysis on possible feasible solutions within the specific context and guide the formulation of sector specific recommendations.

Throughout the FNG process stakeholders from agriculture, food systems, health, social protection, education and other sectors are engaged to provide their input and interpretation into the analysis. One key area in which stakeholders provide input is the identification of appropriate interventions to be modelled. For example, stakeholders working in agriculture might be interested to see the potential impact of home-gardening interventions such as vegetable production; bio-fortification of crops; or large scale agricultural interventions aimed at reducing the overall cost of certain foods or making certain foods more available. Those involved in social protection might be interested in modelling cash transfers or vouchers for nutritious foods (e.g. leafy greens or animal source foods) or fortified Specialised Nutritious Foods (SNFs). Stakeholders within the health sector might be interested in seeing the impact of interventions such as the provision of iron folic acid tablets for PLWs; micronutrient powders or fortified complementary foods for children under 2; or staple food fortification. These interventions can be targeted at specific individuals of interest in the household, such as a child under 2, a PLW and an adolescent girl, or to the household as whole. Interventions aimed at specific target groups can also be combined to form a potential 'optimal' package of interventions targeting different household members. Different types of transfer modalities can also be modelled such as the provision of these foods through market channels or via voucher/ in-kind.

The results of the modelling are then used to inform stakeholders of the different potential intervention options that could be effective within their context. These results are intended to stimulate discussion and sensitise sectors on the contribution they could provide to improve access to nutritious diets, rather than prescribe specific actions. The results of the modelling combined with the wider FNG analysis then provide a basis upon which sector-specific recommendations to directly or indirectly improve nutrient intake can be formulated and implemented.

Keywords: Fill the Nutrient Gap, Cost of the Diet, linear programming, nutrition situation analysis, affordable diets

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APPLICATION OF WHO GUIDELINES ON OPTIMAL BLOOD FOLATE CONCENTRATIONS TO PREVENT NTDS IN COUNTRIES

OPTIMAL SERUM AND RED BLOOD CELL FOLATE CONCENTRATIONS IN WOMEN OF REPRODUCTIVE AGE FOR PREVENTION OF NEURAL TUBE DEFECTS

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Increasing awareness of the public health significance of insufficient folate intake due to its association with neural tube defects has emphasized the need for guidance on use of appropriate biomarkers for the assessment of folate status and cut-offs to define folate deficiency and insufficiency at the population level. In the early 1970's, the World Health Organization (WHO) endorsed serum and red blood cell folate cut-off values for defining folate deficiency based on risk of occurrence of macrocytic anaemia. In 2005, WHO updated the cut-off values to reflect folate deficiency based on metabolic indicators, primarily homocysteine concentrations. In recognizing the important role of folate in the prevention of neural tube defects, WHO has recently released guidance on the assessment of optimal folate status among women of reproduction age for the prevention of these birth defects. WHO recommends that red blood cell folate concentrations should be above 906 nmol/L (400 ng/mL) at the population level to achieve the greatest reduction in neural tube defects. This same threshold can also be used as an indicator of folate insufficiency in women of reproductive age at the population level. However, this should not be used at the individual level, as it cannot explain all cases of neural tube defects and therefore cannot predict an individual's risk of having a neural tube defect-affected pregnancy. The use of microbiological assay is recommended for the assessment of red blood cell folate concentrations with appropriate quality control measures. The current recommendations are based on results of microbiological assay with chloramphenicol-resistant strain and folic acid calibrator. The use of different folate calibrators or dif-

ferent microorganisms may lead to different results among microbiological assays and laboratories and may need to adjust the threshold value for optimal red blood cell folate. Due to insufficient evidence, a threshold for serum folate could not be made at this time for defining folate insufficiency.

USING THE WHO OPTIMAL BLOOD FOLATE CONCENTRATIONS FOR THE U.S. TO EVALUATE THE IMPACT OF FORTIFICATION AND SUPPLEMENT USE POST-MANDATORY FOLIC ACID FORTIFICATION (NHANES 2007-2012)

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Intake of 400μg folic acid per day before and during early pregnancy prevents many neural tube defects (NTDs). Since 1998 there have been three sources of folic acid in the U.S.: enriched cereal grain products (ECGP) mandatorily fortified with 140μg folic acid per 100g; ready-to-eat (RTE) cereals, which are allowed but not required to contain up to 400μg per serving; and dietary supplements, generally 400-800μg. In 2015 the World Health Organization established a threshold for the population level optimal red blood cell (RBC) folate concentration [> 906nmol/L (>400ng/L)] for prevention of NTDs. We found previously that 22.8% of the U.S. population is below the threshold. To evaluate the impact of the current folic acid fortification policy and consumption patterns on NTD risk, we used 2007-2012 data from the National Health and Nutrition Examination Survey (NHANES), a cross-sectional survey representative of the non-institutionalized U.S. civilian population, to examine usual daily intake of synthetic folic acid and naturally-occurring food folate and RBC folate concentrations among U.S. women of reproductive age (12-49 years). RBC folate concentration distributions were then used in simulations to predict NTD risk based on published dose-response relationships in the population overall and among those consuming folic acid from difference sources. The predicted NTD risk among U.S. women of reproductive age was 7.1 NTDs per 10,000 live births (95% uncertainty interval [UI] 5.3-9.2). Among those with ECGP as their only source of folic acid had lower median usual daily intake of folic acid (115 μg interquartile range 79-156) and higher predicted NTD risk (8.5/10,000 live births; 95% UI 6.4-10.8) compared to those consuming folic acid from additional sources. We estimate that if reproductive-aged women with ECGP as their only source of folic acid (48% of population) increased their folic acid intake through RTE cereal and/or supplements, it could be possible to prevent up to an additional 640 NTD-affected pregnancies (95% UI 143-114) per year. Although folic acid fortification has prevented many NTDs, under current consumption patterns some U.S. women of reproductive age remain at risk for having an NTD-affected pregnancy.

RED BLOOD CELL FOLATE INSUFFICIENCY AMONG NON-PREGNANT WOMEN OF CHILDBEARING AGE IN BELIZE: PREVALENCE AND PREDICTED RISK OF NEURAL TUBE DEFECTS

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Background and objectives: Studies have shown that increased consumption of folic acid by women during the periconceptional period can significantly reduce the occurrence of neural tube defects (NTDs), which has led to current recommendations for women to consume 400 μg (0.4 mg) of folic acid daily. Based on these studies the World Health Organization recently released recommendations stating that red blood cell (RBC) folate concentrations should be above 400 ng/L (906 nmol/L) for optimal prevention of folate-sensitive NTDs. The objective of this study was to determine the distribution of RBC folate insufficiency (<906 nmol/L) and potential risk of NTDs based on RBC folate concentrations among non-pregnant women of childbearing age (WCBA) in Belize.

Methods: A national and regional multistage cluster probability survey was completed during 2011 among Belizean WCBA, aged 15–49 years. Demographic and health information, and blood samples for RBC folate analyses were collected from 973 women. Prevalence rate ratios of folate insufficiency and predicted NTD prevalence were estimated based on RBC folate concentrations.

Results: The national geometric mean of RBC folate was 719 nmol/L (95% confidence interval (CI) 689, 750). National prevalence of RBC folate insufficiency was 48.9% [95% CI 44.8, 53.1]. RBC folate insufficiency showed wide variation by ethnicity: Mayan 70.5% (60.1% - 79.2%); Mestizo 46.2% (40.2%-52.3%); Creole/Garifuna 54.3% (46.3%-62.1%) and Other 33.5% (21.0%-48.8%). There was also wide variation by geographic region (40.2%-60.4%). Based on the population distribution of RBC folate con-

centrations, the national predicted NTD risk was 15.4 per 10,000 live births (95% CI 11.8, 19.9). The predicted NTD risk was more than 12 times higher among women with RBC folate concentrations at the 5th percentile compared to women with RBC folate concentrations at the 95th percentile (49.5 vs. < 4 per 10,000 live births, respectively).

Conclusions: Folate insufficiency is very high and remains a public health concern in Belize. Folate insufficiency was more prevalent among Mayans, Creole/Garifunas and in regions with a large proportion of indigenous populations. These results suggest that there is a need to ensure that WCBA in all ethnic groups in Belize receive at least 400 μg of folic acid daily to reduce the risk of folate-sensitive NTDs.

Keywords: Red blood cell folate insufficiency, Prevalence of Neural Tube Defects, Predicted risk of Neural Tube Defects, Non-pregnant women of childbearing-age, National and regional representative household survey in Belize

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FOLATE AND VITAMIN B12 STATUS AMONG NON-PREGNANT WOMEN OF REPRODUCTIVE AGE IN MALAWI, 2015-2016

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consumption of 400 mcg of folic acid prevents the majority of NTDs. Folate insufficiency or deficiency is thought to be a public health problem in Malawi among women of reproductive age (WRA), but data on folate and vitamin B12 micronutrient status are lacking.

Objective: To determine baseline prevalence of folate deficiency and insufficiency and vitamin B12 deficiency among non-pregnant women aged 15-49 years in Malawi.

Methods: A cross-sectional two-stage cluster sampling design was used to conduct a national nutrition and biomarker survey from December 2015 to February 2016. Demographic and health information were obtained through in-person interviews. Blood samples were collected and analyzed for serum and RBC folate and vitamin B12 from 35 clusters (8 urban, 27 rural) in the country's three regions (North, Central, South). Serum folate deficiency, RBC folate deficiency, and RBC folate insufficiency were defined as <7 nmol/L, <305 nmol/L, and <748 nmol/L, respectively. Vitamin B12 deficiency was defined as <148 pmol/L.

Results: Preliminary data show the prevalence of serum folate deficiency, 8.5% (95% CI 5.8-11.2); RBC folate deficiency, 13.3% (95% CI 9.6-17.0); RBC folate insufficiency, 81.4% (95% CI 75.7-87.0) and vitamin B12 deficiency, 11.8% (95% CI 8.1-15.4). Char-

acteristics of Malawian women by micronutrient status will be presented.

Conclusions: Establishing baseline folate and vitamin B12 status among non-pregnant women of reproductive age will help to define folate and vitamin B12 micronutrient insufficiencies and deficiencies in Malawi.

Keywords: Malawi, women of reproductive age, red blood cell folate insufficiency, red blood cell folate deficiency

PERICONCEPTIONAL SURVEILLANCE FOR PREVENTION OF ANEMIA AND BIRTH DEFECTS IN SOUTHERN INDIA

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Neural tube closure defects (NTDs) are among the most common and debilitating adverse pregnancy outcomes globally. The association between maternal folate status and NTD risk was first observed over 40 years ago. However, there is little representative population-level data, particularly in South Asia, where the burden and consequences of micronutrient deficiencies are unacceptably high.

We are establishing a periconceptional surveillance program as part of our collaborative community-based research program in Southern India. As part of this project, we are establishing the gold standard microbiological assay for folate in our laboratory in India, with expert guidance from the Centers for Disease Control and Prevention, and conducting a biomarker survey to elucidate the burden of anemia and micronutrient deficiencies in women of reproductive age. This living laboratory will also serve as the foundation for future intervention trials and public health programs in this well-characterized population, for the prevention of anemia and birth defects.

In this presentation, we describe the establishment of this periconceptional surveillance program in Southern India, and discuss preliminary findings from the pre-intervention biomarker survey.

Keywords: Folate, neural tube defects, biomarker, surveillance, India

Track 4: Nutrition and Management of Diseases

OBESITY AND EPIGENETICS

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Epigenetics involves the study of heritable changes in gene expression that are not due to changes in the nucleotide sequence, but involve for example other mechanisms such as histone modifications or changes in DNA resulting from alterations in the methylation patterns. Such modifications can be impacted by diet, nutrients, and environmental factors such as chemical, psychological, and behavioral influences. While the role of dietary factors is more readily understood in the context of obesity, the epigenetic phenomena associated with obesity risks provides the linkage between factors such as stress, sleep deprivation, and obesity.

The specific genetic alterations that result in diseases and complex syndromes continue to be identified. Genome-wide association studies have identified concepts such as the rare variant-common disease hypothesis and the common variant-common disease hypothesis. Through association studies, unique gene-environment interactions, which may occur with or without specific periods of permissiveness or vulnerabilities, have also been identified. Major conditions where the role of exposomes and epigenetics are rapidly evolving are obesity, neurological disorders, immune disorders and cancers. These concepts are particularly intriguing in the context of obesity. Search for the origins of disease have led to investigations into the roles of dietary and environmental factors as potential triggers or modifiers of risk. In reproduction, certain genes are turned on while others are turned off in the process of imprinting. In the case of imprinting, even though there are two copies of the gene, only one copy is expressed and there is no substitute functional allele. For this reason, imprinting makes the imprinted genes more vulnerable to the negative effects of mutations.

Nutritional epigenetics is seen as a means for the prevention of developmental diseases and cancer, and to delay processes associated with aging. Studies with rodent models suggest that during both early development and in adult life, environmental signals can activate intracellular pathways that directly remodel the epigenome, leading to changes in gene expression and function. These studies define a biological basis for the interplay between environmental signals and the genome in the regulation of individual differences in behavior, cognition, and physiology. Diseases in which epigenetic factors are considered significant include type 2 diabetes mellitus, obesity, inflammation, cardiovascular diseases, neurocognitive disorders, and immune diseases, with function influenced by environmental factors including early experience. In conclusion, epigenetics can be defined as heritable traits resulting from changes in DNA or chromatin structure without alterations in the DNA sequence and is considered an important phenomenon in understanding the environmental influences that modify disease risk profiles.

Keywords: Epigenetics, Obesity, Nutrition, Environment, Diet

OBESITY AND SLEEP DISORDERS

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We will discuss about the link between obesity and sleep disorders.

The sleep deprivation leading to a continuous organic stress syndrome with disbalance in body homeostasis and the release of hunger and satiation's neurotransmitters.

We'll show the sleep patterns identified like epigenetic factors that could pull the trigger of obesity.

We show an easier way to identify the presence of sleep disorders in obesity patients.

Finally we call the attention about the role of treat those sleep disorders because if we don't treat them we are making the treatment obesity worse than already is.

Keywords: Obesity, Sleep disorders

NUTRITIONAL FOODS OR SUPLEMENTS IN OBESITY: CLINICAL APPROACH

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The incidence of obesity, diabetes and insulin resistance are associated with high glycemic load diets. Identifying food or food groups that can help patients to achieve their glycemic, cholesterol or weight goals could be an preventive strategie with high impact on the cost of the treatment and in public health funds.

Our aim was to analyze the insulin secretion in subjects free of diabetes in response to different food groups with high glycemic index .

We evaluate 24 volunteers free of diabetes, 11(45,8%) female, with 24±3,7years old that underwent laboratory and anthropometric during three days with a seven day distance between each day. Were exclude from the study subjects with diabetes and hypertension. After a 10 hour fasting subjects received a meal with

50 grams (g) of carbohydrate (CHO) with high glycemic index from different foods.

The 3 meals had 240 milliliters (ml) of whole milk (12g of CHO). For the first day (1D) we added 65g of wheat flour bread (38g de CHO). In de second day (2D) we added 43g of wheat flour bread (25g de CHO) and 50g of chunkey bananas (13g de CHO). In the third day (3D) we added 43g of wheat flour bread and 86g of apple (13g de CHO). Subjets were asked to consumed the meal in 10 minutes and blood samples were performed in -15, 0, 30, 60, 90 and 120 minutes. Were determined: BMI, abdominal circumference, glycemia and insulin in all of the samples, glycemia peak value (VPG), insulin peak value (VPI), glycemia time peak value (VTPG), insulin time peak value (VTPI), absolute insulin increase (deltai), absolute glycemia increase, area under de glycemia curve (AUCG) e area under de insulin curve (AUCI).

There were no statistical difference between glycemic values in all the samples and between the curves at VPG, VTPI, deltai and deltag. The VTPG at the 1D were 67,5 ±36,7, at 2D 50,6 ±34,2, at 3D 99,9 ±13,9 (p < 0,008). The AUCI was higher at 1D 2867,2 (809,2-6947,2) than in 2D 1771,5 (689,2 – 4194,0). The 3D was 2345,2 (416,2-9605,2), iqual to 1D.

There is no glycemic índex for meals, only for food. High Glycemic index foods are determined with 70 or above. In this study the 1D had 85 of IG, the 2D had 81 and the 3D had 73. The major responsible for this high IG in all meals were the wheat flour bread that induced an higher insulin secretion in order to maintain the same glycemic value. The VTPG had smaller values in 1D and 2D than in 3D because of its higher IG.

Our study suggests that healthy individuals in order to maintain the same glycemic response after a meal with food from different carbohydrate sources is necessary to have a bigger insulin secretion when the meal has high glycemic index foods

Keywords: Nutrition, Supplement, Exercise, Performance, Obesity

COLLAGEN SUPPLEMENTATION FOR HEALTH OF THE SKIN, CARTILAGE AND MUSCLES – CURRENT MYTHS AND TRUTHS

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Collagen is the most abundant protein in the animal body, it is present from the most primitive invertebrates to man, in at least 27 protein isoforms found in connective tissue throughout the body, such as bones, tendons, cartilage, veins, skin, teeth and muscles.

The commercially important types are Type I, the most common, found in skin, tendons and bones, Type II found in cartilage, and Type III, which forms the reticular fibers of the lungs, intestines, blood vessels, liver, uterus.

Permanent collagen exchange processes in body takes place during the whole human life, the old fibrils are replaced by new ones all the time. In young organism, the collagen production and degradation is balanced dynamically, but with aging the degrada-

tion becomes more intensive and UV radiation, smoking, stress and unhealthy diet can speed up the process.

After protein intake, the most important nutritional factor for proper biosynthesis of collagen is the level of circulating vitamin C. There are at least three vitamin C-depended enzymes, prolyl 3-hydroxylase, prolyl 4-hydroxylase and lysyl-hydroxylase, essential for the biosynthesis of collagen fibers.

Hydrolysate collagen has been generally regarded as having low biological value, because it does not contain all the essential amino acids, it's a reputable nutritional component often used to supplement other proteins because of its superb digestibility and high user tolerance. Hydrolysate collagen have been reported to have beneficial biological functions and designated as Generally Recognized as Safe (GRAS) by the Food and Drug Administration (FDA).

Many researches reported the beneficial effects of oral collagen hydrolysates administration, which crosses the intestinal barrier by dietary bio actives peptides, which reaches the blood circulation and becomes available for metabolic processes. Collagen hydrolysate can be used in several medical applications, such as high energy supplements, geriatric and enteric products, therapeutic or weight control diets for specific digestive disorders, amino acid absorption and metabolism. Papers also included cases of patients with malnutrition attached with trauma, burns, cancer and hepatic encephalopathies. Hydrolysate collagen can be a good source of amino acids for people suffering from anorexia, anemia and for vegetarians. The main scientific evidences show that collagen after absorption can reach and accumulate in the cartilage, stimulating a significant increase in extracellular matrix synthesis by chondrocytes that can prevent or reduce pain in patients suffering from osteoarthritis and osteoporosis. Clinical studies suggest that dietary hydrolyzed collagen supplements are protective agents of tendons, muscle structures and act on joint regeneration in athletes with pain related to joint activity. Important beneficial effects have also been observed in the maintenance of tonus and hydration of skin structures and the quality of hair and nails.

Keywords: Collagen, supplement, skin, cartilage, muscle

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PERSPECTIVES ON NUTRIENT DENSITY: TOO HIGH AND TOO LOW

NUTRIENT-ENERGY DENSITY: ORIGINS OF THE CONCEPT

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The question of what makes a food "healthy" continues to puzzle both regulatory agencies and expert panels. A literature review conducted in 1977 showed that the concept of a nutritious food was not fully defined. General statements that such a food should provide "significant amounts of essential nutrients" were not backed by any firm standards or criteria. The concept of nutrient density was defined three decades later (Drewnowski 2005), along with some of the first attempts to devise a composite nutrient density score. Later attempts to quantify nutrient density of foods, now collectively known under the name of nutrient profiling, have been based on a variety of calories-to-nutrient scores, nutrients-per-calorie indexes, and nutrient-to-nutrient ratios. One problem was that healthy foods were often defined by the absence of problematic ingredients—fat, sugar, and sodium— rather than by the presence of any beneficial nutrients they might actually contain. By contrast, the naturally nutrient rich (NNR) score was based on mean percentages of daily values (%DVs) for 14 nutrients contained in in 2000 kcal of food. The subsequent Nutrient Rich family of scores included nutrients to encourage, notably protein, fiber, and a range of vitamins and minerals, as well as the so-called disqualifying nutrients, saturated fat, added sugars and sodium. The US Food and Drug Administration had been disqualifying foods from carrying nutrition or health claims if they contained excessive amounts of fat, saturated fat, sodium, and cholesterol . Later scores of composite nutrient quality assessed amounts of index nutrients per reference amount: 100g, 100 kcal, or serving size. In addition to nutrients, some models also included food groups to encourage (vegetables, fruits, nuts). The goal of nutrient profiling models was to separate empty calories from more nutrient-dense or nutrient-rich food. Nutrient profiling models were also extended to create novel metrics of affordability or environmental impact. Whereas nutrient density was measured in terms of nutrients per calorie, affordability of foods was measured in terms of calories or nutrients per penny. Environmental impact has been measured in terms of energy or nutrient cost in greenhouse gas emissions associated with food production, processing, consumption, and waste. Initially intended to support of nutrition and health claims, nutrient profiles have found a role in consumer education, regulation of marketing to children, and in food taxation. Industry has used nutrient profiling to assess and reformulate product portfolios.

Adapting nutrient profile models to the needs of low and middle income countries (LMIC), many undergoing nutrition transition, raises additional questions about diet composition, animal versus plant foods, nutrient bioavailability, and amino acid composition of protein. Any nutrient standards need to be based on dietary shortfalls for a given country. Not all nutrient composition and dietary intake data may be readily available. A nutrient profiling manual to evaluate the LMIC food supply would be a valuable addition to the nutrition literature.

APPLICATION OF THE CONCEPT IN A PUBLIC HEALTH CONTEXT

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There are practical and applied aspects for employing "nutrient-density" (ND) as a perspective, beyond total daily intake, as an expression of public health nutrition interest. One can think of ND as a ratio, with a numerator and denominator. The numerator is a quantity of a macro- or micronutrient. The denominator is any expression that can contain (or constrain) the intake of food; it is generally a standard amount of dietary energy, e.g. per 1000 kcal, but it can also be a weight (grams), specific meal or standard portion-size, or even cost/price or environmental footprint (carbon-emission, water-consumption, etc.).

We recognize Brown, Dewey and Allen and their "Complementary feeding of young children in developing countries" (WHO,1998) for insights stimulating the use of ND both in the evaluation and planning of diets, specifically through the infant and toddler years, when human milk forms a variable component of the early-life diet. Both the "critical nutrient-density" concept and the "problem nutrient" term derive from this monograph.

Whereas the nutrient-intake recommendations from the US-Canadian (DRI) and UN (WHO/FAO) sources are based on a fixed daily quantity for each age/sex-group, a novel experience (and experiment) for Latin America was inspired by the Cavendes Foundation of Venezuela, under the leadership of the late Dr. Jose Maria Bengoa in the 1980s. The insightful principle was based on the assumption of a common, communal household-diet (rather than individualized rations); they proposed a prescribed density for each essential nutrient in the family fare, one that would satisfy the needs of each member when consuming the proportion of the foods and beverages meeting their specific daily energy needs. It failed to gain traction in the Region, however, which remained

with the more-established international guidance. With increasing consumption outside of the home in the intervening three decades, however, the assumption of a pooled fare has become obsolete.

Although the future trajectory of the human food supply cannot be predicted with certainty, there are reasonable bases for expecting constraints on caloric intake around the world. Urbanization, and its concomitant sedentary lifestyle imperative, will advance the restriction in effective energy needs, whereas food scarcity may ensue in other settings. In the face of the shrinking energy as the denominator factor, public health tolerance for "empty calories" is reduced, while an imperative to construct dietary fares from micronutrient-enhanced calories will become evident. To the extent that unprocessed foods are to contribute, their biofortification – even in the fruit and vegetable sector – must be considered. The residual processed component of the diet will also need to offer more micronutrients per calorie, but the fortification logistics represent a challenge. Dietary diversity confounds any given staple food's being the conveyor of key nutrients across the whole population. A strategy of "total fortifiable foods," in which a thin – but broad – "veneer" of balanced micronutrient fortification is distributed among all commercially-processed foods, has been proposed by Omar Dary. This, however, presents challenges for micronutrient-safety in any setting with broad extremes of individual energy requirements.

Keywords: Nutrient density, caloric requirement, biofortification, nutrient excess

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GUATEMALAN CASE-STUDY: SITUATIONAL LOW-ENERGY INTAKE

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Guatemala has a unique history for contribution to the understanding of nutritional problems. It has been a pioneer for public policies in micronutrient fortification and supplementation. In the 1950s potassium iodate was found to be as nutritionally efficacious and much more resistant than potassium iodide for fortification of salt. In the 1970s, Guatemala pioneered the fortification of table sugar with vitamin A. Despite these measures, micronutrient malnutrition has not been completely controlled in Guatemala.

At any age, from fetal life to older age, Guatemalans have small body size, with the corresponding implications for daily energy requirements. The combination of the basic dietary pattern in Guatemala and its undersized population allows for a rich basis for understanding the utility of a nutrient-density in analyzing nutrient intake and devising remedial solutions.

The initial issue in the convergence is that recommended intakes for micronutrients are common for any given age, sex or physiological group independent of the weight of the individuals. A population reference value of energy is also created as a standard

reference, but it is widely understood that each individual has a unique energy requirement based on body size, lean-body tissue and exertional efforts.

In our work with Guatemalan women we used reference 'critical nutrient densities' – i.e., nutrient amount per 1000 kcal which would provide the nutrient requirements when the energy requirement is satisfied – to assess the nutrient adequacy of the diet and pregnant and lactating women from rural and urban communities of the Western Highlands. For women who are either pregnant or lactating, the required daily energy and nutrients are higher – sometimes substantially higher – than for women in the non-reproductive state. Although women reported eating more during pregnancy and lactation, estimated energy intakes were below the status-specific requirements. Without the additional foods to meet the greater energy and nutrient needs, intake gaps with respect to the 2004 FAO/WHO Recommended Nutrient Intakes (RNI) were observed for 9 of 17 index micronutrients in pregnant women and 6 of 17 micronutrients in lactating women across the studied communities. If these women were to consume more calories of the same diet, requirements of some – but not all – nutrients would be met. Nutrient which would remain inadequate across the studied communities – i.e., which have a critical nutrient density above the observed nutrient density – include vitamin C, pantothenic acid, vitamin D, E, and K, calcium and iron in pregnant women and vitamin C, pantothenic acid, vitamin D, E, and K in lactating women. Nutrients with an adequate estimated nutrient density – i.e., for which intakes would meet requirements if the women were to eat 100% of their energy assignment – include vitamin B6, B12 and iron in pregnant women and calcium in lactating women.

The realities in Guatemala are such that normative amounts of micronutrients are not consumed both because energy-intakes are below the group reference, and because nutrient-density is intrinsically low. Both situations, however, justify increasing nutrient density as a solution to achieve recommended daily intakes of micronutrients.

Keywords: Pregnant and lactating women, nutrient adequacy, nutrient density, Guatemala

BIOFORTIFICATION: INCREASING MICRONUTRIENT DENSITY OF STAPLE CROPS

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Nutrition interventions to alleviate vitamin and mineral deficiencies (hidden hunger) have made significant contributions to the health and wellbeing of entire generations in low and medium income countries. Universal and targeted supplementation and food fortification schemes with multiple or single micronutrients, however, carry recurring costs that donors and/or consumers must bear because the existing food system does not provide sufficient nourishment for one or more vulnerable stages of the life cycle. The poor have very limited or no access to commercial food or pharma-

ceutical products to eliminate the micronutrient intake gap associated with monotonous plant-based diets. In societies that derive over 50% of the daily energy requirements from a single staple crop such as maize, wheat, rice or cassava, it makes sense to add varieties of the same staples with higher micronutrient densities, especially if the target populations can grow a significant proportion of the food they consume. Biofortification targets the poor, which makes it a supply-driven initiative; but these crops must also be in demand by the food sector to keep the plant breeding and bioengineering pipelines generating high yielding, pest resistant, climate resilient varieties continuously. Biofortified crop varieties are intrinsically loaded with higher concentrations of iron, zinc or provitamin A carotenoids; therefore, their adoption does not bring additional recurring costs to farming households. The plants do the work; and because the crops developed by international agricultural research network centers and national agriculture agencies are public goods, sustainability is not an issue. HarvestPlus and collaborators from multiple disciplines and sectors have developed provitamin A-rich maize, cassava and sweet potato; high iron beans and pearl millet; and high zinc wheat and rice varieties during the past 15 years. While plant-breeding programs continue to feed a responsive pipeline of crop cultivars, 140+ varieties of 10 staple crops are already publicly available and contribute to crop varietal diversity in over 30 countries across continents. The provitamin A, iron and zinc density of the targeted crops have increased up to 15-fold for provitamin A maize and cassava, doubled the iron in several common bean varieties and pearl millet varieties, and increased zinc concentration by 30% in whole wheat and 75% in milled rice. Randomized controlled efficacy trials have demonstrated that at the currently available micronutrient density levels, biofortified crops improve micronutrient status and important nutrient-dependent functions in different vulnerable population groups. Economic analysis indicates that biofortification is cost-effective due to large reductions in inadequate intake and resulting DALYs saved. The potential additive effects of the adoption of multiple biofortified crops can have an important impact on dietary nutrient density and therefore the vitamin A, iron and zinc status of entire populations. The way forward for biofortification follows a 2030 vision of global availability and consumption of micronutrient-rich crops by 1 billion people. Achieving the goals associated with this vision will require scaling up delivery systems in 30+ countries, mainstreaming breeding for higher micronutrient density, and expanding markets and adoption of biofortified crops with multiple partners.

Keywords: Biofortification, micronutrients, staple, crops, diversity

FOOD FORTIFICATION ADDRESSING DIETARY NEEDS

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Inadequate intakes and absorption of vitamins and minerals to sustain good health and development lead to micronutrient deficiencies. With two billion people suffering from deficiencies in Iron, Iodine, Vitamin A and Zinc, this remains one of the world's biggest public health issues.

While ideally, essential micronutrients should be obtained from a balanced and varied diet, this is not always possible. Fortified foods that are both affordable and accessible have been recognized as a cost-effective way to improve nutrition and health of vulnerable populations alongside efforts to diversify diets. Infants, young children and women of childbearing age are disproportionately affected, because of their greater need for these nutrients.

The path to provide relevant and impactful fortified offers should entail:

• understanding the local nutritional needs and gaps to identify most relevant fortificants

• select vectors that are widely and regularly consumed by the target population

• educate and communicate on the benefits of fortified foods

• ensure accessibility of the fortified products

• partner with stakeholders to leverage efforts

• study the impact of our actions for continuous improvements

Quality, safety and sensorial aspects have to be taken into account and it is recommended that food manufacturers develop mandatory internal fortification policies clearly defining fortification levels and appropriate quality management and monitoring procedures.

Eliminating malnutrition is a top priority in the global development agenda and is the second of the United Nation's Sustainable Development Goals. The private sector can work together with governments and civil society to develop new models to make tasty, nutritious and affordable foods accessible to the people who need them.

Keywords: Micronutrient, Fortification, Food, Voluntary fortification

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NOVEL HOME-FORTIFICATION FOR LACTATING WOMEN

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Thoughtful design of a food supplement will consider both dietary needs and cultural behaviors as a way to improve nutritional impact and compliance. This talk will focus on the model we used to develop a novel food supplement for use at home among lactating women in Guatemala. It is well documented that the first 1000 days of a child's life provide a critical window of opportunity to influence cognitive and physical development. Examination of cultural practices during the early postpartum period in the Western Highlands of Guatemala identified the role of atole, or thin gruels,

as a beverage perceived to improve both quality and quantity of breastmilk and an important vehicle to deliver additional nutrients through home fortification. Gruels are consumed in Guatemala several times per day and make an important contribution to total daily water intake, which frequently falls below the Adequate Intake recommendations among lactating women. Initial work quantifying the characteristics of how atole is prepared, served and consumed in markets and at home identified a wide variety in temperature at which atole is served and standard volume consumed. Nutrient gaps were identified by comparing intakes from 24 hour dietary recall to recommended values for women in urban, semi-rural and rural locations. Gaps were found for protein and several micronutrients and were more pronounced in rural women. Based on these data, a goal was developed to deliver an additional 15 grams of high quality whey protein dispersed three times throughout the day. The supplement was initially tested at benchtop for impact on solubility in atole and changes in organoleptic quality. Acceptability and use was further tested through in-country consumer testing in rural and urban dwelling women using both commercially-available and home-prepared gruels. In these panels, women were able to identify a difference between atole with and without whey protein supplementation; however, the supplemented atole was reported as the more preferred beverage. Future work will encompass identifying novel forms of vitamins, minerals and long chain fatty acids that will have little to no impact on color and flavor. Packaging options will focus on materials that protect integrity and prolong shelf life as well as graphic designs that clearly convey serving size and clear, appropriate directions for use. Successful integration of this novel home fortificant into the diet of lactating women will provide a culturally-relevant approach to improve hydration, intake of high quality protein and micronutrient status.

Keywords: Hydration, protein, micronutrients, fortification, lactation

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Track 6: Functional Foods and Bioactive Compounds

SS_144/36
POLYPHENOLS IN HUMAN NUTRITION

POLYPHENOL ADME: HOW FOOD AND PHYSIOLOGICAL FACTORS IMPACT DELIVERY OF THESE BIOACTIVE PHYTOCHEMICALS

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With evidence suggestive of a health-protective role for dietary polyphenols, interest in factors that can influence their bioavailability from foods has increased. Both food matrix and physiological factors are important modifiers of digestive behavior, absorption and metabolism of polyphenols. Using tea, cocoa, grape and berries as models, the role of food formulation on bioaccessibility and bioavailability of key dietary flavonoids (flavan-3-ols, flavonols and anthocyanins) were investigated. Macro and micronutrient interactions in foods and through the GIT were found to alter digestive stability and intestinal transport of flavan-3-ols from these foods. Specifically, formulation with ascorbic acid, minerals and carbohydrate improved flavan-3-ol digestive stability and bioavailability in vivo. In contrast, protein has only a modest negative impact to overall absorption, despite the ability to enhance stability of flavan-3-ols to normal digestion. These factors suggest that flavonoid interactions with macro and micronutrients in foods and through normal digestion may lead to differences in acute bioavailability.

Flavonoid bioavailability and metabolism may also be impacted by dietary and physiological factors including repeated exposure typical of dietary patterns high in fruits and vegetables and the presence of underlying conditions. To study these factors, the impact of background diet (high fat versus low fat), repeated exposure and presence of risk factors (obesity and diabetes) were investigated in animals and clinical settings. 10 day repeated dosing studies with grape polyphenols were conducted with Sprague Dawley (SD) and Zucker diabetic fatty rats. Background diet did not significantly impact anthocyanin or flavonol acute absorption or metabolism in SD rats. However, flavan-3-ol and flavonol bioavailability and metabolism were reduced in diabetic Zucker diabetic fatty rats relative to lean controls suggesting that obesity and diabetes might impact flavonoid bioavailability and metabolism. Similar results were observed in a pilot clinical with lean (BMI 23.5) and obese (BMI 30.5) participants. Following 11 day repeated dosing of grape polyphenols from Concord grape juice (20 oz/d), grape seed extract (900 mg/d) and resveratrol (250 mg/d) to grape polyphenols an increase in acute pharmacokinetic response was observed for catechin, epicatechin and quercetin in lean in-

dividuals but not obese suggesting the potential for differential adaptation in the gut to flavonoid absorption in obese individuals.

Mechanisms of adaptation were explored using the Caco-2 human intestinal cell model. Findings suggest that repeated exposure to 1-10μM of flavonoids during differentiation of intestinal cells results in an enhancement of trans-epithelial transport over time despite a tightening of tight junctions. Changes in xenobiotic and metabolizing systems (COMT, ABCC2 and ABCB1) were observed from exposure to flavonoids and extracts which suggest that repeated exposure to flavonoid rich foods may alter gut function and response to flavonoids. Overall, it is apparent that both food and physiological factors can alter bioavailability and metabolism of flavonoids and that adaptation to flavonoid dietary exposure must be considered as a factor in the study of association to disease risk and outcomes.

Keywords: Flavonoids; Bioavailability; Metabolism; Food Matrix; Adaptation

POLYPHENOLS AND INTESTINAL FUNCTION: LOCAL AND SYSTEMIC EFFECTS

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The intestinal epithelium is not only the place of nutrient absorption, but it is also the first barrier against the systemic entrance of microbiota-derived and food toxins, The gastrointestinal tract (GIT) also exerts major immunomodulatory actions, regulates energy metabolism, and hosts the microbiota, which plays a central role in gut physiology. The GIT is exposed to large amount of flavonoids present in foods, which can exert local effects as parent compounds, or can be transformed by the microbiota to bioactive metabolites. Current evidence supports the concept that flavonoids and their metabolites may have significant health effects at the GIT by: i) preserving the functionality of the intestinal barrier, ii) regulating fat absorption, iii) regulating energy metabolism (e.g. by modulating the release of incretins and GIT hormones), iv) shaping the gut microbiota, and v) exerting anti-colorectal cancer (CRC) actions. Among the multiple types of existing flavonoids, the flavanol (-)-epicatechin (EC) and its polymers, the procyanidins (PACs), and anthocyanins (AC) are among the most abundant in human diets. These polyphenols protect the intestinal epithelium from different aggressors, including pro-inflammatory cytokines, bile acids and high fat diets. The capacity of AC and EC to prevent intestinal permeabilization and the associated increased transfer of luminal bacterial endotoxins into the circulation (endotoxemia), underlies in part their capacity to prevent steatosis and insulin resistance in high fat diet-fed mice. AC and EC also increase the circulating levels of glucagon-like peptide-1 (GLP-1) and 2 (GLP-2), which improve glucose homeostasis and have trophic effects on the GIT. AC and PAC also modulate the GIT physiology by positively modulating the microbiota ecology and exerting anti-inflammatory and anti-CRC actions. In this regard, PAC interacts with select areas of the epithelial cell membranes, inhibiting inflammatory, proliferative and anti-apoptotic cell signals. In summary, flavonoids can have significant beneficial effects at the GIT that may be relevant not only locally, but can also extend to systemic health benefits, including an improvement of Western style diets-induced insulin resistance and steatosis.

Keywords: Flavonoids, polyphenols, intestine, bioactives, microbiota

POLYPHENOLS AND GUT MICROBIOME FOR A HEALTHY AGING. EVIDENCE FROM CLINICAL STUDIES

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Polyphenol-rich foods and polyphenol-rich diet may affect the development of age-related diseases, and therefore lifespan. There are, however, a number of limitations related to epidemiological studies concerning the associations between diet and healthy aging. One of the causes of these limitations is the multi-factorial complexity of accurately assessing dietary exposure. Therefore, nutritional biomarkers are increasingly used in current research.

Our findings in InCHIANTI study increasing evidence on the protective effects of total polyphenols, and indirectly, diets with polyphenols rich foods like fruit and vegetables and some beverages such as red wine, against cognitive decline and overall mortality.

Our results also demonstrate the importance of assessing the intake of polyphenols, whenever possible, using nutritional biomarkers and not only by dietary questionnaires.

Keywords: Polyphenol, microbiota, mortality, InChianti study, Metabolomics, frailty, microbiota, mediterranean diet

Further collaborators: Patricia Casas, Nicole Hidalgo, Raul González, Alex Sánchez, Antonio Miñarro, Biomarkers and Nutrimetabolomics Laboratory, Department of Nutrition, Food Sciences and Gastronomy, Faculty of Pharmacy and Food Sciences, University of Barcelona, Spain. CIBERFES

FLAVANOLS AND VASCULAR FUNCTION: FROM HYPERTENSION TO KIDNEY FILTRATION

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Flavanols are under active research as responsible for the beneficial effects on human health associated to the consumption of certain fruits and vegetables. Particularly, the effects on vascular function constitute a relevant topic and are being thoroughly studied because on their potential impact decreasing the prevalence and incidence of hypertension and its related diseases, including kidney dysfunction.

We have extensively studied the vascular protection by (−)-epicatechin (EC) in rodents subjected to dietary overload with both fructose and fats. In both conditions the main effects of dietary EC were associated with decreasing oxidative stress, inflammation, and maintaining functional levels of nitric oxide (NO).

In rats overloaded with fructose (condition that mimics most of the features of the metabolic syndrome in humans) was observed increase in the blood pressure in association with a compromised NO bioavailability at vascular level. Concomitantly, there was a development of kidney functional alterations, evaluated as the presence of mild proteinuria, as well as renal cortex fibrosis, decreases in nephrin, synaptopodin, and WT1 (all indicators of podocyte dysfunction), increased markers of oxidative stress, and development of pro-inflammatory conditions, manifested as NF-κB activation, and higher expression of TNFα, iNOS, and IL-6. Dietary supplementation with EC prevented or ameliorated most of these adverse effects of high fructose consumption.

When analyzed in terms of biochemical mechanisms, it is possible to hypothesize that all these effects are consequence of the regulation of the tissue production of NO and superoxide anion by EC: i) NO generation through NO synthases, ii) superoxide anion, essentially produced by NADPH-oxidases, and iii) the resultant balance considering the high rate of reaction between NO and superoxide anion.

In summary, our results suggest that EC ingested through the many fruits and vegetables that contains it, would protect the vascular and kidney function of patients with metabolic diseases. This information can be valuable to design nutritional approaches with scientific bases to modify the development of silent conditions that when chronically established develop in disease and pathological conditions.

Keywords: Epicatechin; nitric oxide; NADPH-oxidase, inflammation

SHOULD WE EAT MORE POLYPHENOLS?

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Major research efforts are currently aimed to identify healthy foods and healthy food components. The overall purpose is to design appropriate dietary strategies that positively influence the quality of life. Plants are substantial sources of compounds that once in our body can interact with the biological machinery. One of the most robust recommendations for improving health is to increase the intake of fruits and vegetables. Based on the premise that different plants contain different bioactives, it is crucial to identify the substances that can better act against pathological conditions. Our research is focused on characterizing select polyphenols, e.g. (−)-epicatechin (EC), as bioactives. That is, to find biochemical mechanism(s) that could explain EC physiological effects considering its actual presence in human tissues (ADME). These mechanistic data together with epidemiological and clinical studies would finally define evidence based recommendation for populations. In this road to define the need for establishing recommendations for EC consumption, it is today accepted: a) the consumption of EC-containing foods has no known undesirable effects; b) the consumption of EC has been epidemiologically and clinically ascribed to lower risk of disease or decreased markers of disease; c) there are several biochemical mechanisms in which the actions of EC are well characterized; and d) there is a consistency between clinical data, in which EC is mostly treated as a drug, and the dietary consumption of EC by human populations. Overall, the consumption of EC as well as of other polyphenols could help to prevent, delay, or ameliorate diseases, especially those that progress silently during life. Establishing the amounts of these polyphenols needed to exert such health effects is conditioned by the absence of formal evaluative processes that quantitatively establishes the importance of these bioactives.

Keywords: Flavanols. Flavonoids. Antioxidants. Inflammation. Chronic diseases.

CRACKING THE EGG POTENTIAL TO REDUCE CHILD STUNTING AND IMPROVE RURAL LIVELIHOODS

EGGS IN EARLY COMPLEMENTARY FEEDING AND CHILD GROWTH: A RANDOMIZED CONTROLLED TRIAL

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Background: Eggs are a comprehensive source of nutrients for growth and development. We hypothesized that introducing eggs early during complementary feeding would improve child nutrition.

Methods: A randomized, controlled trial was conducted in Cotopaxi Province, Ecuador from March-December 2015. Children ages 6-9 months were randomly assigned to treatment, one egg per day for 6 months (n = 83), and control, no intervention (n = 80) groups. Both arms received social marketing messages to encourage participation in the Lulun Project ("egg" in Kichwa). All households were visited once per week to monitor morbidity symptoms, distribute eggs and monitor egg intakes (for egg group only). Baseline and endpoint outcome measures included anthropometry, dietary intake frequencies, and morbidity symptoms.

Results: Mothers or other caregivers reported no allergic reactions to the eggs. Generalized linear regression modeling showed the egg intervention increased length-for-age z score by 0.63 (95% confidence interval [CI], 0.38-0.88) and weight-for-age z score by 0.61 (95% CI, 0.45-0.77). Log-binomial models with robust Poisson indicated a reduced prevalence of stunting by 47% (prevalence ratio [PR], 0.53; 95% CI, 0.37-0.77) and underweight by 74% (PR, 0.26; 95% CI, 0.10-0.70). Children in the treatment group had higher dietary intakes of eggs (PR, 1.57; 95% CI, 1.28-1.92) and reduced intake of sugar-sweetened foods (PR, 0.71; 95% CI, 0.51-0.97) compared to control.

Conclusions: The findings supported our hypothesis that early introduction of eggs significantly improved growth in young children. Generally accessible to vulnerable groups, eggs have the potential to contribute to global targets to reduce stunting.

Keywords: Eggs, complementary feeding, growth, stunting

Conflict of Interest disclosure: At the time of the study, Gregory Reinhart and Ana Palacios worked for The Mathile Institute, which funded the study. The Mathile Institute has no vested interest in the outcome(s) of the study. The Mathile Institute is a not-for-profit organization that financially supports basic research in the global nutrition sector pertaining to infant and young children nutrition. The other authors have no conflicts of interests.

BIOLOGICAL PATHWAYS THROUGH WHICH EGGS MAY INFLUENCE CHILD GROWTH AND DEVELOPMENT

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Background: Child stunting is a problem of public health significance in many low and middle-income countries. Animal source foods may be particularly important for child nutrition, particularly early during the complementary feeding period when nutrient requirements are high. Recent evidence has suggested that eggs may improve child growth in populations at high risk of stunting.

Methods: 163 infants aged 6-9 months were recruited into a randomized controlled trial with two groups: 1) Egg intervention: one egg per day for 6 months or 2) Control: usual diet. Blood samples were collected at baseline and after 6 months of intervention to measure choline and related metabolic pathways, essential fatty acids, long-chain polyunsaturated fatty acids, vitamin B12, and retinol concentrations.

Results: Infants in the egg intervention group had higher concentrations of choline, betaine, trimethylamine N-oxide (TMAO), and dimethylamine (DMA); docosahexaenoic acid (DHA), and some amino acids, notably aspartic acid (all p<0.05). Phosphatidylcholine concentrations were lower in the egg group compared to controls. Choline, DHA, and histidine concentrations were all significantly associated with lower odds of stunting and were potential mediating factors of the egg intervention on improved growth.

Implications: Eggs are a rich source of choline, essential amino acids, essential fatty acids, and micronutrients all of which may be associated with improved growth. Effects may be mediated through insulin-like growth factor-1 (IGF-1) stimulation, the one-carbon metabolic cycle, or through anti-inflammatory pathways.

Keywords: Eggs, growth, choline, amino acids, docosahexaenoic acid

PUTTING OUR EGGS IN MORE THAN ONE BASKET – LESSONS LEARNED FROM WORKING WITH MULTIPLE SECTORS IN RURAL GHANA

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Background:. The diet of infants and young children (IYC) is influenced by policies and programs of multiple sectors, includ-

ing health, agriculture, and finance. Collaborative and complementary initiatives are needed to develop effective approaches to improve child nutrition in rural Ghana where families face challenges linked to endemic poverty, erratic weather, and limited and uncoordinated district resources.

Methods: Nutrition Links is a 5-y project to improve the well-being of vulnerable rural populations, including IYC, in the Upper Manya Krobo district of Ghana. Three of six sub-districts were selected for a cluster randomized trial to test the effect of a 12-month integrated intervention on child nutrition. Forty-three communities were randomly assigned to the intervention or control arm. Enrollment occurred in two phases, one year apart, using the Heifer 'pass-on-the-gift' model (participants pay back inputs to fund others). The study included 316 (phase-1) and 185 (phase-2) households.

The intervention used a multi-level, multi-sector approach. District-level training to build capacity of frontline workers and harmonize knowledge on nutrition, disease control, gender, and data analysis was provided for staff from agriculture, health, education, finance, and local governance institutions. At the community level, nutrition/health, agriculture, and gender education was provided for residents of intervention communities. At the household level, the intervention included income-generating activities (IGA), promotion of gardens, and related education. The central IGA was poultry farming for egg production. Caregivers received 30-40 hens, initial inputs, weekly technical assistance, and facilitated market access. A second IGA, beekeeping, was primarily taken up by men in phase-1 intervention households. Home gardens were supported with planting materials and training to increase access to micronutrient-rich vegetables. Weekly group education sessions on nutrition, health, and child stimulation promoted optimal caregiving behaviors. Caregivers were encouraged to feed children eggs and diversify the diet. Children's diet on the previous day and anthropometric measurements were documented at baseline and endline; data from both phases will be presented.

Results: Less than one-fifth of infants in phase-1 consumed eggs the previous day at baseline (14% intervention, 20% control; p=0.16). The poultry IGA rapidly increased the percent of children consuming eggs (61% intervention, 27% control; p<0.001). For children who already consumed eggs at baseline, the prevalence at endline of phase-1 was similar for both study arms (52-54%). However, for children with no egg consumption at baseline, 60% more children were reported to consume eggs in the intervention than control group (27% vs. 17%; Mantel-Haenszel p<0.01). Intake of eggs was associated with higher BMI (difference = +0.25; p<0.05).

Conclusions. Finding the winning mix of interventions that addresses the multiplicity of contributors to childhood malnutrition is challenging. The benefit associated with egg consumption corroborates the value of increasing accessibility to eggs as one of a mix of interventions that can be supported through the presence of multiple sectors in rural communities. Nutrition Links is registered at Clinical Trials (NCT01985243); partially funded by Government of Canada.

Keywords: Eggs, diet, children, rural, Ghana,

SOCIAL MARKETING TO BUILD COMMUNITY ENGAGEMENT IN NUTRITION-SENSITIVE AND NUTRITION-SPECIFIC INTERVENTIONS

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Background: Social marketing (SocMkt), a sub-discipline of social psychology, applies a multidisciplinary approach that integrates commercial marketing techniques with other bodies of knowledge in order to promote voluntary prosocial behavior in targeted audiences. In the Lulun project, we developed a SocMkt strategy that accompanied a randomized controlled trial (RCT) to test an egg-based intervention in five rural indigenous parishes in the Ecuadorian highlands. This campaign drew from our previous SocMkt experience in a comparable sociodemographic context, which showed that nutrition interventions are effective when participants become project owners. Effective SocMkt should respond to social realities that recognize cultural norms and values as well as opportunities and barriers that participants face. Our strategy aimed to empower participants and generate solutions for methodological RCT challenges, fieldwork complexity, and potential difficulties.

Methods: Our targeted audiences included caregivers of eligible children and other stakeholders such as community leaders. The design and implementation of the strategy was shaped by a creative process developed from market research, which accounted for culture, worldviews, sense of aesthetics, and local expectations. Key outcomes included a communication plan and the "Lulun Project" brand. In tandem with the implementation of the RCT, the SocMkt strategy contained four campaigns: outreach; recruitment; intervention promotion; and project closing. Each campaign was based on specific messages, promotional materials, and activities, which were designed to systematically stimulate behavior change from an isolated event ("giving one full egg to a 6 to 9 months' child"), to the establishment of a habit ("a full egg a day every day"), and ultimately as practice ("a full egg a day should be given to children 6-9 mo. to improve their nutrition").

Results: SocMkt implementation was instrumental for overcoming factors beyond our control (e.g. the eruption of the nearby Cotopaxi volcano), protecting the integrity of the RCT, and responding to concerns in the community around methods applied (e.g. blood collection, perceptions of inequity among caregivers with control group children, and negative rumors). Our strategy was directly linked to four interconnected effects. First, the Lulun Project received targeted audiences' loyalty, giving us a compet-

itive advantage in the project's market, where other agents who also seek the loyalty of the target group interact. Second, participants were empowered, as reflected in their narratives, low attrition levels (7%,) and attendance in activities. Third, the strategy influenced behavioral change, as demonstrated by high treatment compliance and low contamination in the control group (n= 80). This was monitored through weekly household visits, health outcomes attained, and attitudes and practices analyzed in qualitative research. Fourth, based on the results of the Lulun project and its SocMkt strategy, Ecuador's Ministry of Health policy changed guidelines regarding the introduction of eggs in complementary diets.

Conclusions: Our SocMkt experience offers theoretical and methodological value to the SocMkt sub-discipline as a whole. The strategy was central to the success of this highly effective nutrition intervention. Furthermore, the SocMkt strategy allows for the possibility for scaling up the egg intervention in the region and beyond.

Keywords:

Social marketing; behavior change; randomized controlled trial (RCT); rural Ecuador; child nutrition

ONE ACRE FUND: SCALING UP SMALLHOLDER FARMERS' ACCESS TO POULTRY IN EAST AFRICA

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Poultry and eggs are unrivaled sources of micro- and macronutrients for undernourished populations, yet how to make poultry accessible and affordable to remote communities remains unknown. Smallholder farmers face difficulties buying, feeding, housing, and vaccinating non-indigenous poultry breeds that are healthier and more productive than indigenous breeds. One Acre Fund aims to offer improved poultry species for purchase on credit to over 500,000 East African farmers. These efforts revolve around ongoing poultry trials in western Kenya.

Phase 1 Trials compare chicken breeds and feeding regimens. We are evaluating growth, egg laying, morbidity, and mortality between breeds Rainbow Rooster, Kruoiler, KALRO and local. Chickens at research stations and on farmers' properties were divided into three groups and fed three different diets: commercial feed, scavenging, and commercial feed plus scavenging. Early results reveal best weight gain in Rainbow Rooster and Kruolier. Group 1 (commercial feed) chickens were heaviest and little difference was seen between Group 2 (scavenge only) and 3 (scavenge plus feed). Data is also being collected on poultry mortality, disease resistance, egg laying, farmer taste preference, and price valuation.

Phase 2 Trials gave farmers in Kakamega District, Kenya, the opportunity to purchase four Rainbow Rooster hens and one rooster for 25 USD. 250 enrolled farmers received the chickens and 250 will serve as a control and not receive chickens. Poultry weight, mortality, health and expense of health items, and egg laying will be monitored until July 2018.

Scale-up will continue with the Phase 3 Trial in which 1500 Kenyan farmers purchase five chickens on credit. The aim of this trail is verifying Rainbow Rooster's performance in the field and our ability to operate this program on a large scale. We aim to distribute poultry at scale in Kenya by 2020, offering five chickens and a small amount of feed on credit to all farmers in all districts with an expected 10-15% adoption rate. Additionally, in 2017 we began trialing fortified chicken feed to enhance egg nutrition, laying, condition and size. We are considering establishing our own hatching and brooding center to reduce costs and ensure adequate supply and timely delivery of healthy birds. Finally, we may create a buy-back program for farmer's chickens and eggs, an idea that has received interest from businesses seeking chicken suppliers.

Several challenges were faced during these trials. Before we located a large poultry supplier 2-3 hours from farmers, long transport times from supplier to farmers made chickens stressed and tired on arrival. We also had to adapt logistic and delivery system to handle live poultry distribution, new protocols, tracking methods, and reconciliations and returns of dead birds.

Successful scale-up of the poultry trials would result in healthy, productive, and vaccinated poultry being accessible to smallholder farmers across Kenya. These farmers would also receive financing and trainings on poultry housing and cost-effective feeding. One Acre Fund is establishing a model for scaling up poultry access to vulnerable and undernourished populations across sub-Saharan Africa that we hope will be widely replicated.

Keywords: Poultry, eggs, Kenya, micronutrients

Track 7: Food Culture Practices and Nutritional Education

NUTRITIONAL EDUCATION IN SPAIN & FESNAD PROJECTS

ANALYSIS OF NUTRITIONAL PATTERNS FOR A PRECISION NUTRITION

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Chronic diseases such as obesity, diabetes, dyslipidemia, and hypertension are characterized by nutritional imbalances or by the need to adjust and manage nutrient intake to specific requirements to counteract the associated metabolic dysfunctions. Dietary intake assessments have conventionally been more orientated on macronutrient/micronutrient supply and seldom on food dietary patterns. Currently, there are some epidemiological and statistical approaches enabling to screen the dietary quality and variety on a population, in order to provide nutritional guidelines for healthy nutrition and safe nutritional intervention programs. Actually, observational and association studies considering dietary patterns and the prevalence/incidence of different metabolic diseases are allowing to identify and define metabolic derangements accompanying chronic unhealthy dietary habits. Potential suitable tools to be applied for the characterization of dietary patterns are diverse, but health professionals and policy makers must distinguish those that are appropriate for each occasion. The design of scores or nutritional indices allow finding out the role of the adherence to a specific dietary pattern on health outcomes, whereas bio-statistical strategies based on cluster, principal component, factor analysis or reduced rank reduction tests allows to determine the onset of dietary patterns within a specific population or nutritional exposures that contribute to prevent obesity and metabolic syndrome associated manifestations. A factor analysis concerning food intake to feature those patterns in a Spanish population interested in an on-line Personalised Nutrition program (Food4Me) was performed. Food items were branded according to nutritional value to carry out the nutritional profile analysis. After the food patterns were defined, results based on the differences in macronutrient distribution between these dietary patterns were re-appraised. Thereafter, association studies between such dietary patterns and reliable anthropometric determinations were implemented to find out potential relationships. The factor analysis statistical strategy produced two quite different regimes; the first one was mainly consti-

tuted by high energy yielding foods, and the second one, featured a higher consumption of vegetables or fruits and seafood products. When the patterns were independently assessed, contrasting trends between both analyses and body adiposity (BMI) were found, although they followed the expected tendency, respectively. Nevertheless, those studies considering with both patterns showed interesting interactions with specific nutrients. Quantitative and qualitative analyses concerning food consumption may assist not only to understand the relationships between nutrition and health issues, but also to prevent the onset and development of chronic diseases as well as to detect specific nutrients that may be metabolically protective for a given population. The assessment of the dietary adherence could be helpful for the design of screening tools and algorithms in Personalised Nutrition evaluation, in order to identify nutritional targets to be precisely approached in every person.

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Keywords: Obesity, Diabetes, Dyslipidemia, Macronutrient distribution, Diet

HEALTHY FOOD FOR PREGNANT AND LACTATING WOMEN. ACTIVITIES RELATED TO THE NATIONAL NUTRITION DAY

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Given the importance of food and nutrition for the health of the population, the Federation of Societies of Nutrition, Food and Dietetics (FESNAD) has developed one of its objectives over nutritional education for the population, celebrating every year the National Nutrition Day (NND), since the year 2003.

Among the different campaigns, FESNAD recently focused its campaign on healthy eating for pregnant and lactating women, given the importance it has for their health and the health of their baby. The growth and development of the baby from the embryonic and fetal stage and during the first year of life is a critical period of extreme vulnerability, especially dependent on the environmental factors that surround the mother, with nutritional intake being one of the most important.

To carry out of the NND campaign, FESNAD conducted a survey on eating and healthy lifestyles in a national sample of women of childbearing age, in order to know their knowledge, habits and attitudes regarding feeding during gestation and lactation, at the same time what was done an update of the scientific evidence on the subject.

The scientific evidence and guidelines of the main international organizations were reviewed on the following sections: energy recommendations and weight control during gestation, as well as nutritional recommendations during gestation and lactation, focusing on the iron and folate status, and their patterns of supplementation during gestation. Evidence on dietary patterns and habits, as well as other lifestyles strongly related to maternal and child health, was reviewed.

Subsequently, all the information obtained in the survey of pregnant and lactating women, as well as the proximity of their knowledge, habits and attitudes to the most appropriate, according to scientific evidence, were evaluated.

From the understanding of all the information, the key points of education were formulated, while the most adequate messages were defined for the realization of the campaign of health promotion adapted to the reality of our environment.

Different materials were made with this information: posters, triptychs, slides of a presentation. The dissemination of the NND was carried out among professional groups of education, health, business, etc ...; Who are invited to perform a nutritional education activity on the subject of DNN-15 in their professional or personal environment. For this they were provided, printed and online, the material designed for the campaign.

In the NND on Healthy Foods for pregnant and lactating women, different materials were distributed throughout the Spanish territory, with more than 300 activities being carried out in different centers and institutions. The activities were directed to small and large groups of the population in general, school or university students, members of associations, workers of companies, users of primary care, etc.

Keywords: FESNAD , nutritional education , pregnant, lactating

Further collaborators: Director of FESNAD in 2015: President: J Salas-Salvadó (SENPE), Vice-president: MD Romero de Ávila (ALCYTA), Treasurer: A Villarino (SEDCA), Secretary: V Arija (SENC), Members: I Bretón (SEEN), JJ Díaz (SEGHNP), R Farré (SEÑ), M López-Pardo (ADENYD), S Monereo (SEEDO).

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• Sociedad Española de Dietética y Ciencias de la Alimentación (SEDCA)

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NUTRITIONAL EDUCATION AT SCHOOL

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Scientific evidence supports that prevailing food patterns and physical activity during infancy and childhood influence growth and development; have an impact on health not only during this period of life, but also on the potential development of risk and protective factors related to the onset of chronic diseases later in adulthood. Programs on nutritional education have been widely used for teaching or reinforcing knowledge on food habits or healthy life styles in children and are considered a useful strategy to prevent the appearance of nontransmissible chronic diseases at early ages. The implementation of nutritional education programs in schools may help to inculcate in children the ability of identifying a healthy food choice for themselves.

It has been established that the triangulation of information amongst the teacher, the children, and the family is a useful strategy for modifying negative feeding behaviors that are contributing to the recent increase in the prevalence of overweight, obesity, hypertension, diabetes, and metabolic syndrome in children, while in the opposite extreme of the spectrum, nutritional deficits persist as important nutritional problems, especially regarding micronutrient, and vitamin deficiencies such as iron, calcium, folic acid, and vitamin A, among others.

The inclusion of nutritional education into formal education programs is one of the most used and recommended strategies, mainly because the children obtain and fix the information in a easy, fun, and permanent way, but also because they act as multipliers of the information, bringing the new information to their homes to achieve, in the best case scenario, the transmission of the information to the whole family group.

Some studies indicate that to obtain a better impact on changing habits on the long term, nutritional education programs must include the whole community, to assure the permanence of changes .

Keywords: Nutritional education; schools; healthy eating practices; educational strategies

HOSPITAL DIETOTHERAPY AND UNDERNUTRITION. EDUCATING PROFESSIONALS

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The hospital food presents characteristics that make it unique in the context of collective catering. It is not just about offering a catering service. It has to translate the science of nutrition into medical therapy. On the other hand, hospital feeding must provide all its technique to get the patients admitted to the hospital receive that nutritional therapy with quality to achieve an adequate food

intake. This is not an easy job because of the patient's own pathological process.

It should always be taken into account that in developed countries there is a significant percentage of patients admitted to hospital with malnutrition, which is not diagnosed as such, and which, in addition to its acute pathology, causes the patient's clinical situation to worsen .

To this must be added the appearance of new cases of malnutrition among the population admitted. All these situations constitute a worrying scenario of great clinical significance.

We must know that hospital feeding is a complex process where the science of nutrition, dietetics, bromatology and hotel techniques are united. This food service should contribute to the recovery of patients and to provide a level of well-being (everyone knows that food is a factor that influences the concept of patients in the hospital).

Nutrition occupies an important place in health and throughout the history of medicine the prescription of adequate food has been part of the treatment of patients

The diary code: is the document where all diets available in each center are recorded

The philosophy that governs the preparation of a therapeutic diet responds to two general lines. The first one focuses on the patient's education regarding the principles of proper nutrition, while the other is about providing foods that the patient can eat and enjoy. There is usually a compromise between the two trends, taking into account that:

Energy and nutrient needs must be met according to the clinical situation.

It must provide a sufficiently broad and varied diet

It will represent a rewarding action.

Must have an appropriate and attractive presentation

The habits of the patient, their tastes, religious beliefs and any other factors that may influence the acceptance or rejection of the diet

Keywords: Dietotherapy, undernutrition, educating

CONSENSUS ON FATS AND OILS IN THE DIET OF SPANISH ADULTS. POSITION PAPER OF THE SPANISH FEDERATION OF FOOD, NUTRITION AND DIETETICS SOCIETIES

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In this consensus document the scientific evidence relating effects of dietary fat quantity and quality on cardiovascular risk is reviewed and recommendations for the Spanish adult population are issued. As a novelty in nutrition guidelines, emphasis is made more on parent foods than on fatty acids per se. In summary, replacing saturated fatty acids (SFA) for monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) reduces cardiovascular risk. Recent data suggest that SFA proper may be harmful or not depending on the parent food, a reason why an intake threshold is not established, but consumption of butter, processed meats, and commercial confectionery and fried foods is discouraged. The established threshold of <1% of energy intake as trans FA, well known to be harmful for cardiovascular risk, is fulfilled in Spain due in part to its present low levels in margarines. MUFA are beneficial or neutral for cardiovascular risk depending on their dietary sources (virgen olive oil versus other fats), and no intake limitations are established. n-6 PUFA are cardioprotective and recommended intakes (5-10% of energy) are not always fulfilled in the Spanish population, thus increased consumption of their vegetable food sources (seeds, derived oils, and margarines) is encouraged. Marine n-3 PUFA are also cardioprotective and the recommendation stands to eat fatty fish ≥2 servings/weeks to reach intake levels up to 1% of energy. Increasing evidence suggests that alpha-linolenic acid (ALA), the vegetable n-3 PUFA, is also cardioprotective, but the parent foods (walnuts, soy products, greenleaf vegetables) may provide benefits beyond ALA itself. Finally, low-fat (high carbohydrate) diets appear to lack cardiovascular preventive effects, while high-fat, high-vegetable fat dietary patterns such as the Mediterranean diet, are protective, a reason why a fat intake limit of up to 40% of energy is suitable for the Spanish population. This position statement targets dietitian, nutritionists and other health professionals involved in dietary counsel so they can deliver it rightly and according to the last scientific evidence

Keywords: Fats, consensus, Fesnad

DAIRY PRODUCT CONSUMPTION AND RISK OF CARDIOVASCULAR DISEASES

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Cardiovascular disease (CVD) is the responsible for 17.3 million deaths each year being the leading cause of mortality in the world. Dairy products has been suggested as a marker of diet quality and has been related with cardiometabolic health outcomes (1).

During the last years, consuming dairy products has been criticized by several nutritional and non-nutritional reasons without consistent scientific evidence. However, the consumption of dairy, including milk, cheese and yogurt has been associated with a reduced risk of several cardiovascular risk factors. The purpose of this presentation is to review the recent literature examining the relationship between dairy product consumption and the risk of type two diabetes (T2D), obesity, metabolic syndrome (MetS), hypertension (HT) and CDV.

High-quality evidence supports favorable associations between the consumption of milk, regular high-fat, low-fat and fermented

dairy such as cheese and yogurt and a reduced risk of T2D. The most consistent inverse association has been reported for yogurt consumption. In case of obesity, studies reflect that dairy consumption is not positively related with changes in body weight. Yogurt was the only dairy food that showed some evidence for a beneficial effect, where higher intakes were inversely associated a reduced risk of obesity, changes in body weight or waist circumference (2).

Additionally, the last systematic review performed in seven prospective cohorts showed inverse associations between dairy products consumption and MetS incidence, especially in relation to yogurt intake (3). Moreover a favorable association between the consumption of dairy products, low-fat dairy, fermented dairy and cheese and the risk of HT. No association with of high-fat dairy, milk and yogurt and HT was found (4).

The newest systematic review indicates with moderate evidence, neutral associations between the consumption of total dairy, cheese, yogurt and CVD risk. Furthermore, with higher evidence total dairy and milk consumption were positively associated with lower risk of CVD.

In conclusion, intake of some type of dairy products seems to be related with a lower risk of CVD and other cardiovascular risk factors such as T2D, obesity, MetS and HT (10). Further research in different populations are required to replicate and confirm strongly all the published literature in reference to this issue.

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Keywords: Dairy products, cardiovascular disease, cardiovascular risk factors

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STATEMENT ON OBESITY

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The epidemics of obesity across the world is a big concern of public health associated to diverse disorders at a metabolic, social and mental levels. Over the last decades, the increase in obesity prevalence has been attributed to excessive intakes of calories within diets including low-density nutrients. Generally, obesity, as the excess of adipose tissue in the organism, is the consequence of the high consumption of macronutrients but with a suboptimal intake of micronutrients, together with distorted lifestyle habits. Weight management treatments for obese children and adolescents should aim to ensure adequate growth and development, by reducing excessive fat mass accumulation, avoiding loss of lean body mass, improving well-being and self-esteem and preventing cyclical weight regain. Nevertheless, there are also genetic and environmental factors that should be taken into account in efforts to tackle obesity. In the case there are no appropriate actions on time, this global crisis has been predicted to develop obesity in 2050 in 60% of male adults, 50% of female adults and 25% of children. The World Health Organization has defined childhood obesity as one of the most important health challenges for this century. One of each five European children is estimated to suffer from overweight and every year around half million children achieve more weight than they should for their age and height. Albeit the actual damage on the metabolism does not show up immediately at an early stage of life, the harm provoked by overweight has to be beard in mind from the beginning since "a posteriori" in the adulthood, the reactions can arrive too late. However, it is important to highlight that not everybody has the same predisposition to lose weight at the same level due to genetic agents. Therefore, with the aim to prevent obesity and maintain an adequate weight during the whole life, the main strategy to manage obesity at any age is to deliver an appropriate nutritional education among the general population, but taking into account the bases of personalized and precision nutrition.

Keywords: Nutritional education, obesity, strategies

REMARKS ON FESNAD FUTURE PROJECTS

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FESNAD arose with the spirit to gather all the organisations devoted to the Nutrition, Feeding and Dietary Sciences (NFDS). The general aim is to create a voice in order to have healthy life habits to improve and expand the hope and life quality (www.fesnad.org).

The federation future projects are:

1. SCIENTIFIC ACTIVITIES

A)   The National Nutrition Day (DNN). The line developed in DNN works with the food groups properly said. The 2018 DNN will be about legumes. Source of vegetal protein with equiparable quality to the meats and fishes , have an important percentage of soluble and insoluble fibre, (15-20 g/100 g). Have a low contribution of fats (2-5%). Consumption is associated, to a satiating effect and suggests that help in the weight loss , contribute to the colorectal cancer prevention, and have a reverse relation with the high levels of total cholesterol making a LDL-cholesterol decrease and a HDL-cholesterol increase . In summary, taking into account their properties, the important proteinaceous source regarding to the low content of fats, the high content in fibre (Fibre consumptions in Spain (18g/person/current day vs. 30 g/pers/dayrecommended) and a decrease in the recommended consumptions in Spanish people (1,5 weekly rations: vs 3-4 weekly rations recommended). FESNAD will develop this campaign to inform of the nutritional properties, culinary properties and good relation between nutritional quality and price.

B)   NAOS Strategy: The obesity in the spanish chilhood is about (18-23 %) (10). Although all FESNAD projects include activities to eradicate it, we will develop collaborations with the AECOSAN* to propose and establish new models of work to decrease the obesity percentage.

C)   FESNAD Congress 2020: There are demands to organise an event that gathered to all the NFDS professionals. With this premise FESNAD develops a congress every five years, with more than 1000 participants. The next announcement will be in Zaragoza 2020. Our challenge is the creation of new research groups to improve the efficiency of resources and the scientific results.

D)   Recommended rations (RR) for spanish people document. It exists a professionals needed to establish RR for menus (patients, commensals… or to the development of epidemoiology studies). There are some guides (SENC) but is complex to establish RR in function of physical activity, age, health, or even the culinary process… The changes in the habits and the diversity of opinions regarding the RR demand of a project with all professionals involved.

2. ACTIVITIES OF SCIENTIFIC MANAGEMENT

A)   FESNAD has a system of accreditation and standardisation of external training activities. It realises an evaluation to the contents to obtain the greater scientific quality. www.fesnad.org.

B)   To the achievement of point 1.D, FESNAD realise agreements for the adhesion of affine organisations involved in the NFDS. In this process will participate Professional Colleges, consumers organisations and professional Societies…

C)   FESNAD participates like a scientific membership in the National Food Safety Day (DNSA). This proyect is a informative approach on the process involved in food chain (including consumer) in order to have a better food safety .

Keywords: NAOS, Zaragoza 2020, legumes, DNN

Track 8: Agriculture, Food Science and Safety

SS_144/1020

INNOVATIVE METHODS AND METRICS FOR AGRICULTURE AND NUTRITION ACTIONS

DIAGNOSTICS TO SUPPORT THE IDENTIFICATION, DESIGN, AND EVALUATION OF INTERVENTIONS IN VALUE CHAINS TO IMPROVE DIETS OF LOW-INCOME POPULATIONS

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Emerging evidence on the nutrition double burden suggests income growth alone cannot solve the problem of malnutrition and may in fact create problems linked to overweight and obesity. The challenge from the nutrition perspective is how to sustainably improve diets, as well as other health-related behaviors, across different low-income populations. In recent years, the nutrition community has explored value chain approaches to address malnutrition. The value chain framework focuses on the actors involved in the production, processing, trade, and consumption of a given product, and the opportunities to achieve beneficial economic outcomes for some or all of the actors through changes in the structures, systems, and relationships. Because value chains play a key role in determining food availability, affordability, and quality, they have a role in shaping diets and can contribute to improving nutrition. Most applications, however, have focused on a single chain and its implications for nutrition, which from a diet quality perspective implies a partial solution at best. The challenge lies in better understanding the options for leveraging a set of value chains (a multi-chain focus) to address the various constraints to improving the diets of a given target group. This case study from the Zomba District of southern Malawi applies data from household surveys, in-depth individual interviews, and market surveys to examine opportunities for improved diets through leveraging demand and supply of nutritious foods, and enhancing value chain performance with a nutrition lens. Preliminary results on bottlenecks and opportunities provide insights for policy and programs.

Keywords: Diagnostics, food policy, diets, markets.

DEVELOPING AN INNOVATIVE APPROACH TO MEASURING THE LIVELIHOODS OF SMALLHOLDER FARMERS AND TESTING CRITICAL LINKAGES FROM FARMER LIVELIHOODS TO NUTRITION

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Background: Analyses of agriculture and nutrition relationships often rely on data collected using different survey design methods. Assessing the magnitude of bias of estimates of agricultural production characteristics resulting from the design of such surveys could inform the development of surveys that make efficient use of limited resources for collecting data on those agricultural characteristics most relevant for predicting nutrition outcomes. This study aims to assess the effect of agricultural survey design on estimates of agricultural production characteristics, and on the association of these characteristics with dietary quality and diversity as well as anthropometric outcomes among pre-school-aged children in Burkina Faso.

Methods: A methodological cluster-randomized controlled trial was carried out between January and February 2017 in seven provinces of Burkina Faso testing three different approaches to collecting data on agricultural production characteristics by varying respondents and agricultural units of analysis. Provinces were randomly selected within each of the country's three agro-ecological zones. Five communities per province, and 30 households per community were randomly selected, with 10 households per community randomly assigned to one of three study arms (n=1,050 households). Respondents in the control arm received a comprehensive questionnaire that collected plot-level data on land area, crops raised and harvested, earnings from agriculture and non-agricultural activities, and control of management decisions and agricultural income. These data were collected from each plot manager separately. Households assigned to treatment arm one of the trial were administered a diagnostic version of the control arm survey that collected aggregate data from the household head only. Households in treatment arm two were administered the same survey version as treatment arm one, but a randomly selected household member, excluding the household head, was chosen as the respondent. We use multi-level regression analysis adjusting for intra-village clustering to estimate the average treatment effect of the three alternative survey designs.

Results: We will examine the extent to which sociodemographic characteristics of surveyed households are well balanced across the three treatment arms of the trial. Mean child height-for-age Z-score (HAZ) (SD) for children aged 24-59 months among the entire sample was -1.2 (1.2). Mean child weight-for-age Z-score (WAZ) and weight-for-height Z-score (WHZ), respectively, were -0.98 (-0.96) and -0.41 (0.96). The area of cultivated land, overall crop yields (by weight), and the species diversity of crop production were all significantly lower among treatment arms 1 and 2 as compared to the control arm of the trial (P<0.05). We will present findings from separate adjusted regression analyses examining associations of land area, crop yield and crop species diversity with child diet and anthropometric outcomes, and including the interaction of agricultural production characteristics with dummy variables representing the randomized treatment assignment.

Conclusions: Survey design choices have a clear influence on estimates of agricultural production characteristics based on data collected from household surveys in Burkina Faso. Estimating the extent to which survey design may bias the assessment of key agriculture-nutrition relationships can allow for the estimation of confidence intervals for interpreting results across studies that apply different survey designs to examine similar relationships.

Keywords: Agriculture, dietary diversity, child anthropometry, crop diversity, Burkina Faso

SCHOOL FEEDING PROGRAM IMPLEMENTATION AND CHILD NUTRITION IN GHANA: IMPROVED METHODS AND TOOLS

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School feeding is among the most universal form of nutrition intervention, aiming to improve nutrition, health and educational outcomes of children. In Ghana, school feeding follows a "home grown" approach to promote agricultural development through local food procurement from smallholder farmers. The program uses a decentralized procurement model which involves caterers who pre-finance procurement and serve as the potential link between small-scale farmers and program beneficiaries. The lack of simple and effective monitoring and evaluation (M&E) tools hinder process and impact assessments of the Ghana School Feeding Program (GSFP) that are needed to inform decisions to improve program effectiveness. Furthermore, existing M&E efforts have emphasized on assessment of educational (e.g., enrollment and attendance) and qualitative outputs (e.g., farmer-reported cultivated land size), while outcomes and outputs that assess nutritional quality of meals and the link between school feeding and local agriculture have been ignored. This study aimed to assess the feasibility of using the GSFP's new M&E tools in measuring nutritional quality of the meals and the link of the program to local agriculture. The new tools combined measurement of program impacts on school children with effects on local agriculture, using meal quality from school-level data on beneficiary children combined with procurement and meal planning data from GSFP caterers. The study was conducted in a total of 18 beneficiary schools from the Northern, Ashanti and Greater-Accra regions of Ghana over a school term. Data on type and portions of meals served were collected by school headteachers or their representative, and procure-

ment information collected from caterers. The findings showed that, in 16 out of the 18 schools observed, meals were provided for pupils every school day in the school term. However, the quality of meals served were low. Generally, no fruits were provided in 99.8% of the observed school meals. The school meals consistently met less than a third of the recommended nutrient intakes of protein (animal source protein offered was mostly milled smoked fish) and micronutrients (Iron, Calcium, Vitamin A & Vitamin B) for school-age children. From the procurement data, the link between caterers and small-scale farmers is either weak or non-existent. Caterers used both imported foods (e.g., rice, tinned tomatoes) and produce from other districts or regions in meal preparations. There was a heavy reliance on wholesale retailers who had more flexible payment terms and sourced food from both local and foreign producers. Caterers attributed their choice to the irregular financial reimbursement by the GSFP management, which often made it impossible to buy from local small-scale farmers who required immediate payment. In conclusion, the new M&E tools were successfully used to access meal quality and procurement from local farmers. However, there is a need to develop or adopt a user-friendly menu-planning tool and standardize handy measures used by caterers to reduce the burden involved in monitoring meal quality and training staff. In addition, efforts to improve local procurement, including timely payment of caterers and formation of farmer-based groups, should be promoted.

Keywords: School feeding, monitoring and evaluation, nutrition, agriculture, tools

INDICATORS OF AFFORDABILITY OF NUTRITIOUS DIETS IN AFRICA (IANDA)

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Background and Objectives: A primary way that agriculture can influence food security and nutrition is by increasing year-round availability and affordability of diverse, nutritious foods. Food prices are tracked by national governments and international agencies but typically encompass basic commodities, or a food basket not closely related to nutritional needs. The IANDA Project (Indicators of Affordability of Nutritious Diets in Africa) develops indicators that reflect nutritious food, using existing food price monitoring systems. Additionally, IANDA partners with national data collectors and end users, toward mainstreaming the use of new indicators that reflect the affordability of nutritious diets.

Methods: In Ghana and Tanzania, IANDA worked with stakeholders to identify the most important sources of food price data and to understand their scope in geographic coverage, foods covered, frequency and methods of data collection. The food lists covered by each organization were analyzed for comprehensiveness from a nutritional perspective, in partnership with stakeholders from national agencies. Using both historical data and new pilot data, three types of indicators were constructed. To construct the Cost of Dietary Diversity (CoDD) indicator, food items were grouped into the 10 food groups of the Minimum Dietary Diversity for Women indicator (MDD-W), and the lowest cost items for each group were used to establish the cost of minimum dietary diversity. To construct the Cost of Nutrient Adequacy (CoNA) indicator, food price data were used in conjunction with the West African Food Composition table, and linear programming determined the lowest cost way to achieve adequacy of essential nutrients. To construct the Cost of Recommended Diets (CoRD) indicator, the average price of foods in each food group were summed to determine the cost of meeting food-based dietary guidelines.

Results: In each country, there were two primary sources of food price data: in Ghana, the Ministry of Food and Agriculture (MoFA) and the Ghana Statistical Service, and in Tanzania, the Ministry of Industry and Trade and the National Bureau of Statistics. In Ghana, a total of 22 food items were added to the existing food price monitoring list used by MoFA; this expanded list was piloted in four geographically distinct districts. MoFA determined that the expanded list would be useful for monitoring the price of nutritious foods and not overly burdensome, and therefore is now institutionalizing the expanded list nationwide. These data, as well as data from the national statistics organizations in both countries, were adequate to construct the three indicators (CoDD, CoNA and CoRD).

Conclusions: Resulting from partnership between the Ghana MoFA and IANDA, in our knowledge Ghana is the first country to institutionalize monitoring of the price of nutritious diets. The indicators developed can be incorporated into food price monitoring systems in other countries as well, to track costs of nutritious food across seasons and geographies. They can also be used as indicators of nutrition-sensitive agriculture within programmes or national evaluation platforms. The accuracy and feasibility of the indicators in representing a nutritious diet depends on the comprehensiveness of food lists within food price monitoring systems, and strong partnerships with stakeholders.

Keywords: Food prices, food environments, food access, affordability, monitoring systems.

FARM TO FORK – PATHWAYS TO NUTRITION OUTCOMES AND IMPLEMENTATION CHALLENGES OF INTEGRATED AGRICULTURE-PROGRAMS

WHY ARE INTEGRATED NUTRITION SENSITIVE AGRICULTURE PROGRAMS NECESSARY AND WHAT ARE THE IMPLEMENTATION CHALLENGES?

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There is great potential for mutual influence between agriculture and nutrition. Seventy-five percent of the world's poor work in agriculture in rural areas and are dependent on agriculture as their main source of income and at least some of their food. Agriculture thus plays a direct role in determining nutrition through food production and consumption, providing access to diets rich in diverse nutritious foods. The crops and livestock chosen and the methods used for production, harvest, processing, and storage can all influence nutrition. Agriculture also plays an indirect role in nutrition by generating income that can be spent on market-purchased food as well as healthcare, water, education, and other living essentials; all of these play a key role in influencing nutrition. Agriculture also impacts women's empowerment, including decision-making over income and time use, assets, and knowledge. When women control a larger share of income and production, this generally strengthens the pathways from income to nutrition and production to nutrition, respectively. Agriculture also plays a role in women's time use and workload, which can have impacts on their own nutrition as well as that of their families. Agriculture can also negatively influence health and nutrition through zoonosis and environmental enteropathy from livestock production, exposure to agricultural chemicals, and food-based diseases and toxins, such as aflatoxins.

Given these complex linkages, there is now widespread recognition that agriculture has a role to play in addressing malnutrition and increasing human health and wellbeing. However, a wide range of past experiences and micro- and macro-level data have borne out the fact that, without specific planning and design, agriculture will not have a large impact on nutrition or health. There is thus a need to develop interventions that aim to explicitly influence nutrition through agriculture. Interest in such nutrition-sensitive agricultural programs and policies is growing, but there remain a number of challenges to their implementation. These include adapting global best practices to resource-constrained local contexts, targeting to reach the most vulnerable while also creating conditions for successful uptake, demonstrating impact, managing diverse multi-sectoral collaborations, empowering women, avoiding adverse impacts on women's time use, mitigating potential increases in environmental enteropathy and zoonosis, balancing diverse demands on water use, avoiding adverse environmental impacts, balancing income-earning with consumption, and delivering integrated agriculture-nutrition behavior change communication. Moreover, interventions must increasingly strive to have impacts at numerous levels of agricultural systems, including across large-scale market zones. Finally, all of this must be done at sufficiently large scales and in a sustainable and cost-effective way.

This talk will give an overview of these motivations for nutrition-sensitive agriculture programs and constraints on their successful implementation, thereby laying the foundation for a rich discussion among experts who are involved with a diverse set of projects currently making advances in this sector.

Annals of
Nutrition&
Metabolism

monly consumed foods of Bangladesh revealed that animal foods contain more selenium than foods from plant origin.

Keywords: Selenium, Commonly consumed foods, Bangladesh

Track 1: Advances in Nutrition Research

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SELENIUM IN COMMONLY CONSUMED FOODS OF BANGLADESH

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Background and objectives: As an essential trace mineral Selenium has a pivotal role in maintaining human health. The beneficial role of Selenium includes antioxidant activities, proper functioning of the immune system, DNA synthesis and conservation of reproductive health. In spite of such beneficial roles of Selenium, there was a lack of data on the Selenium content of foods in Bangladesh. This study is the very first approach of incorporating analytical data of Selenium of commonly consumed foods.

Methods: Sample selection and prioritization were done according to the key food approach throughout the year. A total of twenty foods of predominant varieties were collected for analysis. Fresh samples of cereals (Rice, Wheat flour), pulses (Lentils), vegetables (Brinjal, Bean, Carrot, Green chili, Onion, Potato, Tomato) fruits (Banana, Mango, Jackfruit), freshwater fish (Rohu, Tilapia, Pangas), meat (chicken leg and breast), egg (chicken), and milk (cow) were collected for analysis of Selenium. The samples were analyzed by inductively coupled plasma mass spectrometry (ICP-MS) followed by microwave digestion.

Results: The result shows that highest and lowest content of Selenium (fresh weight basis) was found in tilapia fish (1.18 μg/g) and in rice (0.13 μg/g) respectively. Among the different food groups the estimated average Se content (μg/g) was found in the decreasing order of egg (1.06) > fish (1.03) > meat (0.75) > milk (0.42) > fruits (0.27) > Cereals (0.13) > Pulse (0.07) > Vegetables (0.06). Again among the individual food categories, the food sample which showed the highest concentrations of Se are cereals- Wheat flour (0.24), pulse-lentil (0.07), Vegetables-bean (0.1), fruits-mango (0.43), meat-chicken breast (0.79), fish-Tilapia (1.18), milk (0.42) and egg (1.06) respectively.

Conclusions: Accurate food compositional database for Se is immensely important to find out the rich source of Selenium. Findings of the present study from nationally representative com-

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DIETARY PATTERNS IN ADOLESCENTS AGED 18 YEARS: RESULTS FROM THE 1993 PELOTAS (BRAZIL) BIRTH COHORT

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Background and objectives: The employment of dietary patterns (DP) to assess dietary has increased rapidly over recent years as an alternative to studying the intake of individual food items or a nutrient-specific approach. In this study we aimed to obtain dietary patterns in adolescents aged 18 years using principal components analysis (PCA), a multivariate method which may allow a meaningful approach to assessing dietary intake.

Methods: Cross-sectional analysis of 4052 adolescents belonged to the 1993 Pelotas (Brazil) Birth Cohort. A food frequency questionnaire (FFQ), composed by 88 items with eight frequency options (from zero to five or more times a day), was administered. The food items were combined into 44 food groups based on nutrient composition similarities and frequency of consumption. Varimax rotation was applied to obtain orthogonal factors. The food groups that showed factor loading >0.25 were considered to have a strong association with this factor. The number of factors that best represent the data were chosen primarily on the basis of the screeplot.

Results: Four DP were identified: "meat and fast foods", "fruit and vegetables", "candies, sodas, and dairies" and "common Brazilian". They explained 40% of the total variance. The first component had a high loading on all types of meat, including processed meats (canned tuna/sardine, salt-cured meat, bacon) and fast foods (hamburger, hot dog). The second component loaded highly on all types of fruits, vegetables and other legumes (except black beans). The third component was characterized by high loads of chocolate powder, regular sodas, dairies products (milk, yogurt, cheese, soft cheese), sweets and chocolates, candies and caramels. Lastly,

the fourth component loaded highly on black beans, white sugar, margarine/butter, white rice and white bread, and was labeled as "common Brazilian" in line with the usual Brazilian lunch "rice and beans" and "coffee and bread" breakfast.

Conclusions: This study identified four DP through a useful method that overcome the inherent problem of intercorrelations between food items when examining individual food associations. These patterns describe 18 years old adolescents' food habits and may be useful for future epidemiological research on health risk in the 1993 Pelotas Birth Cohort.

Keywords: Food consumption; Dietary patterns; PCA; Adolescents; 1993 Pelotas Birth Cohort

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PROGNOSTIC VALUE OF METABOLITES FOR PREDICTING RESPONSIVENESS TO NUTRITIONAL INTERVENTION AGAINST OXIDATIVE STRESS AND INFLAMMATION

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Background and objectives: Integrating traditional biomarkers and omics biomarkers might allow the discovery of prognostic markers for distinguishing responders from non-responders to nutritional interventions. We aimed to identify prognostic metabolites that predict responses to an intervention against oxidative stress and inflammation, using a data set from a randomized controlled trial evaluating Korean black raspberry (KBR).

Methods: We performed a case study to evaluate the prognostic use of 1H NMR metabolite profiling, using a data set from a four-week, randomized controlled study evaluating Korean black raspberry (KBR) in sedentary overweight/obese adults. To achieve this, we applied several statistical analyses to integrate biochemical and metabolite markers.

Results: Compared with the placebo group, KBR supplementation significantly changed erythrocytes oxidized glutathione (GSSG), the ratio of reduced glutathione (GSH) to GSSG, plasma malondialdehyde (MDA) and interleukin-6 levels, and seventeen urinary metabolites. Seven urinary metabolites were associated with clinical biomarkers. A two-metabolite set (glycine and N-phenylacetylglycine) had the strongest prognostic power for oxidative stress and probably inflammation (AUC-ROC=0.778, AUC for the leave-one-out cross-validation ROC= 0.683).

Conclusions: The integration of 1H NMR metabolomics data and biochemical markers may provide a novel prognostic marker that can be used to screen for responders to an intervention against oxidative stress in sedentary overweight/obese adults.

Keywords: oxidative stress, nutritional intervention, prognostic marker, metabolomics.

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INTAKE OF MARINE DERIVED OMEGA 3 POLYUNSATURATED FATTY ACCIDS AND MORTALITY IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Marine-derived omega-3 polyunsaturated fatty acids (n-3 PUFA) have been shown to exert protective effects on all-cause and cardiovascular (CV) mortality in the general population. In renal transplant recipients (RTR) all-cause and CV mortality is high but the effect of n-3 PUFA intake on long-term outcome is unclear. We investigated whether marine-derived n-3 PUFA intake is associated with risk of all-cause and CV mortality in a large cohort of RTR.

Methods: Intake of Eicosapentaenoic acid plus Docosahexaenoic acid (EPA-DHA) was assessed using a validated Food Frequency Questionnaire. Cox-Proportional Hazards Regression analyses were performed to evaluate the associations of EPA-DHA intake with all-cause and CV mortality.

Results: We included 627 RTR (age 53 ± 13 years, 56% male). EPA-DHA intake was 102 [interquartile range: 42-216] mg/day. During median follow-up of 5.4 years, 130 (21.0%) RTR died, with 52 (8.3%) due to CV causes. EPA-DHA intake was associated with lower risk of all-cause mortality (Hazard Ratio (HR) 0.85; 95%

confidence interval (95%CI) 0.75-0.97, P = 0.02), independent of potential confounders. The HR for the association of EPA-DHA intake with CV mortality was of similar magnitude, but did not reach significance (HR 0.83, 95%CI 0.68-1.02, P = 0.08). The association of EPA-DHA intake with mortality was significantly modified by age (P = 0.03) and smoking status (P = 0.01), with lower risk for all-cause and CV mortality particularly in the older (≥ 63 years old) (HR 0.75; 95%CI 0.61-0.92, P = 0.01; and 0.68; 95%CI 0.48-0.95, P = 0.02 respectively) and non-smokers (HR 0.80; 95%CI 0.68-0.93, P = 0.01; and 0.74; 95%CI 0.56-0.98, P = 0.04, respectively) subgroups of RTR.

Conclusions: Higher marine-derived n-3 PUFA intake was associated with lower risk of all-cause and CV mortality in RTR. Strongest associations were present in elderly and non-smoking RTR. Our study adds further evidence to the plea for EPA-DHA supplementation in RTR, particularly in subgroups of this population.

Keywords: Renal transplant recipients; Omega-3 polyunsaturated fatty acids; Cardiovascular mortality; All-cause mortality.

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CHANGES IN WHOLE-BLOOD POLYUNSATURATED FATTY ACIDS AND THEIR PREDICTORS DURING RECOVERY FROM SEVERE ACUTE MALNUTRITION

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Background and objectives: Severe acute malnutrition (SAM) is common in children in low-income countries and may be associated with low polyunsaturated fatty acids (PUFA) status.

The objective was to describe changes in PUFA-status during SAM treatment.

Methods: A prospective study among children treated for SAM in Uganda. Whole-blood fatty acid composition was assessed at admission, transition, discharge and follow-up, and among healthy children. ANCOVA was used to identify predictors of change.

Results: The study included 120 children with SAM and 29 controls. At baseline, the relative contribution of saturated fatty

acids to fatty acids in whole-blood (FA%) were lower, while most monounsaturated fatty acids were higher in children with SAM compared to controls. All n-6 PUFAs including linoleic (LA) and arachidonic acid (AA), as well as total n-3 PUFA and docosahexaenoic acid (DHA) were lower in children with SAM. Whole-blood n-6 PUFA proportions increased until follow-up, except for AA, which decreased by 0·79 (95%CI 0·46, 1·12) FA% from admission to transition and additional 0·10 (95%CI 0·23, 0·44) FA% to discharge. Compared to admission levels, total n-3 long-chain (LC) PUFA decreased by 0·21 (95%CI 0·03, 0·40) FA% at discharge and 0·22 (95%CI 0·01, 0·42) FA% at follow-up. This decrease was greater in children from families with recent fish intake before admission and those with nasogastric tube feeding.

Conclusions: Children with SAM had low whole-blood LCP-UFA. Current therapeutic feeds do not correct whole-blood levels of LCPUFA, particularly n-3 LCPUFA.

Keywords: Essential fatty acids, malnutrition, treatment, children

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HEMOGLOBIN CONCENTRATIONS AND ANEMIA PREVALENCE AMONG CONGOLESE CHILDREN 6-59 MONTHS WITH SICKLE CELL AND A-THAL-ASSEMIA HEMOGLOBINOPATHIES

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Background and objectives: Genetic hemoglobin (Hb) disorders are autosomal inherited conditions caused by mutations and/or deletions in the genes encoding the α- and β-globin chains of Hb. The Glu6Val variant in HBB causes sickle cell trait in the heterozygous form and sickle cell disease in the homozygous form. Deletions in HBA1 and HBA2 cause α-thalassemia; the most com-

mon variant is the α3.7 deletion. Our aim was to determine the prevalence of these gene variants in children in the Democratic Republic of the Congo, and to assess the association with Hb concentrations and anemia.

Methods: Venous blood was collected from n=709 children 6-59 months in South Kivu (SK) and Kongo Centrale (KC) provinces. Genomic DNA was extracted from buffy coat. Pyrosequencing was used to detect the Glu6Val variant in HBB and PCR was used to detect α3.7-thalassemia deletions. Capillary Hb concentration (g/L) was determined using a Hemocue®. One-way ANOVA (Bonferroni-adjusted for multiple comparisons) was used to detect significant differences in Hb concentration across genotypes.

Results: Prevalence of sickle cell trait was 6% (n=26/426) in SK and 16% (n=47/283) in KC, and sickle cell disease was <1% (n=1/426) in SK and <1% (n=1/283) in KC. Prevalence of α3.7-thalassemia heterozygous was 10% (n=39/372) in SK and 6% (n=2/31) in KC, and α3.7-thalassemia homozygous was 2% (n=6/372) in SK and 6% (n=2/31) in KC. Overall, Hb concentrations were not significantly different among children with no sickle cell variants (111±16 g/L) compared to children with sickle cell trait (111±17 g/L) and sickle cell disease (94±30 g/L) (P>0.05); anemia prevalence (Hb <110 g/L) was 43%, 48%, and 50%, respectively. Hb concentrations were not significantly different among children with no α3.7-thalassemia deletions (111±14 g/L) as compared to both α3.7-thalassemia heterozygous (108±12 g/L) and α3.7-thalassemia homozygous (107±8 g/L) (P>0.05); anemia prevalence was 41%, 54%, and 50%, respectively.

Conclusions: These disorders were not significantly associated with Hb concentrations. Sickle cell disease and thalassemia are associated with ineffective erythropoiesis that may result in increased iron absorption and higher concentrations of ferritin and/or sTfR. Further work is warranted to investigate the associations with iron status.

Keywords: hemoglobin, anemia, sickle cell, α-thalassemia

Conflict of Interest Disclosure: HarvestPlus contributed to the study design, but did not have a role in the analysis of samples or data, or the final interpretation of findings. All authors declare no conflict of interest.

ASSOCIATION OF PPAR GAMMA GENE EXPRESSION WITH DIETARY INTAKE OF FAT AND OIL AMONG NON-DIABETIC SUBJECTS

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Background and objectives: Several animal studies showed the expression of peroxisome proliferator activated receptor-gamma (PPAR gamma) in adipocytes among rats fed with high-fat diet was higher than those fed with normal diet. However, there are no human studies to support this. The objective of the present study was to investigate the association between the PPAR gamma expression in visceral and subcutaneous human adipose tissues and intake of hydrogenated and non-hydrogenated vegetable oils and butter.

Methods: Visceral and subcutaneous adipose tissues were obtained from 97 subjects (41 non-obese, 18 obese, and 38 morbid obese), who underwent open abdominal surgery with minimal impact on dietary intake. Intake of hydrogenated and non-hydrogenated vegetable oils and butter were collected using a valid and reliable food frequency questionnaire. The gene expressions of PPAR-gamma in visceral and subcutaneous adipose tissue were assessed by Real-Time PCR.

Results: after adjustment for total energy intake and age, visceral adipose tissue PPAR-gamma gene expression was correlated with total fat and oil intake (β=-0.531, P=0.014) in the total population. Among non-obese subjects, visceral adipose tissue PPAR-gamma gene expression was correlated with non-hydrogenated oil (β=0.621, p=0.017). PPAR-gamma gene expression in subcutaneous adipose tissue was correlated with non-hydrogenated oil (β=0.481, P=0.026) among obese subjects. Moreover, among morbidly obese subjects, we found significant correlations between visceral adipose tissue PPAR-gamma expression and total fat and oil intake (β=0.417, P=0.020).

Conclusions: Expression of adipose tissue PPAR-gamma mRNA negatively correlates with total fat and oil intake mostly in

visceral fat. In addition, non-hydrogenated oil positively correlates with PPAR-gamma expression.

Keywords: PPAR-gamma, adipose tissue gene expression, oil and fat

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CARBOHYDRATE INTAKE IS ASSOCIATED WITH HIGHER APELIN GENE EXPRESSION IN VISCERAL AND SUBCUTANEOUS ADIPOSE TISSUES

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Background and objectives: The evidence showed that the insulin level concentrations have an important role in apelin gene regulation and circulation. Diet may affect the level of insulin. The aim of the current study was to investigate the association of the apelin gene expression and concentration with habitual carbohydrate intake.

Methods: Visceral and subcutaneous adipose tissues were obtained from 32 morbidly obese and 32 age- and sex-matched non-obese subjects, who underwent open abdominal surgery. Dietary intake was collected using a valid and reliable food frequency questionnaire, and daily intake of carbohydrates, fiber, glucose, fructose, and total sugar were calculated. The mRNA expressions of apelin gene in visceral and subcutaneous adipose tissues were analyzed by Real-Time PCR.

Results: The mean age was 39.6 years for both groups and body mass index for morbid obese and non-obese subjects were 45.3 and 25.6kg/m2, respectively. Apelin gene expression was more increased in morbid obese than non-obese subjects in both subcutaneous (3.42 vs 0.49, P<0.05) and visceral adipose (3.65 vs 0.19, P<0.05) tissues. Apelin expression in visceral adipose tissue among non-obese subjects was marginally correlated with fructose (r=0.314, P=0.061); however, among morbid obese subjects, carbohydrate (r=0.429, P=0.014), fiber (r=-0.360, P=0.034), glu-

cose (r=0.341, P=0.048), and fructose (r=0.310, P=0.057) was correlated with apelin gene expression in visceral adipose tissue. Moreover, among obese subjects we found significant correlations between apelin expression in subcutaneous adipose tissue and carbohydrate (r=0.447, P=0.010), fiber (r=-0.443, P=0.013), total sugar (r=0.369, P=0.038), and among non-obese subjects we found significant correlations with glucose (r=0.481, P=0.006), fructose (r=0.467, P=0.008), and total sugar (r=0.435, P=0.014). Apelin concentration was correlated with percentage of energy from carbohydrate (r=0.379, P=0.046), fiber (r=-0.501, P=0.001) only in non-obese subjects.

Conclusions: The results of the current study showed that apelin among morbid obese had a positive correlation between carbohydrate and simple sugar intakes and a negative correlation with fiber intake.

Keywords: Fiber; Carbohydrate; apelin gene expressions; visceral and subcutaneous adipose tissues

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COMPARISON BETWEEN ENERGY INTAKE AND EXPENDITURE USING ACCELEROMETERS IN LARGE SCALE DISASTER SCENARIOS

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Background and objectives: When large-scale disasters occur, firefighters are expected to engage in high-intensity and long-term disaster response activities under harsh environments. Total energy consumption at the time of disaster activity is presumed to be about 3,000 to 4,000 kcal from literature review research, etc. However, the necessary amount (energy) is wide and there is no sufficient basis yet for these values.

In a report issued by the Fire and Disaster Management Agency of the Ministry of Public Management, Home Affairs, Posts and Telecommunications in 2012, each fire department headquarters has been shown to make efforts to prepare foods, drinking water, personal equipment, etc. that can function for 72 hours or more.

"Eating" or food plays an important role in maintaining the condition of firefighters even in case of emergencies and continuing to demonstrate their strength. Therefore, food (reserve) stockpiling needs to be considered in advance. However, the energy requirements of firefighters engaged in disaster response activities are not known, and it is the current situation that is left to the judgment of each municipality.

When large-scale disasters occur in the future, there is a need to clarify energy consumption and energy requirement at the time of disaster response activity in order to prevent the condition maintenance and performance deterioration of firefighters.

Therefore, in this research, we aimed to investigate the amount of activity in training close to the actual disaster activity and clarify the current state of energy consumption.

Methods: We targeted firefighters consisting of 62persons in 11 departments of three prefectures participating in a two-day blind firefighting training dedicated to large-scale disasters (hereinafter referred to as brand training). For the activity level survey, a clinical triaxial acceleration sensor activity meter was mounted from before the start of the blind training until after the end. Food content survey was recorded by photographing and filling in the survey form.

Results: In the blind training assuming large-scale disasters, the obtained result supported the past literature in terms of energy consumption.

Conclusions: In comparison, it became clear that there is a deficiency in the amount of energy of the meals currently being ingested by firefighters or disaster rescue personnel.

Keywords: Fire-Fighters. energy-intake. energy-expenditure. accelerometers.

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EFFECT OF MATERNAL MICRONUTRIENT SUPPLEMENTATION IN PREGNANCY ON THE INTELLECTUAL DEVELOPMENT OF ADOLESCENTS: LONG-TERM FOLLOW-UP EVALUATION BASED ON A RANDOMIZED CONTROLLED TRIAL IN RURAL CHINA

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Background and objectives: The benefits of maternal micronutrient supplementation in pregnancy on their offspring's mental development in early childhood have been evaluated from the randomized controlled trials. The aim of this study is to further examine the long-term effect of perinatal micronutrient supplementation on the adolescent intellectual development.

Methods: Eligible adolescents whose mother received one of three kinds of daily antenatal micronutrient supplementation (folic acid, iron/folic acid, and multiple micronutrients [MMNs]) in a community-based, double-blind, randomized controlled trial in rural western China, were recruited to a follow-up evaluation. Intellectual development of adolescents was assessed by the Fourth Version of Wechsler intelligence scale for children (WISC-IV). 5 composite scores were derived from WISC-IV to indicate the full-scale intelligence quotient (FSIQ), verbal comprehension index (VCI), working memory index (WMI), perceptual reasoning in-

dex (PRI), and processing speed index (PSI). Mean differences and 95% confidence intervals (CI) of 5 composite scores among three treatment group were estimated by generalized estimated equation linear models, and adjusted for the potential confounders.

Results: 2119 adolescents aged 9-15 years old were interviewed. There were non-significant differences among three treatment group in scores of FSIQ, WMI, PRI, and PSI. The score of VCI in MMNs group was significant higher than those in folic acid group (adjusted mean difference: 1.71; 95% CI: 0.11-3.32). In adolescents, whose mother initiated micronutrient supplementation before 12 gestational weeks, MMNs supplements significantly increased FSIQ by 2.05 (95% CI: 0.20-3.90) compared with folic acid group. For adolescent from poorest one-third household both in pregnancy and in current, maternal MMNs supplements was significantly associated with increased PRI scores (adjusted mean difference: 4.31; 95% CI: 0.77-7.86) compared with folic acid only. Compared with iron/folic acid group, MMNs supplementation significantly increased FSIQ (adjusted mean difference: 1.94; 95% CI: 0.18-3.70) in adolescent with their maternal total consumption number of antenatal supplementation less than 180.

Conclusions: In rural China, maternal MMNs supplementation was positively associated with the intellectual development of their offspring in adolescent compared with iron/folic acid or folic acid alone with the largest benefits in initiating supplementation in first trimester and in poor household subgroup.

Keywords: Maternal micronutrient supplementation, adolescent, intellectual development, longitudinal study, rural western China.

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HABITUAL PHYSICAL ACTIVITY AND APELIN GENE EXPRESSION IN VISCERAL AND SUBCUTANEOUS ADIPOSE TISSUES AMONG MORBID OBESE AND NON-OBESE SUBJECTS

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Background and objectives: adipose tissue is an expanded endocrine organ affects body hemostasis by secreting protein named adipokine. Plasma level of apelin (a new adipokine) decreased after exercise; however, the evidence on gene regulation in

adipocyte is rare. The objective of the present study was to investigate the association between the apelin gene expression and habitual physical activity among morbid obese and non-obese subjects.

Methods: Visceral and subcutaneous adipose tissues were obtained from 32 morbidly obese and 32 non-obese age- and sex-matched subjects, who underwent open abdominal surgery. Physical activity was collected using a valid and reliable International Physical Activity Questionnaire (IPAQ)-long form, and the metabolic equivalent of task (MET) was calculated. The mRNA expressions of apelin gene in visceral and subcutaneous adipose tissues were analyzed by Real-Time PCR.

Results: The mean age was 39.6 years for both groups and body mass index for morbidly obese and non-obese subjects was 45.3 and 25.6 kg/m2, respectively. Apelin gene expression was more increased in morbid obese than non-obese subjects in both subcutaneous (3.42 vs 0.49, P<0.05) and visceral adipose(3.65 vs 0.19, P<0.05) tissues. Apelin expression in visceral adipose tissue among morbidly obese subjects was correlated with total MET (r=-0.345, P=0.045); however, apelin gene expression in subcutaneous adipose tissue was not significantly correlated with total MET. Among morbid obese subjects, total home MET (r=-0.412, P=0.019) was correlated with visceral adipose tissue.

Conclusions: Decreased apelin gene expression in visceral adipose tissue is linked to total MET in morbidly obese subjects, suggesting an important role of physical activity pathways in the causal relationship between consequences of higher physical activity and the development of obesity.

Keywords: Exercise, Adipokine, Apelin, Physical Activity.

Further collaborators: The authors would like to thank Dr Mohammad-Reza Ebrahimi for surgical procedures

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ANTI-STEATOTIC EFFECTS OF DOCOSAEXAENOIC ACID AND HYDROXYTYROSOL IN THE LIVER OF MICE FED A HIGH-FAT DIET: PPAR-A AND NRF2 UP-REGULATION, AND OF SRBP-1C AND NF-KB DOWN-REGULATION

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Background and objectives: Background: Non-alcoholic fatty liver disease (NAFLD) is characterized by abnormal ac-cumulation of lipids, being insulin resistance, oxidative stress, inflammation and a drastic depletion of n-3 LCPUFA the main expressions of the disease. Docosahexaenoic acid (DHA, 22:6, n-3) controls liver lipid metabolism by stimulation of lipolysis and inhibition of lipogenesis and Hydroxytyrosol (HT) exhibits strong tissue cytoprotective effects. Objetive: To evaluate the molecular mechanisms involved in the protective effects of a mixture of DHA and HT (DHA /HT), to prevent the development of NAFLD induced by high-fat diet (HFD) in mice.

Methods: Male C57BL/6J mice received control diet (CD) (10% fat) or high fat diet (HFD - 60% fat), non-supplemented/ supplemented of DHA (50 mg per kg per day)/ HT (5 mg per kg per day) for 12 weeks. Parameters studied included liver histology (optical microscopy), activity of hepatic antioxidant enzymes (catalase, superoxide dismutase, glutathione peroxidase, and glutathione reductase (by spectrophotometry), oxidative stress indicators (glutathione, thiobarbituric acid reactants, and the antioxidant capacity of plasma), gene expression assays for PPAR-α, Nrf2, SREBP-1c and NF-κB (qPCR and ELISA), and LCPUFA profiles in liver (gas-liquid chromatography).

Results: Results: HFD induced (i) liver steatosis (increasing total fat, triacylglycerols and free fatty acid content), (ii) higher fasting serum glucose, insulin levels and HOMA index, total cholesterol, triacylglycerols, TNF-α and IL-6, (iii) liver and plasma oxidative stress enhancement, (iv) depletion of n-3 LCPUFA content of liver phospholipids, increasing lipogenic and reducing lipolytic enzyme activities (v) down-regulation of PPAR-α and Nrf2, and (vi) up-regulation of SREBP-1c and NF-kB (gene expression and DNA binding activity). These changes were either reduced (p < 0.05) or normalized (compared to CD) in animals feed HFD supplemented with DHA/HT.

Conclusions: DHA/HT intervention exerts anti-steatotic effects underling antioxidants and anti-inflammatory responses by improving insulin sensitivity and recovering the lipolytic/lipogenic status of the liver altered by HFD, being PPAR-α and Nrf2 up-regulation, together with SREBP-1c and NF-κB down-regulation important molecular mechanisms involved in the protective action of DHA/HT. These effects may support the potential therapeutic use of DHA/HT supplementation in the treatment of liver steatosis induced by nutritional factors and/or other etiologies.

Keywords: Anti-steatotic effects; docosahexaenoic acid; hydroxytyrosol; antioxidant effects ; antiinflammatory effects

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THE FADS GENETIC VARIANTS, FISH INTAKE AND LONG TERM WEIGHT CHANGE: RESULTS FROM THE SINGAPORE CHINESE HEALTH STUDY

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Background and objectives: A recent study in Greenlandic Inuit identified genetic signatures for adaption to diets rich in fish and n-3 polyunsaturated fatty acids (PUFAs), such as variants in

FADS cluster, which also affect adiposity feature. We therefore hypothesized that the genetic signatures might interact with fish/PUFA intakes on body weight.

Methods: The interactions between FADS variant and the fish, long chain polyunsaturated fatty acids intakes in relation to long term changes in body-mass index (BMI) were prospectively tested in 6,592 Chinese women and men from the Singapore Chinese Health Study (SCHS).

Results: We found that total EPA+DHA intake consistently accentuated the genetic influences of signatures FADS rs174570 (C/T, with T is rich in Inuit) on long term changes in BMI in the SCHS cohort. Differences in long term changes in BMI were -0.105 (SE 0.067), 0.027 (SE 0.064), and 0.120 (SE 0.067) kg/m2 across three tertiles of total EPA+DHA intake. Similarly, fish intake significantly accentuated the genetic influences on long term changes in BMI (p for interaction=0.006). Differences in long term changes in BMI were -0.096 (SE 0.071), 0.041 (SE 0.052), and 0.251 (SE 0.151) kg/m2 across three categories (≤1 serving/week, 1~6 servings/week, and ≥ 1 serving/day) of fish intake. In addition, the T carriers had much stronger associations of fish and long chain n-3 PUFAs intakes with long term changes in BMI than did the non-T carriers.

Conclusions: Our data supports that fish and long chain n-3 PUFAs intakes might modify the genetic effects of FADS variant on weight change in Chinese.

Keywords: Fish, fatty acids, FADS gene, gene diet interaction

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HANDBOOK FOR CONDUCTING CLINICAL TRIALS WITH DIETARY SUPPLEMENTS OF NATURAL ORIGIN

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Background and objectives: Introduction: The clinical development of natural products, especially dietary supplements, is a field of research currently under development around the world and in Cuba. The clinical trials with dietary supplements used different methodologies which are sometimes inadequate, with inconclusive results. There is no methodology for clinical trials with these products, the scientific evidences, supporting health benefits, are insufficient and limited for their generalization.

Objective: To prepare a handbook for conducting clinical trials with dietary supplements of natural origin.

Methods: A study that classified as applied research was carried out. The current situation of clinical trials with dietary supplements, the theoretical and the methodological foundations and the methodology used in clinical trials with these natural products, were identified in the scientific literature; and was designed a handbook to conducting clinical trials with natural dietary-supplements.

Results: The dietary surveys, anthropometric, biochemical and hematological determinations are methodological aspects defended by specialists of nutrition and the handbook suggest, it have to take into account in the investigative practice with this type of natural product, that`s why that proposal suggest necessary the participation of the accredited specialist in nutrition and propose their functions. The handbook contains issues to be taken into account during the planning and execution of the clinical trial. The specialists who valued the proposal agree with more than 75% of the indicators and 76.92% with all the indicators to evaluate the guide.

Conclusions: The handbook provides the necessary theoretical and methodological aspects while performing clinical trials with dietary supplements of natural origin.

Keywords: The handbook provides the necessary theoretical and methodological aspects while performing clinical trials with dietary supplements of natural origin.

144/1225

CALCIUM-IRON INTERACTION: A NEW APPROACH ABOUT THE EXPRESSION OF GENES AND PROTEINS INVOLVED IN NON- HEME IRON ABSORPTION IN SMALL INTESTINE

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Background and objectives: Calcium is the only dietary factor that affects both non-heme and heme iron absorption in humans. Mechanisms behind this effect are not elucidated. Our hypothesis is that calcium could modify the expression of gene and proteins involved in iron absorption. An interesting experimental model for evaluating this effect in small intestine is the human cell line Caco-2, which is easy to use and produces results that strongly correlate with the absorption of iron in humans.

Objective: To evaluate the effect of calcium on the expression of gene and proteins involved non-heme iron absorption by Caco-2 cells

Methods: Caco-2 cells were exposed by 1h with 2μM iron solution (ferrous sulfate) and calcium (chloride) using different calcium:iron molar ratios (MR) 0:1 to 1000:1. Intracellular iron concentration was determined by ECLIA method, mRNA expression by qRT-PCR and protein expression by Flow-Cytometry. Changes in ferritin, mRNA and protein expression were compared between non calcium-stimulated cells (calcium: iron molar ratio=0:1) and cells stimulated with calcium at different concentrations.

Results: Calcium does not affect intracellular iron concentration. However, calcium increased mRNA DcytB expression (p=0.007) but an opposite effect was found in DcytB protein expression in membrane (p=0.001). No effect was found on both, mRNA and protein expression in membrane of DMT1 (p=0.42 and p=0.55 respectively). Otherwise, mRNA levels and protein expression of FPN (Ferroportin) were decreased by calcium (p=0.002 and p=0.03, respectively).

Conclusions: Calcium decreased the protein expression of DcytB and FPN in membrane. Because FPN is the only protein involved in efflux of all dietary iron forms from diet, this effect may explain the negative effect of calcium on iron absorption previously described in humans. However, our results as well as previous data warrant further investigation into the effect of calcium on iron absortion.

Keywords: Non-heme iron, Calcium, Iron absorption, Caco-2 cells

IDENTIFICATION OF BLOOD CELL TRANSCRIPT LEVELS OF POMC AND AGRP IN THE OFFSPRING OF GESTATIONAL CALORIE RESTRICTED RATS AS POTENTIAL BIOMARKERS OF PREDISPOSITION TO IMPAIRED ENERGY HOMEOSTASIS CONTROL

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Background and objectives: Undernutrition during gestation is associated to perturbations in neuropeptides regulation and impaired leptin sensitivity, setting the stage for further obesity development. In turn, leptin supplementation during lactation reverses most of these detrimental effects. We used the animal model of gestational calorie restriction to determine potential transcript-based biomarkers in peripheral blood mononuclear cells (PBMCs) in adulthood indicative of a deficient energy homeostasis control and hence predictive of increased risk to develop obesity.

Methods: Adult male Wistar rats belonging to three experimental groups were studied: the offspring of control dams fed ad libitum with standard diet during gestation (controls); the offspring of 20% calorie-restricted dams from days 1-12 of gestation (CR); and CR rats supplemented with a daily oral dose of leptin throughout lactation (CR-Leptin). All offspring were fed standard diet thereafter. Body weight was followed. Body fat content and plasma leptin levels were determined at 3 and 6 months. Results of a microarray analysis performed in PBMCs at 4 months were used to identify genes related to feeding control being differentially expressed between controls and CR animals. RT-qPCR analysis was performed to confirm gene expression results.

Results: No significant differences were found between the three groups of animals concerning body weight, although CR an-

imals, but not CR-Leptin animals, presented a higher feed efficiency from 4-6 months than controls, and a higher adiposity index at 6 months. At this age, CR animals, but not CR-Leptin animals, also displayed higher leptin levels than controls. Up-regulated Agouti-related transcript (Agrp) and down-regulated proopiomelanocortin (Pomc) were identified by microarray gene expression analysis of PBMCs between CR versus control animals and related to feeding control. RT-qPCR confirmed the results. These alterations were partially reverted in CR-Leptin animals.

Conclusions: Expression levels of Agrp and Pomc are revealed as potential blood-cell transcript-based biomarkers of predisposition to excess fat accumulation in adulthood due to alterations in energy homeostasis control. Notably, these transcript levels are sensitive to oral leptin supplementation during lactation, in accordance to its ability to revert most of the detrimental effects on energy homeostasis control caused by inadequate fetal nutrition.

Keywords: PBMCs, maternal undernutrition, metabolic programming, feeding control.

144/1842

ROLE OF MICRORNAS MIR-155 AND LET-7B ON INFLAMMATION IN THP-1 CELLS: EFFECTS OF PRO- AND ANTI-INFLAMMATORY FATTY ACIDS

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Background and objectives: Our group has previously shown that a Mediterranean-based nutritional intervention is able to induce changes in the expression of Let-7b and miR-155-3p in white blood cells of individuals with metabolic syndrome. In addition, a low consumption of lipids and saturated fat has been associated with higher expression of Let-7b. However, to our knowledge there are no evidences about the role of anti- and pro- inflammatory fatty acids (FAs) on the expression of these microRNAs. In this sense, the main objective of the current study was to investigate the regulatory roles of miR-155-3p and Let-7b on the expression of inflammation-related genes in monocytes, macrophages and LPS-activated macrophages (AcM). Moreover, we explored the regulatory role of pro- and anti- inflammatory fatty acids on the expression of these miRNAs in the three cell types.

Methods: Human acute monocytic leukemia cells (THP-1) were differentiated into macrophages and activated with LPS for 24 hours. Monocytes, macrophages and AcM were transfected with miR-Let-7b-5p and miR-155-3p mimics or a negative control. The expression of the miRNAs and selected genes involved in inflammatory pathways (TNF, IL6, SERPINE1 and TLR4) was measured by qRT-PCR. The three cell types were also incubated with palmitic, oleic, docosahexaenoic (DHA) and eicosapentaenoic (EPA) acids.

Results: miR-155-3p mimic increased the expression of IL6 in the three cell types. In the same way, SERPINE1 was upregulated in monocytes and macrophages. However, TLR4 was downregulated in miR-155-3p-transfected monocytes and macrophages. Let-7b mimic downregulated TNF/IL6 in monocytes and SERPINE1 in AcM. However, TNF, IL6 and SERPINE1 were upregulated in macrophages. Oleic acid was able to increase the expression of miR-155 in monocytes when compared with DHA but not when compared with non-treated cells. On the other side, oleic acid increased the expression of Let-7b in macrophages and AcM.

Conclusions: Overall, these findings suggests a pro-inflammatory role for miR-155-3p and an anti-inflammatory role for Let-7b in THP-1 cells. However, these effects depended on the cell type. Moreover, some of the beneficial properties of oleic acid in non-activated and LPS-activated macrophages might be mediated by increasing Let-7b expression.

Keywords: TNF, SERPINE1, monocyte, macrophage, oleic acid

144/1843

ASSOCIATION BETWEEN FOOD INSECURITY AND NUTRITIONAL STATUS OF ADULT WOMAN

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Background and objectives: The Food and Agriculture Organisation (FAO) Voices of the Hungry (VOH) developed an

experience-based measure called the Food Insecurity Experience Scale (FIES). The FIES consists of a set of eight questions that focus on reported food-related behaviours associated with difficulties in accessing food due to resource constraints. The paper examines the association between food insecurity and nutritional status of Chakhesang people, an indigenous tribe of Nagaland, Northeast India.

Methods: Data on Food insecurity was assessed using pretested questionnaire from a representative sample of adult women to provide the information in order to (a) test the coherence of the selected questions and explore the degree of food insecurity, (b) classify the respondents into different classes of food insecurity (secure, moderately insecure, and severely insecure) and (c) estimate the prevalence of people experiencing food insecurity at various levels. R-program was developed to build the Rasch model for the analysis of FIES data.

Results: Different scoring methods (Raw and Weighted) were used to obtain the prevalence rates of food insecurity. A significant association between the prevalence by raw scores and Rasch model (<0.001) was observed indicating the synergy between the two methods in estimating the food insecurity prevalence rates. Rasch model suggests a higher prevalence of mild and moderate food insecurity (72%) whereas it was 59% with the raw scores. Approximately, 72% of the households experienced food insecurity at different levels and only 28% of the households are food secured. The prevalence of Food Insecurity is significantly (p<0.01) associated with Literacy rate, per capita income and family size. Food insecurity was higher among illiterate subjects (74%) as compared to literates (47%), low income groups (74%) as compared to high income groups (33%) and with family size of >=9 members (74%) as compared to family size of 1-4 members (54%). However, no significant association was observed between Chronic Energy Deficiency (CED) food insecurity levels.

Conclusions: Food Insecurity is heavily depending up on socio-demographic profile of the households.

Keywords: Food insecurity, Association, Rasch model, nutritional status, tribal population

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144/1854

MODERNIZING DIETARY ASSESSMENT

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Background and objectives: A cornerstone of governments' policies to reduce the risk of non communicable diseases is to encourage population change towards healthier diet and lifestyle. However, monitoring dietary changes in response to policy recommendations is based on self-reported dietary assessment tools, which are known to have high misreporting rates. We have developed a novel analytical pipeline capable to independently of recorded food intake, classify people into consumers of a healthy or unhealthy diet based on urinary metabolic patterns (Garcia-Perez et al., Lancet Diabetes Endocrinology, 2017).

Here we aim to apply this methodology based on metabolic profiling to improve the accuracy of monitoring dietary intake and adherence to diet guidelines for free living people and evaluate its utility for establishing inter-individual variation in response to diet.

Methods: We used a randomised controlled trial in 19 volunteers to develop metabolite models of eating patterns. Volunteers were admitted to a clinical research unit for four day periods. Participants were provided with all food and drink representing 25, 50, 75 and 100% of healthy eating recommendations to increase fruits, vegetables, carbohydrates, dietary fibre and to decrease total fats, sugars, and salt. A cohort of 20 volunteers collected spot urine samples once a week for six months and a matching 24-hours food diaries for each day of the sample collection. Metabolic profiles were measured by 1H-NMR spectroscopy. MetaboNetworks has been used to investigate the metabolic coverage based on inter-individual variation.

Results: Analysis of 1H-NMR spectroscopy data indicated significant differences in the urinary metabolic profiles of the four diets. These were used to predict the healthiness of the dietary habits of free-living people and tracking adherence to healthy eating recommendations over time. Missreporting of dietary data has been investigated using dietary biomarkers against the food records.

In addition, significant differences in metabolite concentrations were investigated to assess individual's variability in response to diet.

Conclusions: This study demonstrates the utility of applying our methodology to monitor adherence to healthful diets and assess individuals' variability in response to dietary changes.

Keywords: metabolic profiling, dietary patterns, dietary assessment, dietary adherence.

144/1903

AN EPIGENOME-WIDE ASSOCIATION STUDY (EWAS) OF OBESITY-RELATED TRAITS

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Background and objectives: Obesity is a complex phenotype that arises as a result of interaction between lifestyle and genetic factors. Epigenetics has been proposed as a molecular mechanism that accommodates genes to the environment and potentially could describe further the link between obesity and its complications. We conducted an epigenome-wide association study (EWAS) on obesity-related traits.

Methods: We used data from two prospective, population-based cohort studies: the Rotterdam Study (RS) and the Atherosclerosis Risk in Communities (ARIC) Study. We used RS (n=1,454) as the discovery panel and ARIC (n=2,097) as replication panel. Linear mixed-effect models were used to assess the association between genome-wide DNA methylation in leukocytes with body mass index (BMI) and waist circumference (WC) adjusting for sex, age, smoking, leukocyte proportions, array number, and position on array.

Results: Fourteen CpG sites were associated with BMI and 26 CpG sites with WC in RS after Bonferroni correction (P <1.07 × 10-7), of which 12 and 14 CpG sites successfully replicated in ARIC Study, respectively. The most significant novel CpG sites were located at MSI2 (cg21139312) and LARS2 (cg18030453) and were associated both with BMI and WC. CpG sites at BRDT, PSMD1, IFI44L, MAP1A, and MAP3K5 were associated with BMI and CpG sites at LGALS3BP, MAP2K3, DHCR24, CPSF4L, and TMEM49 were associated with WC.

Conclusions: We report novel associations of methylation at MSI2 and LARS2 with obesity-related traits. These results provide further insight in mechanisms underlying obesity-related traits, which can enable identification of new biomarkers in obesity-related chronic diseases.

Keywords: DNA methylation, EWAS, BMI, waist circumference, cohort

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144/2080

ASSOCIATION OF THE FTO FAT MASS AND OBESITY – ASSOCIATED GENE RS9939609 POLYMORPHISM WITH REWARDING VALUE OF FOOD AND EATING BEHAVIOR IN CHILEAN CHILDREN

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Background and objectives: FTO is the strongest known genetic susceptibility locus for obesity. Experimental studies in animals suggest a potential role of FTO in regulating food intake and eating behavior. Objective: The aim of this study is to assess the association between the genetic variant rs9939609 in the FTO gene and homeostatic and non-homeostatic eating behavior patterns in Chilean children.

Methods: Cross-sectional study in 258 Chilean children (44% female; 8-14 years-old) showing a wide variation in BMI. Anthropometric measurements (weight, height, Z-score of BMI and waist circumference) were performed by standard procedures. Eating behavior was assessed using the Eating in Absence of Hunger Questionnaire (EAHQ); Child Eating Behavior Questionnaire (CEBQ); Three Factor Eating Questionnaire (TFEQ) and the Food Reinforcement Value Questionnaire (FRVQ). Genotype of the

rs9939609 in FTO was determined by a Taqman assay. Statistical Analysis: Association of the rs9939609-A allele with eating behavior was assessed using non-parametric tests.

Results: Allelic frequencies of the rs9939609 was estimated as 77% for the A allele and 23% for the T allele in Chilean children. We found that normal weight girls carrying the A-allele have higher scores of Satiety Responsiveness and higher scores of the Slowness in Eating subscale. In normal-weight boys, carriers of the A-allele showed significantly higher scores of the Negative Affect sub-scale and lower scores of the Desire to Drink sub-scale, in relation to the non-carriers. In the overweight group we found that carriers of the A-allele showed higher scores of the Food Responsiveness, Emotional Overeating, Enjoyment of Food and Food Choice sub-scales and lower scores of the Satiety Responsiveness and Slowness in Eating sub-scales. In the obese group we found higher scores of the Cognitive Restrained subscale and significantly lower Food Choice.

Conclusions: The rs9939609-A allele is associated with eating behavior traits that may predispose obese children to increased energy intake and obesity.

Keywords: Fat Mass and Obesity Related (FTO), Children, polymorphism, eating behavior.

144/2110

SHORT TERM EFFECT OF EARLY OVERNUTRITION IN THE TRANSCRIPTOME OF WISTAR RAT HYPOTHALAMUS (RATTUS NORVEGICUS)

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Background and objectives: The postnatal overnutrition (PON) influences the generation of metabolic disorders such as obesity and dyslipidemia. Recent reports in animal models with hypercaloric diet show changes in the concentration of peptides that regulate the activation or inhibition of neurons that induced behaviors of appetite and satiety, resulting in hyperfagia after treatment.

The objective of this work was analyze the short-term effect of the PON in the hypothalamus and adipose tissue transcriptome. Particularly analyzing metabolic pathways related to the regulation of the processes of hunger, satiety and inflammation.

Methods: Overnutrition model in Wistar rats by overlactation from day 3 to day 21 of life by litter size reduction method using pup male was generated: control group (n=5) and overnutrition group (n=5). Transcritome was analyzed with microarrays of expression technology (Ratgene ST 2.2, Affymetrix®), with a coverage of 28,407 transcripts. The pathway analysis was performed with the Ingenuity Pathway Analysis software (IPA). Bioinformatic analysis was performed on the R statistical software, statistical analysis for phenotypic and biochemical parameters were analyzed in Graphpad Prism 6® software, it was applied Student´s t test with $p < 0.05$.

Results: Treatment group shows overweight, and high concentration of triglycerides, glucose and leptin serum. Transcriptome analysis in hypothalamus showed 226 deregulated transcripts of which 98 are under-expressed transcripts and 128 overexpressed with a cutoff of fold change (Log fold change) of 1.5 were found. Furthermore the adipose tissue transcriptome showed 161 deregulated transcripts of which 61 are overexpressed and 100 are underexpressed. Analysis of the pathways expressed in hypothalamus showed a deregulation of the pathways of lactation, inflammation, circadian rhythms and leptin resitance. The desregulated vias in adipose tissue was associated to inflammation, disorder of lipid metabolism and hyperleptinemia.

Conclusions: Early postnatal overnutrition generates insulin resistance and dyslipidemia. We show for the first time the effects of early postnatal overnutrition in the hypothalamus and adipose tissue transcriptomes to 21 days. Some of differentially expressed transcripts controls neuronal circuits involving the hypothalamus control circadian rhythms and endocrine regulation (leptin vias), this is an evidence of metabolic disruption in hypothalamus and adipose tissue.

Keywords: Hypothalamus, adipose-tissue, metabolic-programming, whole-transcriptome.

144/2299

DO MEASURES OF SWEET TASTE INTENSITY AND HEDONIC LIKING OF GLUCOSE PLAY A ROLE IN DIETARY INTAKE OF SWEET FOOD?

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Background and objectives: A range of psychophysical taste measurements are used to characterise an individual's sweet taste

perception. The links between sweet taste perception and dietary intake of sweet foods should to be explored, since it could be a link to address health outcomes. This study aims to investigate the relationship between both perceived sweet intensity and hedonic liking of sweet taste, and the relationship with dietary intake.

Methods: This cross sectional study recruited women (n=44) aged 20-40 years. Measures of sweet taste perception (sweet taste intensity and hedonic liking of suprathreshold concentrations) were assessed using glucose as the tastant. Dietary intake was assessed for energy, macronutrients and sugars (total sugar, glucose, sucrose, fructose, lactose and maltose) using a four-day weighed food record.

Results: There were significant inter-individual variations in sweet taste measurements. Mean perceived sweet taste intensity correlated inversely with mean recorded energy (r=-0.403, p=0.009), carbohydrate(r=-0.449, p=0.003), total sugar (r=-0.421, p=0.006), glucose (r=-0.411, p=0.008), fructose (r=-0.408, p=0.008) and maltose intake (r=-0.325, p=0.038). Mean hedonic liking correlated positively with mean recorded energy (r=0.324, p=0.039), carbohydrate (r=0.360, p=0.031), total sugar (r=0.437, p=0.004), glucose (r=0.418, p=0.007), fructose (r=0.391, p=0.012) and maltose intake (r=0.463, p=0.002).

Conclusions: To the best of our knowledge this is the first study reporting robust significant relationships between a combination of both sweet taste intensity measures and hedonic liking measures of suprathreshold concentrations with dietary intake measures. Although causality cannot be inferred due to the cross-sectional design, the increase in strength of correlations and strength of significance suggest a dose-dependent relationship between sweet taste intensity, as well as the hedonic liking and dietary intake of energy, carbohydrates and particularly glucose.

Keywords: sweet taste intensity; hedonic liking; dietary intake; glucose

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UTILIZING DIGITAL TECHNOLOGY FOR PAPER-LESS DATA COLLECTION AND REAL TIME MONITORING OF RESEARCH PROJECTS

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Background and objectives: Real time data collection and management is crucial for public health research. A centralized data capturing mechanism using tablet and web based application was implemented in a large community based trial in rural Bangladesh where information was collected from 35,372 pregnant women. The goal of designing such a data capturing and storing system was to introduce an advanced tab-based technology for real time, error free and cost effective, and data collection and reporting mechanism.

Methods: A paper-less data management software was centrally developed for data collection, and transmission, to central server for monitoring and field management. All data collection variables were incorporated into the smartphone [with Symbian operating system (OS)] and tablets (with Android OS) with internet enabled SIM card. Separate software were developed for the smartphone and tablets. All types of display and validation conditions were built into the software to prevent errors and ensure logical flow, range check, uniqueness check and skip-rules. Data were stored locally in the tablet during interview. Data coollectors upload data daily to a central server to create a pooled central database. For real time monitoring and supervision, a separate web-browser based interface was developed. Password protected login identifications and audits were incorporated to ensure data safety.

Results: Such a digital data capturing system ensured high quality, reliable data. This allowed evasion of conventional way of manual data entry, data filing and stocking. A built-in GPS tracking system helped data collector and investigators to locate the respondent's households, reducing the barrier of distance. Any mismatch in data could be easily detected and traced using unique identifiers, and accordingly respondent specific corrections were made. A back-

up copy of the entre database were stored in a separate server in a different physical location to ensure data protection.

Conclusions: We have developed an application for Symbian, Android operating system and web platform to assist research activities. Quality, complete and timely data collection from a large community based trial is unprecedented in rural Bangladesh. This innovation ensured quality data capturing by reasonably educated workforce at point of contact in an integrated manner.

Keywords: operating system, data capturing, paperless, digital technology

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144/2500

HIGH-FAT DIET DISRUPTS PERIPHERAL CIRCADIAN CLOCKS IN WHITE AND BROWN ADIPOSE TISSUES

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Background and objectives: Due to the periodic changes of 12h-light and 12h-dark in the environment, circadian clock rhythmic exists in almost all living creatures. The circadian oscillation system is generated by a transcriptional feedback loop that consists of clock genes. It has been reported that clock genes regulate metabolic and physiological process in peripheral tissues. However, the relationship between dysfunction of circadian mechanism and obesity has not been revealed clearly. The aim of this study is to examine the change of circadian oscillation of clock genes in white adipose tissue (WAT) and brown adipose tissue (BAT) in high-fat diet-induced obese mice.

Methods: Six-week-old male ddY mice, after one week feeding of a normal laboratory diet, were divided into a low-fat diet (LFD, 10 energy%), or a high-fat diet (HFD, 60 energy%) for 8 weeks under strict 12h-light and 12h-dark cycle. Mice were sacrificed every 4h over continuous 24h, and WAT and BAT were isolated. The circadian expression of clock genes was examined by quantitative real-time PCR.

Results: Without difference in the quantity of energy intake between feeding groups, after 8 weeks on a HFD, mice displayed obese metabolic features. In LFD group, a similar oscillatory pattern of the clock genes was revealed in WAT and BAT. Additionally, HFD feeding affected the circadian expression of clock genes by altering phase, amplitude or oscillatory pattern, but the effects varied from WAT to BAT. In WAT, the oscillations of Bmal1, Clock, Per(1-3), Cry(1-2), Rev-erb(α,β) and Rorα were affected by HFD feeding significantly. However, in BAT, the oscillations of Npas2, Bmal1, Cry(1-2), Ror(α,β,γ) were changed significantly by HFD feeding.

Conclusions: Clock genes displayed robust cyclic expression both in WAT and BAT. The oscillatory pattern of the clock genes were disrupted in HFD induced obese mice, but the effects of HFD on peripheral circadian clocks are different between WAT

and BAT. This indicates an intrinsic correlation between circadian oscillation and metabolic function in adipose tissues, and the difference in circadian regulation between WAT and BAT. Further study is needed to reveal the mechanisms.

Keywords: circadian oscillation, obesity, disruption, brown adipose tissue, white adipose tissue

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144/2520

COMPARISON BETWEEN EQUATIONS TO ESTIMATE ENERGY REQUIREMENT FOR WOMEN FROM ANTIOQUIA WITH EXCESS WEIGHT (COLOMBIA)

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Background and objectives: Energy is the ability of bodies to perform work and produce changes in themselves or in other bodies. The energy balance occurs when the daily energy needs are equal to the expenditure, in this way the weight is conserved. Objective: To compare the energy expenditure by indirect calorimetry vs diverse equations to estimate the energy expenditure at rest, in women with overweight

Methods: Materials and methods: population and sample: 1500 female patients, aged between 18 and 73 years, with overweight, who attended for 9 years (2006-2015) to private medical consultation and performed indirect calorimetry, of the total of calorimetry, was made a selection of a sample corresponding to 1178 calorimetry for this study. Statistical analysis: we performed a comparative descriptive analysis of multidimensional type of cross-section. To the statistical analysis we used multivariate analysis of variance (MANOVA) with canonical orthogonal type contrast, the analysis was complemented by the Spearman correlation technique, additionally was one-dimensional type descriptive statistics. We used SAS University 2015 statistical packet

Results: The present investigation it showed that as the age increases, it diminishes the stature, increases the average weight and increases the body mass index (BMI). When performing the analysis of variance (MANOVA), we did not detect significant differences in energy expenditure, determined by indirect calorimetry (IC) in the analyzed groups ($p > 0.05$); we detected a significant difference ($p < 0.05$) in energy expenditure according to the Harris and Benedict equation (HB).

Conclusions: An overestimation or underestimation of energy requirements in individuals can lead to a deficit or excess in caloric intake, which will be reflected in their nutritional status.

Keywords: Energy requirement, indirect calorimetry, energy expenditure

144/2673

APPLICATION OF A NEW CHALLENGE METHOD: IMPROVING METABOLIC RESILIENCE WITH WHOLEGRAIN WHEAT PRODUCTS

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Background and objectives: Whole grain wheat (WGW) consumption has been associated with beneficial health effects in observational studies. However, intervention studies show mixed effects upon traditional measurements under overnight fasting conditions. The aim of the study was to show that quantification of resilience can be used to substantiate health effects of WGW in a healthy population. For this purpose we used a standardized mixed meal challenge test called PhenFlex test (PFT).

Methods: A randomized controlled double blind trial was performed with 50 male and female participants with mildly elevated plasma total cholesterol levels. After 4 weeks run-in with refined wheat (RW) participants were assigned to either 12 weeks WGW (98 g per day) or RW. Before and after 12 weeks intervention PFT was performed. Blood samples were taken at overnight fasting (t=0) and 30, 60, 120, and 240min postprandial. During the 4 hour response time course, 31 biomarkers were quantified focusing on cardio-metabolic health.

Results: At fasting only 2 out of 31 biomarkers were significantly different between RW and WGW, in contrast to the PFT response with 12 out of 31 biomarkers. Among these were ALAT and ASAT, TG and HDL, CRP, IL8, SAA, IL10, IL6, IL1b and TNFα. PFT response showed little or no significant differences in NEFA, TG, cholesterol, glucose and insulin responses between the two interventions, but when combining these into a health space model a clear WGW metabolic health effect in the direction of subjects from younger age was observed.

Conclusions: Here we show for the first time in a RCT that WGW improved metabolic health, liver health and inflammatory status as measured by a set of biomarkers to a nutritional challenge test. This confirms the associated beneficial health effects from epidemiology, while traditional overnight fasting blood measurements showed little or no health effect of WGW.

Keywords: whole grain wheat, phenotypic flexibility, biomarkers, challenge test, metabolic health

144/2698

IN OBESE WOMEN, INCREASED BLOOD VOLUME AND REDUCED SERUM IRON PARTIALLY EXPLAIN THE HIGHER RISK FOR IRON DEFICIENCY

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Background and objectives: Obesity has been shown to be a risk factor for low serum iron status in different settings. The hypoferremia of obesity might be explained by a combination of biological factors such as inflammation, hemodilution and increased iron requirements. Excess body mass has been suggested to lead to increased blood volume, which may explain lower serum iron concentrations observed in obese individuals.

This observational study compares blood volume in normal-weight versus overweight and obese, healthy, non-anemic women (n=62) (BMI 18.5-39.9 kg/m2). We examined if differences in blood volume might explain the reduced serum iron in overweight/obese women. Additionally we developed an equation to calculate blood volume in overweight/obese women.

Methods: We assessed body composition by dual energy X-ray absorptiometry (DXA), iron status, inflammation, and blood volume using the carbon monoxide (CO)-rebreathing method.

Results: Overweight/obese women presented higher absolute blood volume, plasma volume and red blood cells, and lower serum iron compared to in normal-weight (P<0.05). There were no significant differences in body iron stores comparing in normal-weight, overweight and obese women. Body mass (r=0.74), lean mass (r=0.82) and fat mass (r=0.56) were correlated with blood volume (p<0.05). Blood volume (r2=0.22, β=-0.29, P=0.02) was a negative predictor for serum iron when adjusted for body iron stores. Equations utilizing combined height-body mass and lean mass were the most accurate for predicting blood volume in all BMI groups.

Conclusions: Due to the dilutional effect of blood volume, 'true' hypoferremia may be overestimated in populations with a

high prevalence of obesity when using serum iron as an indicator. Nevertheless, our results indicate that the iron requirements of obese women are actually increased.

Keywords: hypoferremia; overweight; plasma volume; iron status

Track 2: Nutrition Through Life Course

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LIPID PROFILE AND FUNCTIONAL ACTIVITY OF BIOACTIVE PEPTIDES IN HUMAN MILK

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Background and objectives: Human milk is a fluid of extreme chemical complexity that provides the required nutrients for the suitable development of the newborn and a series of compounds with biological activity essential for adaptation to extrauterine life. Last years, the presence of polyunsaturated long chain fatty acids in breast milk and infant feeding has become very important. They are obtained by the mother's diet during pregnancy and lactation. The purpose of the study is to determine the nutritional status of pregnant women and their influence on the markers of fatty compound synthesis in breast milk.

Methods: A prospective cohort study will be conducted in women during pregnancy and lactation. The sample is 112 healthy women and 112 women with risk pregnancies (diabetic, obese and hypertensive).

The anthropometric evaluation will be performed obtaining the following parameters: weight, size, folds, perimeters, diameters.

The nutritional assessment will be done using 3 types of validated questionnaires: food register, 24-hour reminder questionnaire and food consumption frequency questionnaire. The lactogenesis is evaluated through the collection of 3 samples: colostrum, transition milk and mature milk. Each of the above samples will be determined as follows: short chain fatty acids, total fatty acid quantification. The following complementary parameters will also be determined: triglycerides, cholesterol, and glucose. As well as, bioactive peptides: study of in vitro digestibility of milk protein and identification of functional peptides, identification of peptides, study of antioxidant activity, antibacterial and probiotic, bioavailability of minerals.

Results: The fat composition of the milk will be different depending on the nutrition of the woman during gestation, her anthropometric measurements and the presence or absence of risk pathologies during the course of gestation.

Keywords: Bioactive peptides, breastfeeding, pregnancy, nutrition

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EXPLORING THE POTENTIAL ROLE OF BREAST-FEEDING IN THE RECOVERY OF ACUTE MALNUTRITION AMONG INFANTS AGED BELOW 6 MONTHS

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Background and objectives: Globally, 4.7 million infants under 6 months (U6M) suffer from severe acute malnutrition (SAM). Recent data suggests that survival of these infants during and after admission is very poor. In a clinical trial, mortality among SAM infants u6m followed up for 1 year after discharge from treatment was 31 per 100 child years and weight gain was poor. Re-establishing exclusive breastfeeding is the main thrust of the WHO updated treatment guidelines, however no studies have tested if successful re-establishing exclusive breastfeeding during inpatient treatment would result in maintained exclusive breastfeeding after discharge and result in nutritional recovery (catch-up growth) and survival.

Methods: We are conducting a prospective cohort study involving 90 infants aged 4 weeks to 4 months admitted with acute malnutrition (WFLZ<-2 or WFAZ<-2) at the Kilifi County Hospital (KCH), Kenya. Study participants are nutritionally managed as per the WHO treatment guidelines emphasizing on re-establishing exclusive breastfeeding and followed up at 2nd, 4th and 6th weeks after discharge to assess growth (anthropometry), breastfeeding status, morbidity and mortality. Views on challenges and drivers of breastfeeding retention are also be collected using interviews.

Results: We anticipate the following outcomes from the study; i) the proportion of malnourished infants under 6 months effectively re-establishing exclusive breastfeeding (attaining weight velocity of >5g/kg/day on breast milk only for 3 consecutive days before discharge); ii) proportion of infants retaining exclusively breastfeeding 4 weeks after discharge; iii) post-discharge weight gain in relation to breastfeeding status; iv) challenges and motivators to retaining exclusive breastfeeding among recovering infants.

Conclusions: The results of this study which will be presented in the conference will demonstrate if exclusive breastfeeding can be attained and retained after discharge; and if breast milk alone is sufficient for recovery of acutely malnourished infants.

Keywords: Severe Acute Malnutrition; infants under 6 months; Breastfeeding; weight gain; Kenya

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AN ANALYSIS OF THE RELATIONSHIP BETWEEN 25-HYDROXY VITAMIN D LEVELS AND MUSCULOSKELETAL HEALTH: A POPULATION-BASED STUDY OF CHINA'S ELDERLY

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Background and objectives: ackground and Objectives Vitamin D deficiency is a public health problem worldwide, in spite that vitamin D plays an important role in musculoskeletal health, immunity system, chronic non-communicable diseases and other diseases. Vitamin D is essential in the regulation of calcium and phosphate homeostasis, which affect bone development and preservation. More and more evidence has shown that vitamin D plays an important role in skeletal muscle, affecting falls or sarcopenia in the elderly. This study was to analyze the reasons behind the prevalence of vitamin D deficiency in Chinese community-dwelling elder people, and furthermore explore the relationship between vitamin D levels and indicators of bone health and muscle health.

Methods: Subjects were part of a cross-section survey, in which questionnaires contained social demographic information, lifestyle information, diseases history, dietary survey and other questions. Physical examinations included somatometry, bone density, body composition and blood test.

Results: The prevalence of vitamin D deficiency and vitamin D insufficiency among the respondents was 74.1% and 20.9%, and there was significant difference among respondents from different regions. The percentage of respondents diagnosed with osteopenia or osteoporosis was about 69.5% and there was significant difference between genders in terms of prevalence of osteoporosis. The prevalence of sarcopenia was 5.7%, and there was no significant difference between genders and residential places. In the final regression models, vitamin D conditions failed to show significant difference on the probability of leading to osteopenia and sarcopenia, though vitamin D conditions were retained in the final model of sarcopenia, while age and residential place were on the contrary.

Conclusions: Vitamin D deficiency is severe in our respondents, and so as the prevalence of osteopenia. Age and gender do affect the prevalence of osteopenia, and for that of sarcopenia the factors are age and region . We should pay more attention on vitamin D deficiency and musculoskeletal health in the elderly.

Keywords: Serum vitamin D; Osteopenia; Osteoporosis; Sarcopenia; The elderly

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SUGARY DRINKS CONSUMPTION AND ABDOMINAL OBESITY IN ADOLESCENTS: A BRAZILIAN COHORT STUDY

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Background and objectives: Introduction. Adolescence is marked by changes in body composition due to growth and development, which may be influenced by many factors as food and beverage intake. Several studies show that high consumption of sugary drinks is associated with risk factors for noncommunicable diseases, for example, abdominal obesity. However, especially among teenagers, it is observed an increasing trend in the consumption of these drinks.

Objective. To assess the relationship between consumption of sugary drinks and abdominal obesity among adolescents from public schools of João Pessoa/Brazil.

Methods: Design. This is an analysis of the baseline study Loncaafs cohort - "Longitudinal Study Sedentary Behavior, Physical Activity, Food and Health of Adolescents", conducted with 1009 adolescents between 10-14 years. Abdominal obesity was evaluated by the waist circumference measures; and the sugary drinks consumption by 24-hour recall. Sugary drinks consumption above 10% of daily total energy intake was considered excessive.

Results: The daily average energy intake of the adolescents was 2357.5kcal, of which 11.0% (254.5kcal), on average, were arising from sugary drinks. The prevalence of excessive consumption of sugary drinks among adolescents was 46.6% (n=470), while the prevalence of abdominal obesity was 40.2% (n=404). Although the relationship between this two variables was not statistically significant (p=0.40), the high prevalence of abdominal obesity and sugary drinks intake are worrying.

Conclusions: Monitoring and health promotion actions targeting adolescents are necessary to change not only the quality of food and beverage intake, but also the anthropometric measurements of this population, improving the quality of life of a whole generation.

Keywords: Sugary drinks; Abdominal obesity; Teenage School

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ASSESSMENT OF ANEMIA CONTROL AND PREVENTION SERVICE PROVISION DURING ANTENATAL CARE IN NORTHERN GHANA

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Background and objectives: Anemia is a severe public health problem in Ghana, particularly among women of reproductive age (42 percent), and children under five (66 percent), the most common causes being diets deficient in absorbable iron, malaria, and intestinal parasites. Anemia shows regional disparities as in the Northern Region (48 and 82 percent, respectively). The USAID-funded Resiliency in Northern Ghana (RING) Project seeks to reduce anemia and has trained health workers on anemia prevention and control, including on the use of HemoCue Hb 301 devices to measure hemoglobin during antenatal care (ANC) visits.

The objectives of the assessment were to:

1. Assess gaps in anemia prevention and control during ANC visits, including provision of nutrition counseling, anemia testing, iron folic acid (IFA) supplementation, treatment, and referral;

2. Identify the origin of the gaps in the supply chain of medicines provided.

Methods: We used the Expanded Programme on Immunization cluster survey methodology with the primary sampling unit being the districts, the secondary sampling being the level of health facility, and the tertiary the health facilities. The sample was based on two groups: the Interventions Districts (IDs) (where HemoCue devices have been supplied for anemia testing) and the non-IDs (where devices have not been provided). Thirty health facilities were randomly selected across each group in which seven interactions between health workers and pregnant women were observed, and information was collected with Android-based tablets. In addition, in each health facility, interviews and review of documents were conducted in order to assess the supply of IFA and others anemia related medicines at the facility, district, and regional stores.

Results: We will present the results in the two targeted groups, in particular the main bottlenecks in regarding to service delivered during ANC visits. In addition we will provide a comprehensive diagnostic of the supply chains of the essential commodities needed in the control and prevention of anemia. Results: **Conclusions:** We will discuss how bottlenecks in service delivery as well as in access to essential medicines were addressed following the survey.

Keywords: anemia - antenatal care – service delivery - supply chain

MATERNAL ALPHA-LINOLENIC ACID INTAKE IS ASSOCIATED WITH OFFSPRING BIRTHWEIGHT

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Background and objectives: Epidemiological evidence indicates that birthweight is inversely associated with adult ischemic heart disease, with a 10–20% lower risk per 1 kg higher birthweight. Imbalanced maternal fatty acid intakes have been reported to be associated with impairments in fetal growth. Accordingly, we sought to determine the association of maternal fatty acid intake during pregnancy with offspring birthweight in healthy mother-child dyads in an Australian tertiary hospital.

Methods: Newborn infants (n=223) were recruited at birth from the Royal Prince Alfred Hospital, Australia. Maternal diet during pregnancy was assessed using a validated Food Frequency Questionnaire. Individual fatty acids were expressed as a percentage of total fatty acid intake (%TFA). Birthweight percentiles were obtained using the most recent Australian national birthweight percentiles. All analyses were adjusted for gestational age and sex and total energy intake.

Results: Neither maternal total fat nor polyunsaturated fat intake were associated with offspring birthweight. Higher maternal intake of omega-3 alpha-linolenic acid (ALA) as percentage of total fatty acid intake (%TFA) was associated with higher offspring birthweight [201g per 1% higher of total fatty acids (95% CI: 21, 380); P=.03]. Categorical analysis of dietary ALA intake by tertiles showed an increasing trend in birthweight across the lowest to highest tertiles (P ANOVA =.05) and significant differences in birthweight between the lowest and highest groups of dietary ALA intake [mean difference:-221g, (95%CI:-429,-12); P=.04]. Subgroup analyses by birthweight percentiles for gestational age and gender reported that mothers of infants born small-for-gestational age (SGA; birth weight <10th percentile for gestational age and sex; n=32) had the lowest ALA intake compared to those born normal birthweight (<25th to ≤75th percentile; n=109) or large for gestational age [(LGA; >90th percentile; n=21); P ANOVA =.05]. No statistically significant associations were observed for the longer chain omega-3 polyunsaturated fatty acids or omega-6 polyunsaturated fatty acids.

Conclusions: In otherwise healthy women giving birth at a major tertiary hospital in Australia, intake of ALA, a plant-derived omega-3 fatty acid, is associated with higher birthweight. This may have impli-cations for prevention strategies aimed at improving fetal growth via modification of maternal diet, and warrants further study.

Keywords: birthweight, maternal diet, fatty acids, alpha-linolenic acid

A HIGHER-CARBOHYDRATE, LOWER-FAT DIET DURING PREGNANCY IS ASSOCIATED WITH GREATER GESTATIONAL WEIGHT GAIN: THE GUSTO STUDY

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Background and objectives: Diet during pregnancy can influence gestational weight gain (GWG), but evidence relating dietary macronutrient composition and food groups to GWG is inconclusive. Hence, we aim to examine the associations of maternal energy, macronutrient and food intakes with GWG in the Growing Up in Singapore Towards healthy Outcomes (GUSTO) mother-offspring cohort.

Methods: Dietary intake of pregnant women was assessed at 26–28 weeks' gestation mainly using the 24-hour recall, with a subgroup completing the 3-day food diaries. GWG z-scores were calculated from weights measured at first antenatal appointment and before delivery. Inadequate and excessive GWG were defined using the Institute of Medicine recommendations based on weights at 15 and 35 weeks' gestation. Associations were examined using substitution models for macronutrient composition, with linear or multinomial logistic regressions.

Results: Mean (SD) daily energy intake, and percentage energy intakes from carbohydrate, protein and fat of 960 pregnant women were 1868 (598) kcal, 51.4% (8.7), 15.7% (3.7), and 32.8% (7.6),

respectively. Higher energy intake (per 500kcal increment) was associated with a 0.18 higher GWG z-scores. In isocaloric diets, higher-carbohydrate and lower-fat intakes (at 5% energy substitution) were associated with 0.07 higher z-scores, and a 14% higher risk of excessive GWG. Concordantly, higher intake of carbohydrate-rich foods was associated with higher z-scores (P-trend=0.042), but higher fruit and vegetables intake was associated with lower risk of inadequate GWG (P-trend=0.003). Compared to the lowest tertile, the highest tertile of dairy intake was associated with 0.18 lower GWG z-scores, while the highest tertile of plant-based protein foods was independently associated with 60% and 34% lower risks of inadequate and excessive GWG respectively.

Conclusions: Energy intake is the main determinant of weight gain during pregnancy, but balancing the proportions of carbohydrates and fat may also be important. Higher intakes of plant-based protein foods, dairy and fruit and vegetables may be beneficial for achieving optimal weight gain during pregnancy.

Keywords: energy, macronutrient, food group, pregnancy, gestational weight gain

Conflict of Interest Disclosure: PDG, KMG and YSC have received reimbursement for speaking at conferences sponsored by companies selling nutritional products. These authors are part of an academic consortium that has received research funding from Abbot Nutrition, Nestec, and Danone. All other authors declare that there is no conflict of interest associated with this manuscript.

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INTRODUCTION OF COMPLEMENTARY FOODS TO INFANTS AND CHILDREN BY AGE AND ETHNICITY; NATIONAL HEALTH AND NUTRITION EXAMINATION SURVEY 2011-2014

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Background and objectives: Dietary patterns that are developed during a child's first few years of life have been shown to impact dietary choices made later in life. Several authoritative sources provide recommendations regarding the introduction of complementary foods to infants and children. It is unclear if these recommendations are followed, how these early food choices impact nutrient intake, and what, if any, the differences are among ethnicities.

To examine the introduction of complementary foods, dietary patterns and nutrient adequacy during the first five years of American infants and children among varying ethnic groups.

Methods: Data from the 2011-2014 National Health and Nutrition Examination Survey were analyzed (n=2,431). Age groups were 0-5 months (n=229), 6-11 months (n=297), 12-23 months (n=394), 2-3 years (n=836) and 4-5 years (n=675). Ethnic groups were defined as Non-Hispanic White, Non-Hispanic Black, Hispanic, and Asian.

Results: At age 0-5 months, when exclusive breastmilk or iron-fortified infant formula are recommended, 41% of infants already consumed baby cereal, 19% consumed vegetables/fruit and 7% consumed snacks and sweets. By age 6-11 months, 45% consumed regular snacks and sweets and 35% consumed baby snacks and sweets. From 1–5 years none of the children met vegetable recommendations and from 4-5 years none of the ethnic groups met dairy or fruit recommendations either. Non-Hispanic Black children consumed the least amount of dairy, never meeting recommendations from 1-5 years. At 4-5 years, Asian children consumed the most yogurt and least cheese, while Hispanics consumed nearly double the amount of cheese. Total HEI score decreased from 59 to 51 from 1 to 5 years. This low diet quality score was reflected in low intakes of key nutrients. Over 80% of infants and children did not meet intake recommendations for vitamin D and over 14% did not meet calcium recommendations. Only 15% of the infants and children had an adequate intake of potassium.

Conclusions: Results showed that dietary recommendations for the introduction of complementary foods are not consistently followed for American infants and children and that ethnic disparities exist. Introduction of age-appropriate nutrient rich complementary foods can improve nutrient intake and diet quality.

Keywords: infants, children, complementary foods, NHANES

Conflict of Interest Disclosure: ED, CJC, and JAH are employees of the National Dairy Council/Dairy Management Inc., Rosemont, Illinois, USA. VLF as Senior Vice President of Nutrition Impact, LLC performs consulting and database analyses for various food and beverage companies and related entities.

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FOOD INTAKE PATTERN OF SCHOOL GOING CHILDREN AGED 3-5 YEARS WITH AND WITHOUT AUTISM IN URBAN DHAKA, BANGLADESH

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Background and objectives: Food intake pattern is one of the major contributors for child malnutrition. Inappropriate food consumption is leading to double-burden of malnutrition. Autistic

children are more vulnerable than normal children of same aged group. There is urgent need to improve the diet quality for improving their nutritional status. To the authors' knowledge, food intake pattern of the autistic children has not been described yet in Bangladesh. So, our objective was to assess the food intake pattern of autistic children and compare with that of normal children.

Methods: A cross-sectional study was conducted during April to December, 2016 among children aged 3-5 years with autism (n=53) and normal children (n=53), were selected from four schools in urban Dhaka city, Bangladesh. Data on food intake pattern was collected by food frequency questionnaire (with a reference period of 7 days) from the children's parents using a structured questionnaire. Statistical analysis was done by IBM SPSS software (version 20) and comparison between autistic and normal children were made by using Mann-Whitney-U test for non-normal distribution.

Results: Children with and without autism consumed 39 foods from six food groups (Cereals, Pulses, Egg, Meat & Fish, Organ Meat, Vegetables & Fruits, Dairy Products). The result revealed that five out of six food groups had significant difference in terms of food consumption (p<0.05). The food consumption was lower by autistic children than normal children. The food consumption were (autistic vs. normal children): unleavened bread (81.7% vs. 98.8, p=0.00); egg (53.2% vs. 98.8, p=0.00); chicken (93.1% vs. 100, p=0.002); beef (32.3% vs. 76%, p=0.004); pui leaf (72.2% vs. 81.7%, p=0.002); carrot (62.7% vs. 85.5%, p=0.00); tomato (66.7% vs. 83.6%, p=0.001); malta (30.4% vs. 70.3%, p=0.009); milk (95% vs. 98.8%, p=0.00).

Conclusions: Food from five out of six food groups was less eaten by autistic children than normal children. Autistic children had chewing problem, carbohydrate intolerance, sensitivity to some food items like gluten, casein, sugar, chocolate etc. and they were medically restricted for food.

Keywords: Food intake pattern, autistic children, normal children, food frequency questionnaire.

we aimed to investigate the potential effect of prenatal exposure to the 1959-1961 Chinese famine on adult cognitive impairment.

Methods: We obtained data from the second National Sample Survey on Disability implemented in 31 provinces in 2006, representing 1.9 per 1000 non-institutionalized inhabitants of China, and restricted our analysis to 387,093 people born from 1956 to 1965.The definition of disabilities was based on the WHO International Classification of Functioning, Disability, and Health (WHO-ICF). Cognitive impairment was defined as intelligence quotient (IQ<70) and adaptive behavior, and IQ for adults was evaluated by the Wechsler Adult Intelligence Scale-Revised by China (WAIS-RC). Famine severity was defined as cohort size shrinkage index, which has been widely used in previous Chinese studies.The famine impact on adult cognitive impairment was estimated by difference-in-difference models, which were established by the variations of famine exposure across birth cohorts.

Results: Compared with adults born in 1963, those who exposed to Chinese famine during gestation (born in 1959-1962) did not experience more risk of cognitive impairment in adulthood in the total sample. However, when excluding concurrent impairments (i.e. hearing, visual, speech, physical and mental disorders), we found individuals born in 1961 had more than two-fold (OR=2.18, CI: 1.15, 4.15) risk of cognitive impairment than their 1963-born peers even though adjusting for multiple demographic and socioeconomic variables. Stratified analyses showed that long-term impact of prenatal famine on cognitive impairment was evident in both male and female sample, but only in rural, not in urban area.

Conclusions: Prenatal exposure to Chinese famine had enduring deleterious effect on the risk of cognitive impairment and concurrent disorder of cognitive impairment may be one of important confounders in this long-term impact. Further studies need to explore the difference between Chinese and Dutch famine and the corresponding mechanism on this issue.

Keywords: Chinese famine, Cognitive impairment, Prenatal malnutrition

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144/608

PRENATAL FAMINE EXPOSURE AND ADULT COGNITIVE IMPAIRMENT: NEW EVIDENCE FROM CHINA

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Background and objectives: A growing number of studies have focused on long-term impact of Dutch and Chinese famine on adult health during past decades. The current measures of cognitive functioning in adulthood do not indicate a long-run association with prenatal exposure to Dutch famine. However, whether such association emerges in China is still poorly understood. In this study,

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FEASIBILITY AND IMPACTS OF INTEGRATING NUTRITION INTERVENTIONS INTO AN EXISTING MATERNAL, NEONATAL, AND CHILD HEALTH PLATFORM IN BANGLADESH

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Background and objectives: Maternal undernutrition contributes to poor child growth and development. Limited evidence exists on effective nutrition intervention packages and delivery platforms to improve maternal nutrition. We evaluated the feasibility and impact of a nutrition-focused Maternal, Neonatal and Child Health (MNCH) package compared with the standard MNCH package in Bangladesh. The standard MNCH package provides essential health services and sales of iron and folic acid (IFA) by frontline health workers [FHWs] through home visits. The nutrition-focused Alive & Thrive MNCH package was integrated into the MNCH platform, providing additional interpersonal counseling (IPC), community mobilization (CM), distribution of free IFA and calcium supplements, and weight-gain monitoring, with additional time from FHWs in home visits to discuss maternal and child nutrition.

Methods: We used a cluster-randomized design with cross-sectional surveys in 2015 and 2016 with FHWs and pregnant and recently delivered women (n~700, 600 and 2,000, respectively, per survey round). We examined operational feasibility, including FHWs' capacity, training, supervision, and service coverage. We derived difference-in-difference estimates (DDE) on maternal dietary diversity, micronutrient supplement intake, and breastfeeding practices.

Results: FHWs were committed and well-supervised, and covered a small catchment area. There were no major shifts in time in either group. FHWs in both groups had high knowledge about micronutrients, but FHWs in nutrition-focused MNCH improved knowledge about maternal dietary diversity compared to those in the MNCH group. Coverage of IPC and CM was higher in the nutrition-focused MNCH group than the MNCH group (97%

vs. 70% and 50% vs 30%, respectively). Improvements were significantly greater in the nutrition-focused MNCH, compared to MNCH group for consumption of IFA (DDE: 9.8 percentage point [pp], 46 tablets), and calcium supplements (DDE :12.8 pp, 50 tablets), maternal dietary diversity (DDE: 30.0 pp, 1.6 food groups), daily intakes of several micronutrients during pregnancy, and exclusive breastfeeding (DDE: 31 pp), but not for early initiation of breastfeeding.

Conclusions: Integrating intensified IPC and CM interventions addressing nutrition during pregnancy into an existing MNCH platform was feasible and effective, leading to improvements in multiple maternal nutrition outcomes. This effective model could be adapted into other health systems in similar contexts.

Keywords: Bangladesh, dietary diversity, interpersonal counseling, maternal undernutrition, micronutrient intake.

Conflict of Interest Disclosure: All authors declare no conflicts of interest. TS, ZM, BA, SS and KA were members of the program implementation team that designed and implemented the interventions studied and reported on in this manuscript. They reviewed the manuscript and provided interpretation of the results, but final decisions for manuscript content lay with the primary authors from the evaluation team (PHN, SSK, EAF, MTR and PM).

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A PROGRAM IMPACT PATHWAYS MEDIATION ANALYSIS OF A MULTI-SECTORAL NUTRITION PROGRAM IN NEPAL

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Background and objectives: As the importance of simultaneously addressing the diverse determinants of malnutrition grows, the complexity of nutrition programming increases. Evaluation of complex programs requires researchers to carefully unpack potential pathways to impact. This can be done using program impact pathways (PIPs), which map out program phases to assess each step in the intended pathways to impact. A PIP analysis was conducted to understand whether program inputs of Suaahara, a complex nutrition program in Nepal targeting the first 1,000 days, translated into intended outcomes and to identify gaps along theorised pathways to impact.

Methods: Regression analysis, using data from a cross-sectional household-level survey for a process evaluation (n=472) split evenly throughout 4 Suaahara and comparison districts, was used to test associations between residing in a Suaahara intervention area and six

ideal household health and nutrition behaviours. For positive, significant associations, structural equation modelling was used to empirically test hypothesized mediators along the pathways to impact.

Results: Belonging to the intervention arm was positively associated with optimal household WASH facilities and practices (b=0.69, p<0.001) and maternal diet during pregnancy (b=0.41, p<0.001). Exposure to specific WASH messages was found to be a positive mediator for how belonging to the intervention arm translated into ideal household WASH facilities and practices (b=0.18, p<0.001). Although being in the intervention arm influenced both maternal knowledge and practices related to diet during pregnancy, there was no association between knowledge and practices.

Conclusions: PIP analyses are useful for monitoring and evaluating the impacts pathways of complex nutrition programs. Evidence for a link between the intervention and WASH facilities and practices through direct and indirect pathways is encouraging and can be used to support the continuation of related intervention components. Further investigation into the reasons for a lack of translation of knowledge from exposure to Suaahara integrated messages to diet during pregnancy should be considered.

Keywords: Diet during pregnancy; Nutrition-sensitive; Program Impact Pathway; WASH behaviours; Nepal

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THE ROLE OF DAIRY FOR THE MANAGEMENT OF MUSCLE MASS AND FUNCTION IN PEOPLE AGED 50+ YEARS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: A meta-analysis of randomised controlled trials (RCT's) was performed to investigate the effects of whole dairy foods and supplements containing dairy ingredients, with and without resistance training (RT), on lean mass, strength, muscle size, muscle protein synthesis and physical function in people aged 50+ years.

Methods: RCT's published to March 1 2015 were identified by a comprehensive systematic search of scientific databases. Eligible reports were critically appraised in duplicate. Data were pooled using random-effects meta-analyses.

Results: 34 RCT's were eligible for inclusion. Dairy consumed in combination with RT resulted in a small increase in lean mass (weighted mean difference [95% CI]; 0.5 [0.02, 0.98]kg; P=0.04; I^2=68%) but had no effect on muscle size (P=0.80), leg press strength (P=0.40) or grip strength (P=0.29). Dairy consumed in the absence of RT had no effect on lean mass (P=0.58). There were insufficient data to analyse gait speed. Dairy protein supplements of different dosages (i.e. 20 vs. 40g/day) increased fractional synthetic rate of myofibrilliar protein both in the context of RT (0.03

[0.0, 0.06]%/hr; P=0.02; I^2=87%) and without RT (0.02 [0.01, 0.02]%/hr; P<0.001; I^2=0%).

Conclusions: Increased dairy intake (at least 20 g per day - particularly in the form of dairy protein supplements) when combined with RT, is an effective nutritional strategy to augment lean body mass in people aged 50+ years. While dairy protein acutely up-regulates muscle protein synthesis in this age group irrespective of RT, this effect does not directly translate into increases in regional muscle size, muscle strength or function.

Keywords: dairy. dairy supplements. muscle mass. body composition. ageing

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DRIVERS OF NEPAL'S SUCCESS IN REDUCING THE PREVALENCE OF UNDERNUTRITION SINCE THE MID-1990S: VARIATION BY AGRO-ECOLOGICAL ZONE

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Background and objectives: Nepal's rapid reductions in child undernutrition and the drivers of this progress have been well-documented. However, Nepal's three agro-ecological zones' (AEZ) – terai (plains), hills, and mountains – drastic differences (e.g. ethnic composition, population density, remoteness) may influence nutrition-related indicators. This study assesses commonalities and differences in drivers of Nepal's success in reducing child nutrition in Nepal's three AEZs.

Methods: Analyzing data from Nepal's 1996, 2001, 2006 and 2011 DHS, we used multivariate regression analysis and decomposition techniques to identify drivers of reductions in LAZ and WHZ. Explanatory variables included: household assets; maternal and paternal education; access to healthcare; WASH facilities/practices; household demography and non- time-varying factors (e.g. child age, residency, caste, maternal age and survey year).

Results: : Since 1996, child (<2y) stunting and wasting (<5y) declined rapidly. The terai experienced the fastest reductions in stunting, whereas wasting reductions were concentrated in the mountains and terai. During this time, asset ownership, education, and access to health and sanitation services improved, but with sub-national variation in magnitude and speed. Our linear decomposition approach showed the changes in LAZ and WHZ that were predicted by changes in the explanatory variables over time in each AEZ. Health services were the single largest contributor to change in LAZ in all three AEZs. Increased toilet use was moderately important in the hills and terai. For WHZ, toilet use

was very important: the single largest factor in the terai. Health services were a key driver in all three sub-samples. Asset accumulation was important in the hills and mountains only, whereas maternal education was only important in the terai.

Conclusions: Nepal's success in reducing undernutrition and the drivers differ across the strikingly diverse AEZs. Our findings of variation in the factors that best predict changes in outcomes over time by AEZ, suggest that some sub-national level policies and programs targeting location-specific obstacles may be necessary. There are indications that WASH investments may yield especially large returns in the humid and densely populated terai. Our findings highlight that a one-size-fits-all approach may not address persistent under-nutrition and targeted approaches may be more effective.

Keywords: Nepal, undernutrition

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MATERNAL COTTON-PICKING DURING PREGNANCY IS ASSOCIATED WITH MATERNAL AND EARLY INFANCY NUTRITIONAL STATUS IN RURAL PAKISTAN

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Background and objectives: In rural Pakistan, the nutritional status of women of reproductive age and infants is poor. The agricultural workforce is becoming increasingly feminised, with 75% of women employed in agricultural labour. The impact of women's agricultural work, conducted during pregnancy, on maternal and early infancy nutritional status is not well documented. Thus, this study aimed to examine the relationship between cotton-picking during pregnancy, maternal body mass index (BMI) and infant growth. Cotton-picking involves long hours of intensive agricultural work.

Methods: A cross-sectional survey of a representative sample of rural mother-infant dyads was conducted in Sindh province in January to February 2016. Infants were 2-12 weeks of age. Interviewer-administered questionnaires and maternal and infant anthropometric measurements (weight and height/length) were collected. The primary outcomes were maternal BMI measured post-pregnancy (BMI; n=1146) and infant length-for-age zscore (LAZ; n=1143).

Associations between cotton-picking during pregnancy and maternal BMI and infant LAZ were examined using multivariable linear regression analysis; adjusting for potential confounders (i.e. household wealth index and education). Structural-equation based modelling was used to test whether maternal BMI mediated the association between cotton-picking and infant LAZ.

Results: Overall, 21.6% of women were underweight and 45.3% of the infants were stunted. Among the women, 29% were involved in cotton-picking during pregnancy. In the multivariable analysis, cotton-picking during pregnancy was negatively associated with both post-partum maternal BMI (β=-0.87 [-1.33; -0.45]) and infant LAZ (β=-0.34 [-0.54; -0.13]). The structural-equation based modelling results showed that cotton picking had a total negative effect (β=-0.35 [-0.53; -0.16]) on infant LAZ. 14% (-0.05/-0.35) of the relationship between cotton-picking and infant LAZ was mediated via maternal BMI.

Conclusions: This study has generated new evidence for link between maternal agricultural workload and maternal and infant nutrition in a sample of mother-infant dyads living in rural Pakistan. Maternal cotton-picking during pregnancy was negatively associated with both maternal BMI and their offspring's size at 2-12 weeks of age. The results of this study underscore the need to reduce agricultural workload demands during pregnancy to reduce the risk of negative energy balance and improve the nutritional status of mothers and new born infants.

Keywords: agricultural workload, nutritional status, women, infant, Pakistan

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144/914

CONSUMPTION OF FOOD, FOOD DISORDERS AND PHYSICAL ACTIVITY IN ADOLESCENTS OF URBAN AND RURAL AREAS OF THE SIERRA REGION OF ECUADOR

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Background and objectives: In Ecuador, adolescents represent 19.3% of the population INEC-Ecuador (2010). This period is characterized by a stage of physical, psychological and psychological changes in which a child becomes an adult. This transition

requires an adaptation of the factors that allow the adolescent to develop all the normal functions with normality. Aims: To evaluate the dietary intake, eating disorders and physical activity of adolescents from a population of the Andean region of Ecuador and their difference between urban and rural areas.

Methods: Cross-sectional study (n = 131). It was applied: a 24-hour reminder and food consumption frequency questionnaire; It was evaluated anthropometry, physical activity and risk of eating disorder.

Results: 19.1% of the population presented short stature by age and 17.6% risk of overweight according to BMI//Age. Macronutrient adequacy percentages throughout the population were low (66.5% carbohydrate, 60.5% protein and 79.8% fat).

Statistically significant differences were found between protein (p = 0.012), fats (p <0.001) carbohydrates (p = 0.013) and energy (p <0.001) according to the zones; (Urban areas showed higher consumption compared to rural areas).

Statistically significant differences were found between the levels of physical activity of adolescents in urban areas (less activity) compared to adolescents in rural areas (greater activity). According to the Scoff questionnaire, 32.3% of adolescents were classified as having an Eating Disorder Risk, clinical differences were found by sex being greater in women than in men. However differences between sex and area were not statistically significant.

Conclusions: The adolescents' diet differs according to the geographical area, showing worse consumption in the rural area.

Keywords: Diet, Teens, Ecuador, Urban, Rural

Further collaborators: High schools "Chap. Edmundo Chiriboga "and" San Andres " High School for the facilities and opening for data collection and the" Vicente Anda Aguirre " High School for the facilities for the pilot study.

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INVESTIGATING ATTRIBUTES CAREGIVERS ASSOCIATE WITH COMPLEMENTARY FEEDING TO PROMOTE SMALL QUANTITY LIPID-BASED NUTRIENT SUPPLEMENT (SQLNS) IN COLOMBIA: FORMATIVE RESEARCH FOR THE SPOON PROJECT

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Background and objectives: The SPOON project aims to design a social and behavior change communication (SBCC) strategy to prevent malnutrition among children 0-24 months through adequate infant and young child (IYC) feeding practices, including home-fortification with SQ-LNS. The SPOON SBCC strategy will build on extensive formative research in Colombia, as well as Guatemala and Mexico. We present an investigation of attributes and beliefs caregivers in Colombia associate with complementary foods in order to identify potential messages and actions for promotion of SQ-LNS.

Methods: Pile sorting, a cognitive mapping technique, was used to evaluate caregivers' knowledge and beliefs about selected foods and caregiving actions. A convenience sample of mothers (n=28) of children aged 0-24 months living in poor communities in Pasto, Colombia were presented with 25 cards with pictures of foods (n=18), and caregiving actions (n=7). Each respondent was asked to put the cards into piles based on what she felt 'go together'. The piles were then used for discussion to explore the rationale for the groupings.

Results: Caregivers made a distinction between food and non-food items, although there were overlaps between these categories, as well as inter-category variability. Foods were often grouped because they: i) relate to complementary feeding and timing of introduction of specific foods (theme used by 81% of mothers), ii) are seen as similar food types (71%), iii) are considered beneficial for child's health (50%), or iv) contain vitamins and minerals (38%). Caregiving actions cards were most commonly grouped into the following categories: i) childcare (42%), ii) affection (27%) and iii) illness prevention (31%).

Conclusions: The pile sorting demonstrates that mothers view foods and caregiving actions from multiple dimensions, with an emphasis on advantages for child's health. Mothers in Pasto are concerned with the health and wellbeing of their children, and are cognizant of topics including complementary feeding, illness prevention, affectionate care, growth and development, and vitamins. However, there are intragroup variations in how respondents interpret each topic. This exercise provides insights for the design of messaging and behavior change components for an SQ-LNS intervention.

Keywords: infant and young child feeding practices, formative research, cognitive mapping techniques, Colombia

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FOOD ACCESS AND DIETARY INDICATORS ASSOCIATED WITH DEPRESSION IN WOMEN OF REPRODUCTIVE AGE IN SYLHET, BANGLADESH

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Background and objectives: Depression is common among women of reproductive age, especially in LMICs. Increased nutritional needs during pregnancy and lactation may deplete nutrients essential to neurotransmission and increase the risk of depression. Depression may conversely lead to poor self- and child care and reduce household food access and dietary diversity. We aim to examine the association between depressive symptoms and several indicators of food access and nutritional status in non-peripartum (NPW) and peripartum women (PW) in rural Bangladesh.

Methods: The Food and Agricultural Approaches to Reducing Malnutrition (FAARM) cluster-randomized field trial evaluates the impact of Helen Keller International's homestead food production program on undernutrition, including around 2700 young women in Sylhet, Bangladesh. We used cross-sectional FAARM baseline data to study the association of food access and nutritional status with depression in NPW and PW women using multivariable logistic regression.

Results: Of 2,599 women in the study, 1018 (39%) were pregnant or one year postpartum, while 1,581 (61%) were NPW. Overall, 20% of women screened positive for major depression (Edinburgh Postpartum Depression Scale ≥12). Both food insecurity (HFIAS) and poor household food consumption (FCS) were strongly associated with depression in fully adjusted models (NPW HFIAS: OR 2.59, 95% CI 2.02-3.30 and PW OR 3.60, 95% CI 2.46-5.27; NPW FCS: OR 2.63, 95% CI 1.80-3.86 and PW FCS: 2.67, 95% CI 1.58-4.53). Low dietary diversity (<5 food groups) was also associated with depression (NPW OR: 1.78, 95% CI 1.30-2.44 and PW OR: 2.11, 95% CI 1.32-3.39), and several distinct food groups lowered the odds of depression in women (dairy, eggs, fish, vitamin A-rich foods and vitamin C-rich foods). Anemia was not associated with depression. Chronic energy deficiency (BMI <18.5) was positively associated with depression in NPW (OR: 1.38, 95% CI 1.04-1.84).

Conclusions: In this large study from Bangladesh, depression was associated with household food insecurity, poor household food consumption, women's dietary diversity, and low BMI. Further studies should investigate the causal links of food access and nutrition with depression, and interventions to reduce poor diets and depression among women in LMICs should be considered.

Keywords: depression, peripartum, food, nutrition, Bangladesh

144/1194

HIGH-PROTEIN EXPOSURE DURING GESTATION – CONSEQUENCES ON FOOD PREFERENCES AND HEALTH IN ADULT RAT OFFSPRING IN SELF-SELECTION MODELS

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Background and objectives: Perinatal exposure via mother's diet induces imprinting that impacts longer term phenotype and health of the offspring. This study evaluates the consequences of a maternal high protein diet during gestation on food preference and health markers in rat pups exposed to two self-selection models (SSM).

Methods: Two groups of Wistar rat dams were fed a high-protein (HP; 55% protein) or a normal protein (NP; control; 20% protein) isocaloric diet during gestation and then switched to a NP diet during lactation. At 3 wk, female pups from the 2 dam groups were weaned and subdivided into 3 diet groups (i.e. six groups each n=8 pups). Each group was subjected to either the control NP diet, a C1 choice diet, or a C2 choice diet, respectively. C1 and C2 groups were exposed to a choice between 2 cups with either proteins (P) or a mix of carbohydrate (C) (88%) and lipid (L) (12%), or a choice between 3 cups, with either protein (P), carbohydrates (C) or lipids (L), respectively.

Results: Compared to the NP group and independent of maternal diet, C1 and C2 groups consumed 10% more energy as P and decreased C intake (P<0.0001). C2 groups compared to control NP group, increased L consumption up to 22% and energy intake (P<0.0001). C1 groups gained less weight than control NP groups (P<0.0001). In contrast, pups from dams fed HP diet during gestation (HP-C2) and subjected to C2 choice had a higher weight gain compared to NP-C2 group (P<0.0001). At 15 wk, HP-C2 group gained 13.5% more weight than NP-C2 group (NP-C2, 183.3+7.7 g; HP-C2, 208.1+11.5 g, P<0.06). In HP-C2 group, total and visceral adipose tissues weight were increased 41.2% (NP-C2, 44.2+2.8 g; HP-C2, 62.4+6.8 g, P<0.03) and 52.1% (NP-C2, 25.9+1.9 g; HP-C2, 39.4+4.5 g, P<0.01), respectively, compared to NP-C2 group.

Conclusions: The present study showed that programming by maternal HP diet during gestation does not affect food choice. But the consequence of a higher P and L intake in the C2 groups is emphasized in pups from dams subjected to a HP diet during gestation, causing increased adiposity. Metabolic pathways are currently explored.

144/1198

RELATION BETWEEN DIET, NUTRITIONAL STATUS, AND STIMULATION AND CHILD DEVELOPMENT: A PATH ANALYSIS

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Background and objectives: Malnutrition is an important public health problem with implications for child development. We examined the direct and indirect effects of diet on memory and overall mental development in young children in rural Bihar India.
Methods: A cross-sectional survey of 4292 children 6 to 18 months of age in 70 health sub-centers of West Champaran, Bihar was conducted in February-March 2016 as part of an endline to a randomized cluster multiple micronutrient trial. Motor and mental development was assessed using the Developmental Milestones Checklist-II, a 75-item parental report. In a subsample of 1179 children 12 to 18 months, memory was assessed using four Elicited Imitation tasks (measured as correctly imitated sequences of actions). Path analyses investigated the pathways through which diet, nutritional status, hemoglobin, stimulation, and motor skills are associated with memory or mental abilities. Standardized coefficients are reported.
Results: Mean motor and mental development scores were 18.6 (SD 6.5) out of 32 and 25.8 (SD 7.5) out of 50; mean number of pairs of actions complete in the correct order was 1.7 (SD 1.2). Fit indices for path models were acceptable. Motor development was significantly ($p<0.05$) directly associated with memory (standardized $\beta=0.13$) and mental development ($\beta=0.53$), and indirectly associated with mental development through stimulation in the home ($\beta=0.01$). Length-for-age z-score (LAZ) and weight-for-length z-score (WLZ) were indirectly associated, through motor development, with memory ($\beta=0.03$ for LAZ, $\beta=0.01$ for WLZ) and mental development ($\beta=0.14$ for LAZ, $\beta=0.04$ for WLZ). Hemoglobin was directly associated with memory ($\beta=0.07$), but not mental development. Dietary diversity (score out of 7) was not significantly associated with either outcome.
Conclusions: Nutritional status, stimulation, motor development and hemoglobin status in early life may have important implications for foundational mental and memory abilities.
Keywords: child development, cognition, nutritional status, diet, path analysis

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144/1238

APPLICATION OF A COMMON FORMATIVE RESEARCH PROTOCOL TO DEVELOP STRATEGIES FOR BEHAVIOR CHANGE: THE SPOON PROJECT IN COLOMBIA, GUATEMALA AND MEXICO

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Background and objectives: Recent evidence suggests that point-of-use fortification using small quantity - lipid-based nutrient supplements (SQ-LNS) improves the nutrient adequacy of infant and young child (IYC) diets in resource-constrained settings. In the context of the nutrition transition in Latin America, and evidence linking IYC feeding to future risk of overweight and obesity, the Inter-American Development Bank initiated a project ("SPOON") in Mexico, Colombia, and Guatemala to evaluate the effectiveness of point-of-use fortification of complementary foods using unsweetened SQ-LNS and promotion of WHO recommended IYC feeding practices for children aged 0-23 months. We describe the methods used by a multi-cultural team of researchers trained in anthropology and communication to conduct formative research with the aim of developing a social and behavior change communication (SBCC) strategy to promote exclusive breastfeeding (EBF), appropriate complementary feeding practices and the use of unsweetened SQ-LNS.
Methods: The main research questions included:
1. How can SQ-LNS be integrated into existing complementary foods and feeding practices?
2. What are the positive attributes that caregivers associate with complementary foods and feeding that could be used to promote SQ-LNS?
3. What instructions and messages can be communicated to promote utilization of SQ-LNS?
4. What are the most effective communication strategies?
We created a common protocol which consisted of two streams of inquiry: (a) focused ethnographic study (FES) to obtain localized knowledge related to IYC feeding, and (b) 14-day home feeding trial to explore the acceptability and use of unsweetened SQ-LNS.
Results: A common protocol ensured consistency in research questions, approach and data collected across settings. However,

adaptations were necessary due to variations in the characteristics of the study populations, setting-specific SPOON project designs and methodological preferences of country-level researchers. In Mexico, the FES sampling design was changed to account for multiple ethno-linguistic groups. In Colombia, more emphasis was given to collect data on EBF, a priority for SPOON project in this setting. In Guatemala, focus group discussion was added to FES data collection.

Conclusions: Multi-country research studies benefit from a common protocol. However, some local adaptations are necessary to ensure that methods and results reflect differences across contexts.

Keywords: small quantity - lipid-based nutrient supplement (SQ-LNS), formative research, Colombia, Guatemala, Mexico

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144/1325

PRE-AND POST-NATAL LIPID-BASED NUTRIENT SUPPLEMENTS AND COGNITIVE, SOCIOEMOTIONAL AND MOTOR FUNCTION IN PRESCHOOL-AGED CHILDREN IN GHANA

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Background and objectives: Adequate nutrition is necessary for brain development during pregnancy and infancy. There is a dearth of evidence from randomized controlled trials of combined supplementation during both pre- and postnatal periods on developmental outcomes in later life. We aimed to investigate the effects of provision of pre- and postnatal lipid-based nutrient supplements (LNS) on cognitive, motor and socio-emotional function at preschool age.

Methods: We performed a follow-up study of children aged 4-6 years in 2016, born to women who participated in the International Lipid-Based Nutrient Supplements (iLiNS)-DYAD trial (n=1320) conducted in Ghana in 2010-2014. Women had been randomized to daily LNS or multiple micronutrient (MMN) tab-

lets during pregnancy through 6 months postpartum or iron and folic acid (IFA) during pregnancy and calcium placebo through 6 months postpartum. Children in the LNS group received LNS from 6 to 18 months.

Primary outcomes were (1) a cognitive factor score based on a test battery adapted from sub-tests of the Developmental Neuropsychological Assessment, Parent's Evaluation of Developmental Status, and other sources, (2) motor score from the NIH Toolbox 9-hole pegboard test, and (3) socioemotional difficulties based on the Strengths and Difficulties Questionnaire (SDQ). Eight secondary outcomes were calculated in specific cognitive and other domains (e.g., language, SDQ prosocial). Analysis was by intention to treat and a 2-group comparison (LNS vs non-LNS (MMN+IFA)).

Results: Developmental results represent 76% of live births from the main trial (n=965). Preliminary analyses in the 2-group comparison show that children in the LNS group had a significantly lower socioemotional difficulties score than children in the non-LNS groups after adjusting for child age, factors at baseline (e.g., maternal BMI, age, education) and factors at follow-up (e.g., maternal cognition). Adjusted and unadjusted differences in mean z-score (95% CI) were: −0.15 (-0.27, -0.02), p = 0.026; and -0.12 (0.21, 0.02) p = 0.084 respectively. Cognitive, motor and secondary outcomes did not significantly differ by intervention group in either 3- or 2-group comparisons (ps > 0.1).

Conclusions: Provision of LNS during the first 1000 days of development may improve behavioral function but did not affect cognition at preschool age in this setting.

Keywords: Cognitive development, Preschool development, lipid-based nutrient supplementation, multiple micronutrients, maternal nutrition

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144/1666

THE EFFECT OF IODINE SUPPLEMENTATION IN MILDLY IODINE-DEFICIENT PREGNANT WOMEN ON CHILD DEVELOPMENT: A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Iodine deficiency during pregnancy may be associated with lower IQ in offspring. It is unknown whether iodine supplementation in mildly iodine-deficient pregnant women improves cognitive function in their children.

Methods: We randomized Indian and Thai pregnant women to receive daily 200 μg oral iodine or placebo until term. Primary outcomes were child development assessed at 1 and 2 years using the Bayley Scales of Infant Development (BSID)-III and at 5-6 years using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI)-III. Secondary outcomes were maternal and infant thyroid function, pregnancy outcomes and child hearing performance. The trial was double-masked and analysis was by intention-to-treat using mixed effects models.

Results: Pregnant women (n=832) entered the trial at a mean±SD gestational age of 10.7±2.7 weeks; their median (IQR) urinary iodine concentration (mUIC) was 131 (81, 213) μg/L, indicating mild iodine deficiency. Compliance with supplementation was 87%; mUICs in the 2nd and 3rd trimester were higher in the iodine group (p<0.001). There were no significant group differences in the cognitive and the combined motor and language BSID-III scores at 1 or 2 years. At 5.4 years, mean differences (95% CI) between iodine and placebo for WPPSI-III scores were: -0.7 (-2.9,1.4), p=0.87 for verbal IQ; -1.6 (-4.5,1.3), p=0.60 for performance IQ; -1.7 (-4.3,0.9), p=0.39 for processing speed; and -1.3 (-3.6,1.1), p=0.63 for full scale IQ.

Conclusions: Daily supplementation with 200 μg iodine in mildly iodine deficient pregnant women increased iodine intakes into the sufficient range but had no effect on child neurodevelopment.

Keywords: iodine, pregnancy, cognition, children, supplementation

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144/1746

MACRONUTRIENT COMPOSITION OF EARLY CHILDHOOD DIET IS RELATED TO GROWTH AND ADIPOSITY DURING CHILDHOOD

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Background and objectives: Previous studies suggest that high protein intake in infancy leads to a higher body mass index. However, it is not clear whether this reflects a higher fat mass and hence more adiposity, or a difference in lean mass, as observed in adults. Furthermore, it is not clear what the role is of other macronutrients and whether effects are independent of diet in later childhood. We examined associations of macronutrient composition of the diet in early childhood with growth and detailed measures of body composition up to the age of 10 years.

Methods: This study was performed among 3,564 children participating in a population-based cohort study in the Netherlands. Dietary intake was assessed with food-frequency questionnaires at age 1 year. We calculated intakes of total protein and protein from different sources; of total carbohydrates, fiber, polysaccharides, monosaccharides and disaccharides; and of total, saturated, monounsaturated and polyunsaturated fat. Height and weight were repeatedly measured during childhood. Fat and fat-free mass were measured at 6 and 10 years using dual X-ray absorptiometry. We calculated body mass index (BMI), fat mass index (FMI), and fat-free mass index (FFMI). Macronutrient intakes were expressed in energy percentages and entered in multivariable linear mixed models in which we examined different macronutrient replacement effects independent of total energy intake. Models were adjusted for several parental and child sociodemographic and lifestyle factors.

Results: Results from multivariable models showed that higher intake of total and animal protein (both dairy and non-dairy) was associated with a higher height, weight and BMI up to the age of 10 years, irrespective of whether it was replacing carbohydrates or fats in the diet. Further analyses showed that the positive association with BMI was completely explained by a higher FMI and not FFMI and that this was irrespective of later diet. No significant associations were observed for the other macronutrients.

Conclusions: Our results suggest that high protein intake, particularly animal protein, in early childhood is associated with higher body fat mass, but not fat-free mass. Future studies are needed to examine the optimal range of protein intake for infants and young children.

Keywords: children, obesity, protein, epidemiology, cohort

144/1750

FEEDING PRACTICES AND NUTRITIONAL STATUS OF 6-23 MONTHS OLD CHILDREN AT DEMBA GOFA AND GEZE GOFA WOREDAS, GAMO GOFA ZONE, ETHIOPIA

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Background and objectives: Prevalence of stunting in Southern Ethiopia is equal to the national average, 44%. Poor infant and young child feeding practices, household food insecurity, poor maternal and child caring practices, poor water and san-

itation, etc were causes of child malnutrition in Ethiopia (CSA, 2014). The objective of the study was to assess under-2 children feeding practices and nutritional status at Demba Gofa and Geze Gofa Woredas of Gamo Gofa Zone, Ethiopia.

Methods: Community-based cross sectional survey was conducted to collect data on 520 samples. Multistage cluster sampling technique was employed. A pretested structured questionnaire was used to collect data on household socio-demographic and economic characteristics, food security level and infant and young child feeding practices. Child weight, height and MUAC were taken following standard procedure. Data were analyzed using WHO Anthro version 3.2.2 and SPSS Version 16.0. Binary logistic regression was used to identify predictors of stunting, underweight and wasting among study participants. Cut off point for significance test was p-value < 0.05.

Results: It was found that majority, 91%, of mothers initiate breast feeding immediately after delivery. Majority of children, 93.8%, ever breast feed. Only 37.9% of children received minimum diet diversity required. The stunting, underweight and wasting prevalence was 18.5%, 9.1% and 3.9 % respectively. As age increases, chance for a child to be stunted increases [AOR (95% CI) = 2.69 (1.27, 5.67). Father's educational status predicted stunting [AOR (95% CI) =0.28 (0.11, 0.73). Breast feeding was also a predicator of stunting in the study area with 2.92 (95% CI, 1.25, 6.85) less likely to be stunted than none breast fed one. Compared with male children, females were less likely to be underweight [AOR (95% CI) = 0.44 (0.23, 0.85). Underweight prevalence increased with the age of children [AOR (95% CI) = 25.53 (1.16, 8.04).

Conclusions: Stunting, underweight and wasting prevalence among under-2 years is relatively better in study areas compared with the criteria of WHO for assessing severity of malnutrition.

Keywords: Feeding practice, stunting, underweight, wasting.

144/1822

A NOVEL APPROACH TO ANALYSE THE RELATIONSHIP BETWEEN PHYSICAL FITNESS AND BIOMARKERS IN OLDER ADULTS

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Background and objectives: Physical fitness (PF) is an independent predictor of all-cause mortality. Biomarkers are the main key to evaluate the influence of PF on the human body. The aim of this study was to investigate the association between PF levels and biomarkers in older adults.

Methods: 429 non-institutionalized Spanish older adults (57% females), aged over 55 years were included in this multicenter study. Each participant performed a battery of validated PF tests (EXERNET). The score for each test ranged from 0 (worst) to 3 (best) points. The maximum score was 12 points. Scores of PF tests were added together to create a cluster. After that, participants were divided into 3 groups (low, medium and high). Fasted blood samples were collected and concentrations of routine biochemistry, vitamins, and homocysteine were analysed. Biomarkers were coded as 0 (out of reference range) and coded as 1 (within reference range). Dietary intake was assessed by two non-consecutive 24h recalls and nutrient intake was calculated using a computer program (ALIMENTA;NUCOX,Spain). Data was analysed using generalized linear model.

Results: A total of 68% and 59% of the participants showed vitamin 25(OH)D deficiency and excessive total cholesterol (TC), respectively. A total of 38.3%, 32.3%, 27.7% and 24.3% of the participants presented high glucose, uric acid, LDL-cholesterol (LDL-c) and total homocysteine (tHcy) concentrations, respectively. More subjects from the low PF group were significantly out of the reference range for tHcy, TC, HDL-cholesterol and creatinine than those in the high PF group (p<0.05). However, less subjects from the low PF group presented vitamin B12 levels out of range (p<0.05). Subjects in the low PF group presented greater LDL-c and triglycerides risk taking into account lipid intake.

Conclusions: Participants included in the high PF group had a better blood markers profile than those included in the other PF groups. PF can have an impact on biomarkers concentrations. Only lipid blood markers seem to be influenced by nutrient intake. Thus, PF has an essential role in the studied population.

Keywords: physical fitness, nutrition, dietary habits, biomarkers, aging

144/1835

VEGETARIAN AND VEGAN DIETS IN PRE-PUBERTAL POLISH CHILDREN: ELUCIDATING BENEFITS AND COSTS IN GROWTH, METABOLISM AND CARDIOVASCULAR RISK

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Background and objectives: In adults, the health effects and safety of appropriately planned vegetarian and vegan diets have been evaluated, and some benefits, mainly cardio-metabolic, have been established. However, equivalent evidence in children is sparse, and relates mainly to anthropometric outcomes and nutrient intakes. More detailed information on cardio-metabolic outcomes, growth parameters and micronutrient status are lacking.

We aimed to assess the associations of vegetarian and vegan diets in children with a range of anthropometric, nutritional and cardio-metabolic outcomes.

Methods: We conducted a cross-sectional study in 188 healthy prepubertal Polish children aged 5 - 10 years: 52 vegans, 64 vegetarians, and 72 omnivores matched for socio-economic status (SES). We ascertained SES using electronic questionnaires, dietary intakes by food records and dietary screener questionnaires. We analysed fasting blood for lipids, vitamin B12, homocysteine and complete blood count (including haemoglobin and mean corpuscular volume (MCV)); and measured bone mineral density by DXA, anthropometry, blood pressure (BP) .

We calculated internal z-scores – adjusting for age and sex – for height, skinfold thicknesses and bone mineral content (BMC); BMC was additionally adjusted for bone area. We used external reference data for BMI and systolic BP. ANOVA was used to compare group means of all outcomes except vitamin B12, where the Kruskall - Wallis test was used to compare medians.

Results: Omnivores were significantly taller than vegetarians (0.41 SDS, 95%CI 0.01, 0.82) and vegans (0.55 SDS, 95%CI 0.13, 0.98). Vegans had significantly lower BMC (-0.61 SDS, 95%CI -1.02, -0.19), haemoglobin (-0.39 g/dl, 95%CI -0.73, -0.05), vitamin B12, LDL-cholesterol (-23.4 mg/dl, 95%CI -33.0, -13.6), mean of 4 skinfolds, BMI, and significantly higher homocysteine and MCV compared to omnivores. Vegetarian values were in between those of vegans and omnivores. Vegans had non-significantly lower systolic BP than the other two groups.

Conclusions: Vegan diets in childhood are associated with increased risk of deficiencies in B12 and iron, and negatively affect linear growth and bone mineral accretion. The same diet is beneficial for cardio-metabolic health, by reducing blood lipids, body fat and blood pressure. Both these costs and benefits are of smaller magnitude in vegetarian children.

Keywords: vegetarian diet, children, growth, cardiovascular risk, nutrient deficiency

144/1954

DOCOHEXAENOIC ACID IMPROVES THE REDUCED UMBILICAL VEIN RELAXATION OBSERVED IN THE OFFSPRING OF PREGNANCIES WITH MATERNAL OBESITY

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Background and objectives: Maternal obesity (MO) is associated with increased risk of long term metabolic risk in the offspring (REF), probably involving mechanisms such as early programming of insulin resistance in fetal and neonatal tissues. On the other hand, exposure to the polyunsaturated acid Docohexaenoic acid (DHA) has been related with increased insulin response in multiple cell types. The aims of our study were to evaluate the in vitro effect of DHA on vascular response of umbilical vein to insulin, and the role of the intracellular inhibitory phosphorylation of the insulin receptor substrate-1.

Methods: Umbilical cords from normal and MO pregnant woman attending to obstetrics service at the Clinical Hospital of Pontificia Universidad Catolica de Chile were obtained after informed consent. Isolated rings of umbilical vein were used to evaluate vasodilatation capacity by wire-myography, in absence or presence of insulin (10-10 to 10-6 uM, 0-20 min) and DHA (100 uM, 12 h). Primary cultures of human umbilical vein endothelial cells (HUVEC) were used to evaluated phosphorylated and total protein levels of IRS-1 in cells exposed or not to insulin (1 nM, 30 min), in absence or presence of DHA (100 uM, 12 h).

Results: Insulin produces a significant vasodilation (20%) in umbilical vein rings from normal pregnancies, an effect that was absent in MO-derived umbilical rings. This vasodilator effect of insulin was recovered in umbilical vein rings from MO pregnancies pre-incubated with DHA. In addition, HUVEC from MO pregnancies showed increased levels of IRS-1 phosphorylated in serine307, compared with normal cells, a difference that was reduced by DHA, even in presence of insulin.

Conclusions: In vitro addition of DHA recovers the reduced vascular response to insulin in umbilical vein from MO pregnancies, involving a reduction of the inhibitory phosphorylation of IRS in serine307.

Keywords: Early programming, Insulin resistance, Maternal obesity, Docohexaenoic acid, human umbilical vein

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144/1993

OFFSPRING DNA METHYLATION CHANGES IN RESPONSE TO MATERNAL FOLIC ACID SUPPLEMENTATION IN THE SECOND AND THIRD TRIMESTERS: EVIDENCE FROM A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Folic acid is widely recognised for its role in the prevention of neural tube defects and other congenital malformations. There is also emerging evidence that maternal folate status during pregnancy is associated with cognitive development in childhood. Folate dependent DNA methylation may provide a potential biological mechanism to link folate status during pregnancy with cognition in the offspring but this remains to be confirmed. Observational studies using candidate-gene or genome-wide analysis have linked maternal folate status with offspring DNA methylation of specific genes, including those related to neurodevelopmental pathways. This study aimed to investigate the effect of maternal folic acid supplementation on cord blood DNA methylation of genes related to brain function.

Methods: Samples for the current study were obtained from a randomized controlled trial in pregnancy which investigated the effect of Folic Acid Supplementation in the Second and Third Trimesters (FASSTT). Cord blood (n 86) taken at the time of delivery was assessed for DNA methylation of the retrotransposon LINE-1 (indicative of global DNA methylation) and the following genes associated with brain function and growth: RBM46, PEG3, IGF2, GRB10, BDNF, GRIN3B, OPCML and APC2.

Results: The results showed that compared with placebo, the newborns of mothers who received folic acid during pregnancy had significantly lower DNA methylation (%) of LINE-1 (57.2±2.1

vs 56.3±1.7; P=0.024), IFG2 (51.2±5.1 vs 48.9±4.4; P=0.021) and BDNF (3.1±0.8 vs 2.7±0.7; P=0.003). The effect of folic acid on IGF2 methylation was however significant only in female offspring (52.1±5.5 vs 48.5±5.3; P=0.028) but not in males (50.2±4.6 vs 49.3±3.4; P=0.201). In contrast, for the BDNF gene, folic acid treatment had a significant effect in male (3.2±0.8 vs 2.7±0.7; P=0.012) but not female (2.9±0.7 vs 2.6±0.7; P=0.212) offspring.

Conclusions: These results indicate that folic acid supplementation (400 µg/d) in trimesters 2 and 3 of pregnancy exerts significant changes in DNA methylation of genes related to offspring brain function and growth, which appear to be sex-specific. These findings require further investigation using genome-wide approaches.

Keywords: Folic Acid. Cord Blood. DNA methylation. Pregnancy. Epigenetics.

144/1997

EFFECT OF MULTIPLE MICRONUTRIENT SUPPLEMENTATION IN LACTATING WOMEN ON INFANT GROWTH AND MORBIDITY: A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL IN RURAL BURKINA FASO

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Background and objectives: Micronutrient deficiencies contribute to the vicious cycle of growth restriction in low and middle-income countries. Lactating women and their infants are at risk of inadequate intakes and deficiencies in multiple micronutrients due to the imbalance between their high requirements and a typical low intake of micronutrient-dense foods. Infants born small-for-gestational age (SGA) or preterm may be particularly vulnerable. However, there currently is no evidence on the effect of multiple micronutrient supplementation in lactating women on infant growth and morbidity. The objective of this study is to test the efficacy of supplementation with the UNICEF/WHO/UNU International Multiple Micronutrient Preparation (UNIMMAP) compared to iron and folic acid (IFA) on growth and morbidity of infants, and particularly those born SGA or preterm.

Methods: In a randomized controlled trial in rural Burkina Faso, 1426 pregnancies were allocated to daily supplementation with either UNIMMAP (intervention) or IFA (control) for three months after delivery. In total, 1296 mothers with live births were enrolled in the study. Daily tablet intake was directly observed by trained community workers. Anthropometry, morbidity and he-

moglobin concentration of infants were measured monthly until the first birthday.

Results: Infant linear growth and relative weight gain remained suboptimal despite supplementation of lactating mothers. The linear growth rate of infants in the UNIMMAP group increased compared to IFA (Beta coef = 0.0117 length-for-age Z-score/month; 95% CI: -0.0022 - 0.0256; P interaction = 0.099). Infants who were born SGA had significantly higher linear growth rates (Beta coef = 0.0217 length-for-age Z-score/month; 95% CI: -0.0012 - 0.0447; P interaction = 0.063), but did not show significant reductions in stunting. Preterm infants had increased hemoglobin concentration rates (Beta coef = 0.1569 g/dL/month; 95% CI: - 0.0208 - 0.3346; P interaction = 0.084). Infants in the UNIMMAP group had a reduced relative weight gain rate (Beta coef = -0.0179 weigth-for-length Z-score/month; 95% CI: -0.0355 - 0.0002; P interaction = 0.047).

Conclusions: Supplementing UNIMMAP instead of IFA during the first three months of lactation promotes overall infant linear growth, and shows a larger effect in those born SGA. However, UNIMMAP reduced ponderal growth compared to IFA.

Keywords: Infant Health, Iron-Folic Acid, Lactation, Multiple Micronutrients, Small for Gestational Age

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144/2116

PRENATAL SUPPLEMENTATION WITH SMALL-QUANTITY LIPID-BASED NUTRIENT SUPPLEMENTS OR MULTIPLE MICRONUTRIENTS INCREASES URINARY IODINE CONCENTRATION IN SEMI-URBAN GHANA: A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: In many developing countries, the iodine intakes of pregnant women may be low. Consumption of small-quantity lipid-based nutrient supplements (SQ-LNS) providing macro- and micronutrients including iodine may impact iodine status. We examined urinary iodine concentration (UIC) as a secondary outcome among 3 groups of pregnant women enrolled in the iLiNS (International Lipid-based Nutrient Supplements)-DYAD Ghana trial.

Methods: Women (n =1320, <20 weeks of gestation) were randomized to consume during pregnancy 60 mg iron and 400 μg folic acid/d (IFA); or multiple micronutrient supplements containing 18 vitamins and minerals including 250 μg iodine/d (MMN); or 20 g/d SQ-LNS with 22 vitamins and minerals including the same iodine content as MMN (LNS). In a sub-sample (IFA, 92; MMN, 102; LNS, 101), we measured UIC in spot urine samples at enrolment and 36 weeks of gestation, compared UIC among groups at 36 weeks gestation by using the Kruskal-Wallis test, and assessed adequacy of iodine intakes by using WHO cut-off levels: median UIC <150 μg/L representing inadequate iodine intakes, median UIC 150–249 μg/L representing adequate iodine intakes, and UIC ≥500 μg/L representing excessive iodine intakes.

Results: In this subsample of women, mean ± SD age was 26 ± 5 years, and 37% were first-time mothers. At baseline, the overall median (interquartile range) UIC was 137 μg/L (78 – 221 μg/L). At 36 weeks of gestation, median (interquartile range) UIC was lower (overall P = 0.011) in the IFA group [120 μg/L (95 – 258 μg/L)] than in the MMN group [172 μg/L (97 – 266 μg/L)] or LNS group [151 μg/L (95 – 258 μg/L)]. This suggests insufficient iodine intakes in the IFA group, and adequate intakes in the MMN and LNS groups.

Conclusions: We conclude that on the basis of UIC, the iodine intakes of pregnant women in this semi-urban setting in Ghana appear to be inadequate despite a national salt iodization program, and that the consumption of SQ-LNS or multiple micronutrient supplements providing iodine at the WHO-recommended daily dose increases the likelihood of adequate iodine status. This trial was registered at clinicaltrials.gov as NCT00970866.

Keywords: iLiNS Project; iLiNS DYAD Ghana; small-quantity lipid-based nutrient supplements; urinary iodine concentration; iodine intakes

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Background and objectives: Infection is associated with impaired nutritional status especially of infants under 5 years old. We assessed the impact of infection indicated by both acute phase proteins (APP), C-reactive protein (CRP) and α-1-acid glycoprotein (AGP), and as reported by maternal recall, on the nutritional status of infants.

Methods: 505 pregnant women were enrolled into a nested longitudinal cohort study of vitamin A. Data analysis was restricted to infant data at 4-months (n=400 mother-infant-dyads) and 9-months (n=385 mother-infant-dyads) postpartum. Incidence and severity of respiratory infection and diarrhea over the previous 14 days were assessed by maternal recall; information on infant/child feeding practices were also collected. Infant weight, recumbent length and heel-prick capillary blood collection were taken at 4- and 9-months postpartum. Indicators of VA status [(retinol binding protein (RBP)], iron status (Hb, ferritin) and subclinical inflammation APP, CRP and AGP were determined. Subclinical inflammation was defined as CRP >5mg/L and/or AGP >1g/L. Impacts of infection on infant nutritional status were estimated with random effect logistic models adjusted for clustering and differences at enrollment.

Results: Infection prevalence, based on elevated CRP and AGP levels, was 36.7%. For diarrhea reported symptoms, 67.4% at 4-months and 42.4% at 9-months had no indication of infection as indicated by CRP and AGP; whilst for acute respiratory reported symptoms, 54.5% at 4-month and 42.6% at the 9-month visit had no indication of infection. There was significant positive association with infection among VA deficient infants based on maternal reported symptoms. The odds of having infection in underweight infants was 3.7 times higher (OR: 3.7; P=0.019); this attenuated after adjusting for inflammation. Infants with iron deficiency were less likely to have infection (OR: 0.40; P=0.001); after adjusting for inflammation, this effect disappeared (OR: 1.11; P=0.607). Infants with VA deficiency were 5 times more likely (OR: 5.06; P=0.0001) to have infection, but after adjusting for inflammation they were less likely to have infection (OR: 0.55; P=0.002).

Conclusions: Acute phase proteins are more useful in defining infection in a population compared to reported symptoms of illness. Not controlling for inflammation in a population while assessing nutritional status might result in over reporting or underreporting prevalence.

Keywords: Inflammation, Infection, Vitamin A deficiency, Iron deficiency, Infants.

Conflict of Interest Disclosure: Frederick Grant, Rose Wanjala, Jan Low, Carol Levin, Donald Cole, Haile Selassie Okuku, Robert Ackatia-Armah, Amy Webb Girard, no conflicts of interest.

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Background and objectives: The WHO recommends exclusive breastfeeding during the first six months of life. Data from developing countries on breast milk adequacy and its association with body composition and energy expenditure of lactating mothers are scarce. We aimed to compare the breast milk output of lactating mothers in Rwanda and the Netherlands.

Methods: We used a convenience sample of 8 Rwandan and 5 Dutch mother-infants pairs (child's age 2-4 months) who fed their infants exclusively with breast milk. Rwandan mothers were recruited from a deprived rural area with a high level of childhood stunting, whereas Dutch mothers were all affluent. The dose-to-mother technique with doubly labelled water was used to assess child's breast milk intake, body composition and energy expenditure. After dosing, saliva samples from mothers and infants were collected over a 14-day period and analyzed for deuterium (2H) and 18-oxygen (18O) abundance by Isotope Ratio Mass Spectrometry. Data were fitted to model water turnover using the multi-point protocol in the mother and infant by using the solver function in Microsoft Excel.

Results: The estimated mean (±SD) daily breast milk output was 902±261 g/d among Rwandan mothers and 848±205 g/d among Dutch mothers (P= 0.706). The percentage of body fat was not significantly different between Rwandan and Dutch mothers (33% vs. 32%, P=0.759), but the total daily energy expenditure was much higher in Rwandan mothers compared to Dutch mothers (3214 kcal vs. 2338 kcal, P=0.004).

Conclusions: Despite their very high total energy expenditure, Rwandan mothers had similar breast milk output compared to Dutch mothers.

144/2908

IODINE STATUS IN BREAST MILK DURING THE FIRST 12 WEEKS POSTPARTUM IN TIANJIN, CHINA

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Background and objectives: The present study investigated the iodine status of breast milk and breastfed infants during the first 12 weeks postpartum in Tianjin, China.

Methods: A total of 175 pregnant women were recruited before delivery. Their breast milk and 24-h urine samples were collected at 4, 8, and 12 weeks postpartum; spot urine samples were simultaneously collected from their infants. The iodine content of the samples was measured.

Results: The mean breast milk iodine concentrations (BMICs) at 4, 8, and 12 weeks were 221.7 ± 103.5 μg/L, 175.2 ± 76.2 μg/L, and 148.1 ± 66.2 μg/L, respectively. Significant differences existed between the mean BMICs of the three sampling times ($F = 12.449$, $p < 0.001$). The BMIC showed a decreasing trend during the first 12 weeks postpartum. The median urinary iodine concentrations (UICs) of the mothers were 152, 112, and 109 μg/L at the different sampling times. The BMIC and UIC were not correlated in the mothers. The median UICs in the infants were 251, 183, and 164 μg/L. The infant UICs were statistically different at the three sampling times ($p = 0.001$). Moreover, the infant UICs correlated with the BMICs ($Rs = 0.205$, $p = 0.010$) but not with the maternal UICs ($Rs = 0.131$, $p = 0.067$).

Conclusions: The BMIC in and infant iodine intake from breast milk decreased in the first 12 weeks. Breastfed infants could receive adequate iodine from breast milk in Tianjin City.

Keywords: Iodine Status, Breast Milk, Lactating Women, Infant, Urine

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144/2971

10-YEAR RISK ESTIMATION FOR TYPE 2 DIABETES MELLITUS IN UNIVERSITY STUDENTS IN ASUNCIÓN, PARAGUAY

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Background and objectives: The beginning of university life implies an important change in the life of the individual. According to research, university life is characterized by limited time for meals and for the practice of physical activity, lack of main meals, excess weight, preference for junk food, and few hours of sleep, among other factors. Objectives: To estimate the risk of 10 years of type 2 diabetes in university students.

Methods: Observational, descriptive, cross-sectional study with non-probabilistic sampling for convenience, carried out in 106 students of Medicine, Dentistry, Nutrition, Accounting, Administration, Audiovisual Sciences and Graphic Design of the Universidad del Pacífico Privada, of Asunción, Paraguay, recruited from October to December 2015. All subjects underwent for weight and height measures for nutritional status assessment, and body fat was also determined; cardiovascular risk by abdominal circumference, daytime somnolence by Epworth sleepiness scale, and some dietary and physical activity (FA) habits described by survey. The 10-year risk of developing type 2 diabetes was assessed through the Findrisk survey. The protocol was approved by the Ethics Committee of the Universidad del Pacífico Privada.

Results: 69% of the population were women. 68% belonged to health careers, with 50% in their second year of university. The median age was 21 years. 59% were with normal weight, and 63% had normal abdominal circumference. 62% had body fat at a high acceptable level. "Low risk" of developing diabetes was found in 65% of cases, and a slightly elevated risk in 31% of the subjects. 73% presented normal daytime sleepiness, 50% reported sleeping 7 hours. 5% smoked and 55% performed AF; however, the median time spent on this was 25 minutes / week. Lunch was the most consumed meal (91%). 54% added additional sugar to their juices and infusions, while 74% reported consuming sugary beverages.

Conclusions: Interventions should be implemented at the university level, increasing the time spent on scheduled physical activity and improving the quality of beverages ingested by this population.

Keywords: Students, education, diabetes mellitus, habits, nutritional status.

144/2978

DEVELOPMENT OF MULTI-SECTORAL NUTRITION ACTION PLAN; TANZANIA EXPERIENCE

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Background and objectives: Multisectoral actions is needed to elimination malnutrition in the world. However, developing the multi-sectoral nutrition action plan has been a challenge to most countries. Tanzania is ready to show an example on how to develop the National Multisectoral Nutrition Action Plan (NMNAP).

Methods: The process started by developing a road which provided for a "steering structure" for policy guidance, sectoral and partner coordination, strategic decisions and quality assurance.

Structurally, the NMNAP steering committee was chaired by the Scaling Up Nutrition (SUN) Country focal point. The steering committee established six task teams with the mandate to develop costed implementation plans for actions in the key result areas (KRA). In forming the task teams, the steering committee used the 2013 Lancet Conceptual Framework for addressing malnutrition and categorized the KRAs into three categories: nutrition specific, nutrition sensitive and enabling environment interventions.

A senior level nutrition expert was consulted as lead facilitator whose role was to provide technical harmonization, coordination, quality assurance and cross-theme conceptual standardization. Tanzania Food and Nutrition Centre (TFNC) facilitated all the technical meetings on key milestones.

Evidence was collected using desk reviews, and where appropriate new operational evidence was collected through bottleneck analysis. The process engaged all key actors in the multisectoral, multi-layer and multi-stakeholder nutrition system at all levels. Consultations were based on the SUN stakeholder platforms. In process, stakeholders did a working session to articulate the desired change and to understand how to relate in productive ways with different stakeholders through a common vision and action.

Results: The task teams consolidated their work in a workshop facilitated by the Lead Facilitator who then used the output from the workshop to develop draft-1 of the NMNAP. This draft was peer reviewed and validated in a second workshop. The Lead Facilitator incorporated inputs from the reviewers and the validation workshop into draft-2, which was then submitted to the High Level Steering Committee for Nutrition (HLSCN) for final inputs.

Conclusions: It took one year for the multi- sectoral plan to be developed and finally indorsed by the HLSC

Keywords: Development. Multisectoral. Nutrition. Plan

Track 3: Public Health Nutrition and Environment

144/376

EARLY-LIFE RISK FACTORS AND THEIR COMBINED EFFECTS AS PREDICTORS OF OVERWEIGHT IN SPANISH CHILDREN

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Background and objectives: Early-life risk factors have been associated with subsequent childhood obesity. However, most of the studies did not consider important confounders to disentangle the contribution of each factor and their cumulative effects. We aimed to explore pre-, peri- and postpartum risk factors on the risk of overweight/obesity at age 6y and to investigate the cumulative effect of early life risk factors on overweight/obesity at ages 2-,4- and 6y.

Methods: A total of 1,031 children were evaluated at birth and re-examined during a 6-year follow-up in a representative cohort of Aragon (Spain). Maternal smoking during pregnancy, gestational weight gain, gestational age, birth weight, caesarean section, breastfeeding practices and rapid infant weight gain from birth to 6 months of age were the factors studied. Parental body mass index (BMI), maternal education, parental/ethnicity origin were defined as main confounders. We used logistic mixed-effects models to assess the associations investigated.

Results: Parental BMI and parental ethnicity/origin were the strongest predictors and they confounded several associations. Rapid infant weight gain (OR=2.29;[1.54-3.42]99%CI) and smoking during pregnancy (OR=1.61;[1.01-2.59]99%CI) remained statistically significant after adjusting for confounders. A higher number of early-life risk factors was associated with higher odds of being overweight or obese at the age of 6, where the OR increased with the number of early-life risk factors: two early-life risk factors (OR=2.72; [1.54-3.42]99%CI); three early-life risk factors (OR=5.02;[2.28-11.04]99%CI) and four to six early-life risk factors (OR=7.33 ;[3.01-17.84]99%CI). No significant associations were found at the age of 2 or 4 years.

Conclusions: Rapid infant weight gain, parental BMI and origin/ethnicity are important determinants of childhood obesity. Those with a higher number of early risk factors had elevated odds for obesity at age 6 suggesting cumulative effects. Monitoring children with rapid infant weight gain is especially important for childhood obesity prevention.

Keywords: Overweight, children, early life risk factors; socio-economic status

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HOW DOES THE HEALTHINESS OF THE US FOOD SUPPLY COMPARE TO INTERNATIONAL GUIDELINES FOR MARKETING TO CHILDREN?

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Background and objectives: Background: Food marketing to children is pervasive and has been linked to increased preference and intake of unhealthy foods. The World Health Organization has developed the only multi-country nutrient criteria to identify foods that should not be marketed to children. However, it is unclear what proportion of the US food supply would be eligible/ineligible for marketing under these criteria.

Objective: To examine the proportion of US food and beverage products eligible for marketing to children under the WHO Europe Nutrient Profile Method (NPM).

Methods: Data for this study are from Label Insight's Open Access branded food database and were extracted in December 2016. Each product was assigned to one of the 21 NPM categories, and nutritional content of the food product cross-checked against the NPM criteria. As added sugars and non-sugar sweeteners are not declared in the Nutrition Facts Panel for US products, each item's ingredient list was checked for the presence of these ingredients. The number and proportion of US products meeting the NPM criteria for marketing to children was examined overall and by category.

Results: Out of 172,842 products, only 22% of US food and beverage products were eligible to be marketed to children. 100% of 'Fresh and frozen fruit, vegetables and legumes', and 0% of 'Chocolate and sugar confectionery, energy bars, and sweet toppings and desserts', 'Cakes, sweet biscuits and pastries', 'Edible ices', 'Juices' and 'Energy drinks' were eligible. Excluding those categories that the criteria specify are 100% eligible, 'Processed meat, poultry, fish' had the highest proportion of products eligible for marketing to children (56%) and 'Savory snacks' the lowest proportion.

Conclusions: The WHO Europe multi-country NPM does not allow the marketing of confectionery or sugar-sweetened beverages, and restricts less healthy non-discretionary items from being advertised, with only 22% of all packaged food products eligible

for marketing to children. This method would be a useful way to determine whether food and beverage products can be marketed to US children.

Keywords: Food marketing; processed foods; public health nutrition; nutrient profiling.

Conflict of Interest Disclosure: ED, SWN and LST have no conflicts of interest.

WATCHING TV AND FOOD CONSUMPTION AMONG BRAZILIAN ADOLESCENTS: PENSE, 2015

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Background and objectives: Evidence from cross-sectional studies has shown that excessive time in front of the TV has been associated with overweight and obesity in children and adolescents, since this practice has a negative influence on the dietary pattern of young people. The aim of this study was to investigate whether sedentary leisure time was associated with increased regular consumption of unhealthy foods, independently of socio-demographic indicators and family context.

Methods: We used data from the National School Health Survey (PeNSE 2015) conducted by a partnership between the Brazilian Institute of Geography and Statistics (IBGE) and the Brazilian Ministry of Health. The analysis included 101,807 students living in all regions of Brazil, including urban and rural areas and attending public and private schools. The outcome variable was sedentary leisure time, defined as watching more than two hours of TV daily. The target explanatory variables were regular consumption (≥5days/week) of sweets, soft drinks and processed meat. Odds ratios (OR) and 95% confidence interval (95%CI) were obtained by multiple logistic regression. Gender, participant's age, skin color, maternal education, administrative classification of the school and living with their mother and father were used as adjustment variables. All statistical analyses were performed using SAS® Studio, version 3.6 and commands were performed taking into account the complex sample design of PeNSE.

Results: Prevalence of sedentary leisure time was 59.8% (95% CI: 59.2-60.3). The regular consumption of sweets, soft drinks and processed meat was reported by 41.6% (95%CI: 41.1-42.2), 26.7% (95%CI: 26.2-27.2) and 31.3% (95%CI: 30.8-31.8) of adolescents, respectively. Regular consumption of unhealthy foods was statistically higher among adolescents who reported watch TV for more than two hours daily. The associations between the regular consumption of sweets, soft drinks and processed meat and watching more than two hours of TV daily were statistically significant be-

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fore and after adjusting for sociodemographic characteristics and family composition.

Conclusions: The results highlight the need for integrated interventions to promote healthy leisure-time activities and healthy eating habits among adolescents to prevent negative health effects, particularly overweight and associated morbidities.

Keywords: Adolescent, food consumption, sedentary lifestyle

144/893

UNMETABOLIZED FOLIC ACID AND ITS ASSOCIATIONS WITH GLOBAL DNA METHYLATION, OXIDATIVE STRESS AND INFLAMMATORY MARKERS: ANALYSIS AFTER MANDATORY FORTIFICATION OF FLOUR WITH FOLIC ACID

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Background and objectives: Folic acid fortification has increased dietary intake of folic acid and folate status, but it is also associated with the presence of unmetabolized folic acid (UMFA). Brazil has mandatory fortification of flours with folic acid since 2012 and recent study showed that 80% of population in São Paulo had presence of UMFA in plasma. Although the biological effects of UMFA are not well known, in the past several years, many researchers have reported potential adverse effects associated with high intake of folic acid. The present study aims to assess new associations with UMFA and health outcomes, considering oxidative stress (MDA and 8-oxo-dG), inflammatory markers (cytokines, CRP and adhesion molecules) and Global DNA methylation.

Methods: Data was from a cross-sectional population-based survey conducted in São Paulo, Brazil. UMFA was assayed by the affinity-HPLC method with electrochemical detection. Oxidative stress was estimated by malondialdehyde (MDA) concentration in the plasma using derivatisation with thiobarbituric acid and quantification by HPLC/diode array, and 8-OH-dG was assayed using ELISA kit. The CRP was determined by IMMAGE® system. We used the MILLIPLEX MAP 13-plex Cytokine Kit and Human CVD Magnetic Bead Panel 2 from Merck Millipore Corp to analyze the cytokines (IL-1β, IL-6, IL-8, IL-10, IL-12) and adhesion molecules (ICAM and VCAM), respectively. The global DNA methylation was estimated using hydrolysis of genomic DNA followed by specific detection and quantification of the 5-methylcytosine content. Analyses were performed using multivariate logistic regressions adjusted for smoking, sex, age and BMI.

Results: The odds ratios (95% CIs) in logistic regression were 1.02 (0.65;1.59) for MDA, 1.32(0.45;3.88) for 8-oxo-dG, 0.85 (0.54;1.33) for CRP, 1.79 (0.95;3.37) for ICAM, 0.95 (0.52;1.74) for VCAM, 0.44 (0.23;0.84) for IL-1β, 0.57 (0.31;1.07) for IL-6, 1.23 (0.66;2.26) for IL-8, 0.55 (0.29;1.02) for IL-10, 0.58 (0.31;1.07) for IL-12 and 0.65 (0.40;1.08) for Global DNA methylation.

Conclusions: After multivariate adjustment, significant association was observed between IL-1β and UMFA. Although the vitamin is not metabolized, the presence of UMFA may indicate an adequate status because this form is only identified with saturation of the folate metabolism due to the excessive intake of this vitamin.

Keywords: Folic acid, unmetabolized folic acid, global DNA methylation, oxidative stress and inflammatory markers

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144/1046

QUANTITATIVE ASSESSMENT OF DIETARY SUPPLEMENT INTAKE IN 77 000 FRENCH ADULTS: IMPACT ON NUTRITIONAL INADEQUACY, EXCESSIVE INTAKE, AND EXTENT OF "AT RISK" PRACTICES

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Background and objectives: Dietary supplements (DS) are largely consumed in occidental countries without having demonstrated their nutritional benefits and safety.

In a large population-based study of French adults: 1) to compare the prevalence of nutrient inadequacy and the proportion of individuals exceeding tolerable upper intake levels (UL) between DS users and non-users, and 2) to quantify the extent of potentially "at risk" DS use practices (e.g. DS/drugs contraindicated associations).

Methods: 76,925 participants to the NutriNet-Santé cohort completed a quantitative DS questionnaire and three 24h dietary records. A composition database including >8000 DS was developed. Variance reduction was applied to estimate usual intakes and analyses were weighted according to the French census data.

Results: DS highly contributed to total intakes among DS users of the specific nutrient (e.g. 52% for vitamin D, 21% for pyridoxine). Compared to dietary intakes only, their prevalence of inadequacy was reduced by 11% for vitamin C, 9% for magnesium, 6% for pyridoxine in men, and 19% for calcium, 12% for iron, 11% for magnesium in women (p<0.0001). The proportion of subjects exceeding UL reached 6% for iron and 5% for magnesium in men, and 9% for iron in women. 7% of DS users had potentially "at-risk" practices, such as DS-drugs contraindicated associations (e.g niacin DS/anticoagulant drugs) or use of beta-carotene DS in current/past smokers.

Conclusions: While DS use contributed to decrease the prevalence of insufficient intakes for several nutrients, it also conveyed excessive intakes for iron and magnesium. Besides, a substantial proportion of potentially "at-risk" DS use practices was reported.

Keywords: Dietary supplements, nutrient inadequacy, tolerable upper intake levels, drug interactions

Further collaborators: Camille Pouchieu, Emmanuelle Kesse-Guyot

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144/1096

SCIENTIFIC PRODUCTION OF THE NATIONAL SCHOOL FOOD PROGRAM IN BRAZIL: A SYSTEMATIC REVIEW

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Background and objectives: The National School Food Program (Programa Nacional de Alimentação Escolar – PNAE) is one of the oldest nutrition programs in Brazil and is internationally recognized in the food and nutrition security area. The program offers meals free of charge to every student enrolled in public schools, as a strategy to guarantee the human right to adequate food. The objective of this study was to map, systematize and evaluate the scientific production about school food in Brazil.

Methods: A systematic review of literature was performed with the following guiding question: How is the scientific production on the National School Food Program in Brazil characterized?. The search for articles was made on Pubmed and Lilacs databases, using keywords related to school food and food and nutrition public policies. Studies made in Brazil were gathered, covering different aspects of PNAE. References of the selected articles were consulted in order to identify other relevant papers. The articles published until February 2016 were systematically reviewed and grouped in analytical categories. The results were described through relative frequency.

Results: From the articles found (2,839 non duplicated articles), 97 full articles were eligible and 16 were identified on references lists, adding up to 113 articles analyzed. The articles are mostly originals (85,8%), quantitative (56,6%), conducted in the Southeast (31,8%) and the South (20,3%), and published from 2010 (67,2%). Six Brazilian public universities were responsible for 50,0% of the manuscripts analyzed. The objects studied were acceptability and adherence to school food (29.2%), evaluation of menu (27,4%), management and operation of the program (25,7%), professional training and action (14.2%), acquisition of products from family farmers (12.4%), sanitary aspects (8.8%) and others (8.0%).

Conclusions: The scientific production related to PNAE is growing, concentrated in some regions of the country, addresses several aspects even in different proportions, but is centered in quantitative approach.

Keywords: School feeding. School. National School Feeding Program. Nutrition programs and policies.

144/1104

IDENTIFYING SOURCES AND VARIABILITY OF IODINE IN COW'S MILK TO ENSURE ADEQUATE DIETARY IODINE INTAKES BY THE SWISS POPULATION

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Background and objectives: Like in many industrialized countries, the main dietary iodine sources in Switzerland are iodized salt and dairy products, with an estimated contribution of 54% and ≈30-40%, respectively. Current health policy calls for a reduction in per capita salt consumption from 9 to 5 g per day; thus, the dietary iodine contribution from dairy products will likely become more important. However, milk iodine concentration (MIC) varies widely, making milk an unpredictable source. Therefore, our research aim was twofold: 1) to survey the MIC from farms throughout Switzerland to determine the main factors determining MIC; and 2) to establish the dose-response relationship of iodine intake of cows and MIC at five different supplementation levels feeding a forage-based diet.

Methods: In study 1, we collected bulk milk samples from 32 farms (n=126) over a period of one year. From each farm, prior to the milk samplings, we sampled all diet components (n=305) including water and completed a questionnaire regarding feeding

and practices of disinfection with an iodine containing teat dip. In study 2, we supplemented 5×5 lactating cows with either 0 or 0.5, 0.7, 1 and 2 mg I/kg dietary dry matter (DM) for 21 days, and weekly collected milk (n=125) and feed samples (n=10).

Results: In study 1, the overall median (IQR) MIC was 87 (42–134) µg/L. Season had a significant effect on MIC, with the lowest and highest concentration found in September and March, respectively (p<0.001). Furthermore, MIC was elevated (p<0.01) by the use of iodine containing teat disinfectants. In study 2, dietary and milk iodine correlated strongly and positively on each sampling day ($r^2 > 0.89$, p<0.001). The milk iodine concentration was ≈150 µg/kg at a dietary iodine concentration of 1 mg I/kg dietary DM of the cow.

Conclusions: We will use these data with current estimated milk and dairy product intakes in target groups (young women and children) to model iodine intakes to set feeding recommendations for dairy cows and revise guidelines for milking to ensure milk and milk products remain reliable sources of dietary iodine.

Keywords: Milk iodine, Cow's milk, Swiss population, Recommendations, Dose-response.

144/1119

COMPLEMENTARY FEEDING IN RURAL BANGLADESH: OUTCOMES FROM THE IMPROVING MATERNAL, NEONATAL AND CHILD SURVIVAL PROGRAMME

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Background and objectives: Improving maternal, neonatal and child survival (IMNCS) programme of BRAC is a comprehensive community based health intervention focusing on preventive and curative care with a group of trained community health workers with the goal to reduce maternal, neonatal and child mortality, particularly among the poor and socially excluded populations in rural Bangladesh. The programme is reaching 25 million people living in 14 districts of Bangladesh with reproductive, maternal, neonatal child and adolescent health (RMNCAH) services.

This abstract intends to demonstrate the achievement of nutritional interventions of the programme of 2015. Principal nutritional interventions of the programme includes initiation of exclusive breast feeding, tracking of continuation of breast feeding, initiation of complementary feeding, tracking of consumption of adequate amount of food and consumption of animal protein by the community health workers.

Methods: The data indicated here are taken from the management and information system of the IMNCS programme.

Results: Data from January to December of 2015 reveals that, 501,834 (93%) of the neonates were successfully initiated breast feeding within one hour of their birth. However, 346,105 (83%) infants continued exclusive breast feeding.

The Shasthya Kormis (SKs) who are the community health workers of BRAC, counsel the mothers and her relatives about complementary feeding and consumption of different animal proteins for the development of the child through regular household visits. 404,166 (83%) children were successfully initiated complementary feeding in the catchment area of the programme. 290,135 (60%) children aging 6 months and above consumed appropriate amount of food. 325,558 (67%) children aging 6 months and above consumed animal protein which is a remarkable achievement despite prevailing superstitions in the community to feed different animal proteins to the children.

Conclusions: The impact of 9 years of the nutritional interventions of IMNCS programme on 25 million people shows clear evidence on improving the status of child nutrition which proves the interventions promising. Scaling up of the programme intervention to other regions will have a substantial effect in ensuring healthy lives for millions of children.

Keywords: Complementary feeding, public health nutrition, child health, paediatric nutrition

Conflict of Interest Disclosure: The authors whose names are listed immediately below certify that they have no affiliations with or involvement in any organisation or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

144/1120

NUTRITIONAL KNOWLEDGE SCALE FOR EUROPEAN ADOLESCENTS USING ITEM RESPONSE THEORY

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Background and objectives: The item response theory (IRT) has several advantages compared with classical test theory approaches and can be used to evaluate the precision of tests in Nutritional Sciences. The aim of the study was to develop a nutritional knowledge scale from a validated nutritional knowledge test (NKT) using the IRT.

Methods: 3215 adolescents of the HELENA study, 12.5-17.5 y, who completed >75% of the NKT and did not answer all the questions right or all the questions wrong were included in the analyses. The NKT consisted of twenty-three multiple-choice questions with four possible answers including the 'don't know' category. The dimensionality of the questionnaire was analyzed by the polychoric correlation matrix in factorial analysis with estimation by principal components analysis. The answers were analyzed by the three parameters logistic model. Discrimination, difficulty and guessing parameters and scores (measure of the construct) were estimated in scale (0,1). IRT parameters were estimated using Bilog-MG software. Other analyses were performed using Stata version 14.

Results: NKT was related to a single dimension scale. Twelve questions presented low discrimination of nutritional knowledge and were excluded from the scale. The discrimination, difficulty and guessing parameters varied from 0.88 to 1.65, from -2.13 to 1.50 and from 0.09 to 0.01, respectively. The scores estimates varied from –0.83 to 0.83. 11 questions showed a good empirical reliability (0.69) and were appropriate in classifying adolescents who present median nutrition knowledge scores.

Nutritional knowledge scale was classified in three different levels: 1) basic, including knowledge about energy expenditure and ingredients from recipes; 2) adequate, including knowledge about nutrients from foods and their role on health; and 3) advanced, including basic and advanced nutritional terms.

Conclusions: The IRT gives guidance in tailoring nutrition knowledge among adolescents. An 11 multiple-choice questions NKT is proposed as a new approach when aiming to classify adolescents according to their nutrition knowledge.

Keywords: Nutritional knowledge, IRT, Multiple choice-test.

144/1174

ASSOCIATION OF DIETARY INTAKE OF POLYUNSATURATED FATTY ACIDS AND MORTALITY: A SINO-AMERICAN NATIONAL JOINT STUDY OF CHNS AND NHANES

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Background and objectives: Polyunsaturated fatty acids (PUFA) may contribute beneficially to cardiovascular health, intellectual development and cognitive function. However, epidemiologic evidence is limited and inconsistent for PUFA intake and mortality, especially in a worldwide comparative study level. Our aim is to systematically evaluate associations between dietary intake of PUFA and mortality in a Sino-American national joint study.

Methods: We utilized data from the China Health and Nutrition Survey (CHNS, 1989-2011, n=14,323) and American National Health and Nutrition Examination Survey [NHANES, 1988-1994 (III), continuous 1999-2010 (n=36,032)]. Participants with cardiovascular disease or cancer at baseline were excluded. A median follow-up duration of 14 and 9.8 years was conducted for CHNS and NHANES, respectively. Cox proportional hazards regression was used to estimate hazard ratios (HRs) and 95% confidence intervals (CIs).

Results: A total of 4826 and 1009 deaths accrued over 378,359 person-years of follow-up in NHANES and 199,091 person-years in CHNS, respectively. Intake of marine long-chain n-3 PUFA [eicosapentaenoic (EPA) + docosahexaenoic acids (DHA)] was significantly associated with a reduced risk of all-cause mortality in CHNS. In multivariable-adjusted model, the HRs across increasing intake levels were [0.63 (95% CI, 0.52-0.75), 0.72 (95% CI, 0.60-0.87), 0.74 (95% CI, 0.61-0.89); P<0.001 for trend] as compared with the lowest level. However, this inverse association was only observed in certain category of marine long-chain n-3 PUFA intake in NHANES. A weak inverse association was found between α-linolenic acid (ALA) intake and mortality in NHANES (P=0.04 for trend), whereas high intake level of ALA was related to an increased risk of mortality in the fourth quartile compared with first quartile [1.23 (95% CI, 1.01-1.51); P=0.05 for trend] in CHNS. Increment of arachidonic acid was associated with lower risk of mortality both in NHANES and CHNS, whereas linoleic acid intake was inversely linked with mortality only in NHANES. Importantly, a U-shape association of n-6/n-3 intake ratio with mortality was observed in CHNS.

Conclusions: Different types of dietary PUFA have divergent associations with mortality. The associations also vary between the two different ethnic populations. Our findings highlight preventive maintenance of n-6/n-3 balance diet and provide evidence-based insights into dietary PUFA recommendations for both Chinese and Americans.

Keywords: Polyunsaturated fatty acids; n-3 PUFA; n-6 PUFA; Mortality; Sino-American joint study

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144/1186

INTAKE OF ULTRA-PROCESSED FOODS IN UK ACCORDING TO SOCIOECONOMIC AND DEMO-GRAPHIC CHARACTERISTICS (2008–12)

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Background and objectives: Ultra-processed food consumption has increased in the past decade and evidence has shown that higher intake is associated with obesity and poor diet quality. The aim of this study was to describe how ultra-processed food consumption, as defined by NOVA classification, varied according to sex, age, and household income in UK.

Methods: Analysis of data from the UK National Diet and Nutrition Survey (2008–12). Dietary information was collected using four-day, unweighted, food-diaries. Ultra-processed foods were defined as formulations mainly or solely of industrial ingredients. Percentage of energy intake provided by ultra-processed foods was compared by sex, age group and income quintiles.

Results: Ultra-processed food consumption did not significantly differ between men (57.1% of total energy) and women (56.4%). Adolescents (68.3%) and children (64.2%) consumed a higher percentage of energy from ultra-processed foods than adults (54.9%) and elderly (52.1%). Adolescents obtained significantly more energy than others age groups from French fries, soft and fruit drinks, packaged salty snack, and pizza; while children obtained significantly more energy from breakfast cereal, sausage, confectionary, biscuits, and milk-based drinks. The consumption of ultra-processed foods significantly decreased from the lowest (57.2%) to the highest quintile (53.5%) of household income. Among the subgroups, the energy contribution of French fries, soft and fruit drinks, margarine, and packaged salty snacks significantly decreased across quintiles of the household income.

Conclusions: Consumption of ultra-processed foods in UK was significantly higher among those with lower income levels. It was particularly higher in children and adolescents for whom they made up 2/3 of total energy intake.

Keywords: Food processing; ultra-processed food; NOVA; UK.

144/1199

CHANGES IN ANAEMIA PREVALENCE AND PROGRAMMATIC COVERAGE AMONG CHILDREN AGED 6 TO 59 MONTHS IN KARAMOJA BETWEEN 2006 AND 2016

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Background and objectives: Karamoja, an agro-pastoralist semi-arid region in Uganda has the highest prevalence of anaemia in the country. Although the region recorded a reduction in anaemia in 2016, there is no evidence of what could have contributed to this reduction. The study explored the plausible programmatic packages that reduced anaemia in Karamoja between 2006 and 2016.

Methods: Secondary analysis data from Uganda Demographic and Health Surveys 2006, 2011 and 2016. Children aged six to 59 months living with their mothers in Karamoja were studied.

Results: Anaemia decreased from 82.2 percent in 2006, 69.5 percent in 2011 to 67.7 percent in 2016. DPT3 and measles immunization increased by 12.2 percent in 2011. The proportion of children who had had diarrhea together with malaria and cough decreased by 1 percent from 10.2 percent in 2006 to 9.2 percent in 2011. Coverage with all three programs of bednets, deworming and vitamin A supplementation increased from 8.5 percent in 2006 to 23.0 percent in 2011. The proportion of children benefitting from one program decreased from 47.8 in 2006 to 30.5 percent in 2011, those from two programs increased from 21.7 to 25.9 percent. The percentage which never benefitted from any preventative program decreased from 21.7 in 2006 to 17.8 percent in 2011. Children who benefitted from more programs were less likely to have anaemia (p<0.005, OR=0.797). Although consumption of minimum acceptable diet improved, it was not significantly associated with anaemia between 2006 and 2011.

Conclusions: Although anaemia among children aged six to 23 months reduced in Karamoja in 2016, it remains of a high public health significance. The increased coverage with packages of programs has contributed to this reduction. Improved coverage with immunization, deworming, vitamin A supplementation, bed nets and adequate complementary feeding will likely reduce anaemia in Karamoja.

Keywords: Childhood anaemia, immunization, programs, vitamin A supplementation

144/1205

IMPACT OF COMMUNITY HEALTH CLUBS ON CHILD DIARRHOEA, NUTRITIONAL STATUS, AND WATER QUALITY IN WESTERN RWANDA: CLUSTER-RANDOMISED CONTROLLED TRIAL

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Background and objectives: Community health clubs (CHCs)—multi-session village-level gatherings led by trained facilitators, designed to promote healthful behaviors primarily related to water, sanitation, hygiene—have been implemented in several African and Asian countries but have never been rigorously evaluated.

Methods: We conducted a cluster-randomised trial to evaluate the health impact of two versions of the CHC model in Rusizi district, western Rwanda. We randomly selected 150 villages and enrolled 8734 households with children under five years of age in a baseline survey in 2013. We randomly allocated villages to three groups: no intervention (control, n=50), eight sessions (Lite, n=50), or 20 sessions (Classic, n=50). We re-enrolled 7934 (91%) of the households in an endline survey in 2015. The primary outcomes were caregiver-reported diarrhea within the previous seven days in children under five years of age and nutritional status of children under two years of age at baseline, measured through length-for-age (LAZ) and weight-for-length (WLZ) z-scores. We measured intermediate outcomes related to water, sanitation, and hygiene. Analysis was by intention to treat and per-protocol. The trial is registered with ClinicalTrials.gov (NCT01836731).

Results: We observed no impact on caregiver-reported diarrhea in the Lite (PR=0·97, 95% CI: 0.81-1.16) or the Classic group (PR=0·99, CI: 0·85-1·15). We observed no impact on LAZ in the Lite (β=0·05, 95% CI: -0·07-0·17) or the Classic (β=-0·03, 95% CI: -0·08-0·14) group, nor on WLZ in the Lite (β=-0·002, 95% CI: -0·08-0·07) or the Classic (β=-0·02, 95% CI: -0·06-0·09) group. The Classic intervention had a positive impact on reported household water treatment (RD=0·086, 95% CI: 0·029-0·14), use of improved sanitation facilities (RD=0·085, 95% CI: 0·015-0·16), and presence of structurally complete sanitation facility (RD=0·065, 95% CI: 0·0013-0·13). There was no impact on the remaining intermediate outcomes, including improved microbiological water quality, in the Lite or the Classic group.

Conclusions: CHCs, in this setting in western Rwanda, had no impact on caregiver-reported diarrhoea among children under five years of age, LAZ or WLZ among children under two years, or water quality. Our results call into question the value of implementing this intervention at scale for the purposes of achieving health gains in the short term.

Keywords: WASH, stunting, wasting, sanitation, dietary diversity

144/1395

DOES CONTEXT INFLUENCE BRAZILIAN WORKERS' BODY MASS INDEX? RESULTS FROM THE ELSA-BRASIL STUDY BASELINE

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Background and objectives: There is growing recognition of environmental effect on obesity by scientific community. In middle and low-income countries there are few studies evaluating the influence of contextual factors on obesity, especially regarding the perception about food and physical activity environments. This study investigates how food and physical activity environments associate, separately and jointly, with body mass index (BMI) in 10,445 adult Brazilians, from 35 to 74 years old, who participated in the longitudinal study of adult health (Estudo Longitudinal de Saúde de Adulto, ELSA-Brasil).

Methods: Food environment and physical activity environment were evaluated separately and jointly (combined environment) on a neighbourhood perception scale adapted to the Brazilian context. First, individual scores were calculated for perception of the environments, then an aggregate score was constructed for each of the three dimensions from the mean perceptions of ELSA participants residing in the same neighbourhood. BMI was analysed in continuous form, and gamma regression models with linked identify function were used.

Results: After adjustment for study centre, age, income, schooling, self-reported health, length of time physically active and consumption of vegetables, an inverse association between BMI and physical activity environment (β = -0.063 kg/m² CI: -0.106: -0.020)

and food environment (β = -0.175 kg/m² CI: -0.299: -0.051) was observed among the women, indicating that the better the environment, the smaller the BMI. Also, a stronger inverse association between BMI and favourable combined environment (β = -0.864 kg/m² CI: -1.343: -0.387) was identified, also among the women. Among the men, no association was found between exposures and outcome of interest.

Conclusions: The study findings indicate that contextual factors associate with obesity, demonstrating that choice of health-related habits is not solely a matter of individual responsibility, and that public policies should be implemented to favour healthier food and physical activity environments.

Keywords: Neighbourhood, Food environment, Physical activity environment, BMI.

144/1492

NORDIC DIET, MEDITERRANEAN DIET, AND THE RISK OF CHRONIC DISEASES: THE EPIC-POTSDAM STUDY

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Background and objectives: The Mediterranean Diet (Med-Diet) has been established as a healthy dietary pattern. However, its relation with risk of major chronic diseases in non-Mediterranean countries is still under debate. A healthy alternative proposed in Northern Europe is the Nordic Diet, although its beneficial effects on different chronic disease have been controversially demonstrated. We aimed at investigating the association between the Nordic Diet and the MedDiet and the risk of major chronic disease (type 2 diabetes (T2D), myocardial infarction (MI), stroke, and cancer) in the EPIC-Potsdam cohort.

Methods: The EPIC-Potsdam prospective cohort recruited 27,548 participants between 1994 and 1998. After exclusion of participants with prevalent T2D, MI, stroke, or cancer, we evaluated the adherence at baseline to a score reflecting the Nordic diet and two different MedDiet scores; one based on the one created by Trichopoulou et al. (tMDS), and the other one based on the Mediterranean pyramid (MedPyr). Habitual diet intake was measured using food-frequency questionnaires. Multivariable-adjusted Cox regression models were applied to examine the association between the different diet scores and the incidence of T2D, MI, stroke, and cancer.

Results: During follow-up, 1,337 cases of T2D, 297 of MI, 331 of stroke, and 1,619 cases of cancer, were identified. Higher adherence to the Nordic diet showed an inverse association with the incidence of MI in the overall population and of stroke in men, although not statistically significant. Adherence to the MedDiet was associated with lower incidence of T2D for both scores (HR: 95%CI per 1 SD; 0.92: 0.87-0.98 for the tMDS, and HR: 0.91: 0.86-0.96 for the MedPyr score). The MedPyr score was also associated with lower incidence of MI in women, but not in men

Conclusions: In the EPIC-Potsdam cohort the Nordic diet showed a trend to decrease the risk for MI in the overall population and for stroke in men. Higher adherence to the MedDiet was associated with a decreased risk of T2D in the overall population and with a decreased risk of MI in women.

Keywords: Mediterranean diet, Nordic diet, chronic disease, EPIC-Potsdam Study

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THE CONTRIBUTION OF MICRONUTRIENT DEFICIENCIES TO ANEMIA AND RED BLOOD CELL (RBC) FOLATE INSUFFICIENCY AMONG NON-PREGNANT WOMEN OF CHILDBEARING-AGE (WCBA) IN BELIZE

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Background and objectives: Although iron deficiency (ID) and other nutritional-related anemia is a significant public health concern among WCBA, relevant biomarkers are rarely concurrently measured. Iron and other nutritional deficiencies can have adverse effects on birth outcomes.

To estimate the population-attributable risk fractions (PARF) associated with risk factors for anemia and RBC folate insufficiency among non-pregnant WCBA in Belize.

Methods: In 2011, a national probability-based survey was completed among non-pregnant Belizean WCBA, 15-49 years. Blood samples to determine hemoglobin, ferritin, alpha-glycoprotein 1 (AGP), folate (RBC and serum) and vitamin B-12 and socio-demographic and health information were collected from 937 women. Adjusted prevalence risk ratios (PRRs) were estimated from logistic regression models to determine PARF contributing to anemia and RBC folate insufficiency.

Results: The overall prevalence of anemia (<12 g/dL) was 21.8% (95%CI 18.3, 25.8), ID (<15 μg/L) 12.0% (95%CI 9.0, 15.8);

AGP-adjusted ID (<15 µg/L) 15.0% (95%CI 11.60, 19.2); serum folate deficiency (<14 nmol/L) 11.0 (95%CI 8.3, 14.4); RBC folate deficiency (<624 nmol/L) 35.1% (95%CI 30.8, 39.8); RBC folate insufficiency (<748 nmol/L) 50.3% (95%CI 45.4, 55.1); and vitamin B-12 deficiency (<221 pmol/L) 49.8% (95%CI, 45.0, 54.6). We estimated that 30.2% (95%CI 20.4, 41.3); 8.0% (95%CI 1.9, 17.8) and 1.8% (95%CI 0, 11.4) of anemia cases were attributable to iron deficiency, serum folate and vitamin B-12 deficiency, respectively. We also estimated that 13.9% (95%CI 4.1, 24.0) and 6.2% (95% CI 2.8, 10.8) of RBC folate insufficiency cases were attributed to vitamin B-12 and serum folate deficiency, respectively.

Conclusions: To our knowledge, this is the first national study to present data on the substantial contribution of iron deficiency, folate deficiency and vitamin B-12 deficiency to the reduction of anemia and RBC folate insufficiency among women of childbearing-age in a a low or medium income country.

Keywords: Population-attributable risk fractions, Micronutrient deficiencies, Anemia, Iron deficiency, Folate deficiency and insufficiency

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IMPLEMENTING FOOD-BASED DIETARY GUIDELINES TO GUIDE POLICIES, PROGRAMMES AND NUTRITION EDUCATION

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Background and objectives: The need for food-based dietary guidelines (FBDGs) to guide national food-related policies and programmes including nutrition education programmes is increasingly recognized. Several sources such as the Framework for Action from the Second International Conference on Nutrition, the Global Nutrition Report 2015, and the Foresight Report, 2016, published by the Global Panel on Food Systems for Nutrition have highlighted the potential role for FBDGs in shaping healthy diets. However, there has been a lack of information on how FBDGs are actually implemented by national entities, and a lack of guidance on carrying out implementation. The aim of this study was to obtain a snapshot of country actions of FBDGs implementation.

Methods: To explore if current implementation covers the different levels of influence on people's food choices, namely personal/interpersonal factors, institutional/community, and the enabling environment, the "social-ecological" framework was used. A literature review covering key scientific databases and grey literature was carried out in 2016. The findings helped shape questions for a key informant survey. Responses were received from 47 key informants in 27 of the 34 countries contacted, mostly from de-

veloped countries. Key informants included staff and researchers in government ministries, national nutrition organizations and academia. Responses therefore built a picture mainly of government-led activity rather than of informal actions and impacts.

Results: Implementation activities that had a direct link to the FBDGs were identified from various countries. These included some policy actions (such as school meal/institutional food standards and vending machine/cafeteria food standards in line with FBDGs), programmes (e.g. food assistance programmes, two examples of agriculture programmes, examples of food labelling/food advertising guided by the FBDGs, and reformulation of food to comply with the FBDGs), and many consumer education programmes. Information on evidence of effectiveness was collected, where available.

Conclusions: Some preliminary recommendations on how to maximize the impact of FBDGs are given, which include the need for a consumer-centred approach; an implementation plan with built in monitoring, evaluation, and funding; the need to target all policies/programmes that influence food, and the need to target policymakers as well as educators and the general public.

Keywords: Food-based dietary guidelines, implementation, food-systems.

Further collaborators:

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THE EFFECTS OF THE DANISH TAX ON SATURATED FAT ON NUTRIENT INTAKE AND MODELLED HEALTH OUTCOMES FOR DIFFERENT SOCIO-DEMOGRAPHIC GROUPS: AN ECONOMETRIC AND COMPARATIVE RISK ASSESSMENT EVALUATION

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Background and objectives: The WHO recommends the use of fiscal policies to promote healthy eating, but underline that the use of fiscal instruments might have potential regressive effects. However, there is very limited real-life evidence of the effect of food taxation, and even less on the potential regressive effects,

as most evidence is based on simulation studies. The objective of this study is to evaluate the effect of the Danish tax on saturated fat in terms of changes in nutritional quality of the diet i.e. changes in saturated fat consumption as well as other non-targeted dietary measures and to model the associated changes in NCD mortality for different socio-demographic groups.

Methods: Based on household scanner data we estimate the impact of the tax on consumption of saturated and unsaturated fat, salt, fruit, vegetables and fiber. The resultant changes in dietary quality are then used as inputs into a comparative risk assessment model (PRIME) to estimate the effect of these changes on Non-Communicable Disease mortality. We estimate the effects for four different educational groups; no education, vocationally trained, short tertiary education and long to medium tertiary education, using education as a proxy for socio-demographic status.

Results: The tax resulted in a 4.0% reduction in saturated fat intake on average with largest decrease among those with no education or medium to long tertiary education. Vegetable consumption increased especially for vocational trained and short educated. Salt consumption increased for most individuals, but mostly for short educated. We find a modelled reduction in annual NCD mortality per 100.000 persons of 3 lives saved for those with no education, 5.1 lives saved for the vocationally trained, 1.7 lives extra lost for the short educated and no change for the medium to long educated. All educational groups experience an increase in food-expenditure due to the tax. Largest increases are found for short and medium to long educated.

Conclusions: Modelling the effect of the changes in diet on health outcomes suggests that the saturated fat tax made a positive contribution to public health in Denmark. The effects are regressive in terms of NCD mortality, but progressive economically

Keywords: Fat tax, progressivity, NCD mortality

Conflict of Interest Disclosure: None of the authors have financial relationships with any organization, that might have had an interest in the submitted work in the previous three years and no other relationships or activities that could appear to have influenced the submitted work.

SERUM PENTADECANOIC ACID, A BIOMARKER OF DAIRY FAT INTAKE, IS ASSOCIATED WITH LOWER RISK OF INCIDENT CARDIOVASCULAR DISEASE AND ALL-CAUSE MORTALITY IN SWEDISH MEN AND WOMEN

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Background and objectives: Dairy food is a major energy and nutrient source in many cultures. Studies assessing associations of milk and dairy intake with mortality and cardiovascular disease (CVD) have been inconsistent, in part possibly due to poor intake estimation. Circulating pentadecanoic acid (15:0) is commonly utilized as an objective biomarker of dairy fat intake. Here we evaluated associations of serum 15:0 with incident CVD and all-cause mortality in a Swedish population-based cohort study.

Methods: Serum cholesterol ester 15:0 was measured at baseline in 60-year-old men (n=2017) and women (n= 2133). With use of national registers, 578 incident CVD events and 568 deaths were identified during a median follow-up of 16.6 y in participants with no prevalent CVD at baseline (n=3785, 53% women). Associations of 15:0 with incident CVD and all-cause mortality were evaluated using Cox proportional hazard models. Serum 15:0 (expressed as proportion of total fatty acids) was assessed as a continuous variable and in quintiles. Nonlinear associations were evaluated by using restricted cubic splines.

Results: In multivariable-adjusted models (including sex, BMI, physical activity, smoking habits, alcohol intake, education, prevalent type-2 diabetes, and drug treated hypertension and hyperlipidemia), serum 15:0 was inversely associated with incident CVD in a linear dose-response manner: hazard ratio (95% CI) of the top vs bottom quintile, 0.75 (0.57-0.98). A nonlinear associa-

tion was identified for serum 15:0 and all-cause mortality, with initially steeply declining risk that plateaued at 15:0 levels above the median (>0.22% of total fatty acids). The hazard ratios (95% CI) of the third and fifth quintiles compared to the first quintile were 0.67 (0.52-0.88) and 0.79 (0.61-1.03), respectively, when evaluated in multivariable-adjusted models.

Conclusions: Serum 15:0, a biomarker of total dairy fat intake, was associated with lower risks of incident CVD and all-cause mortality among older Swedish men and women.

Keywords: Dairy fat; biomarker; fatty acid; cardiovascular disease; mortality

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THE DIFFERENCES OF LIPID PROFILES BETWEEN THE ONLY CHILDREN AND NON-ONLY CHILDREN: A NATIONAL SURVEY IN CHINA

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Background and objectives: Although the lifelong effects of childhood dyslipidemia have been identified, the differences of lipid profiles between the only children and non-only children are still unclear. As the one-child policy had been implemented for 35 years in China, it is important to investigate that whether the only-child factor is associated with dyslipidemia.

Methods: 65347 Chinese children aged 6 to 18 years from 7 provinces were participated in this study, in which 16100 lipid profiles were available. Children's height, weight, total cholesterol (TC), triglycerides (TG), high-density lipoprotein cholesterol (HDL-C) and low-density lipoprotein cholesterol (LDL-C) were measured. Questionnaires were used to assess the demographic information. Covariates selected a priori included age, gender, living in urban or rural areas, provinces, parental educational levels, monthly family incomes and body mass index z-score. General linear model and logistic regression were used in the comparison of lipid profiles and prevalence of dyslipidemia, respectively. Subgroup analysis was applied to further explore the gender and urban-rural disparity between only- and non-only children.

Results: The only children were more likely to be boys and lived in urban areas than non-only children (53.76% VS 44.10%, 65.44% VS 40.97%, respectively). After adjusted for all covariates, the only children showed higher concentration of TC and LDL-C when compared with the non-only children (3.97±0.78 VS 3.89±0.77, 2.12±0.65 VS 2.06±0.64, all P<0.010). In the subgroup analysis, the differences were only found in children who lived in rural areas but not those in urban areas. Similarly, the raw prevalence of hypercholesterolemia and hyper-LDL-cholesterolemia were higher in only children (5.48% VS 4.43%, 3.97% VS 2.96%, all P<0.010). However, we only found higher prevalence of hyper-LDL-cholesterolemia in only-child girls who lived in rural areas when adjusted for all covariates (Odd Ratio: 2.58; 95% Confidence Interval: 1.29-5.14).

Conclusions: Higher levels of TC and LDL-C were found in only children especially for those who lived in rural areas. Higher prevalence of hyper-LDL-cholesterolemia was found in only-child girls who lived in rural areas. The gender and urban-rural disparity of lipid profiles between only- and non-only children should be well considered in the preventive guidelines and public health policies for childhood dyslipidemia.

Keywords: One-child policy, lipid profiles, dyslipidemia

IMPACT OF THE FARMER NUTRITION SCHOOL INTERVENTION ON IMPROVED DIETARY DIVERSITY OF WOMEN: RESULTS OF A COHORT STUDY FROM THE USAID SPRING PROJECT IN BANGLADESH

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Background and objectives: The USAID funded Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project implemented a nutrition activity called Farmer Nutrition Schools (FNS) to improve dietary practices in selected areas of Bangladesh. This study aimed at examining changes in women's diet diversity and other nutrition-related indicators following FNS participation in the implementation areas.

Methods: SPRING designed a cohort study to measure changes plausibly brought about by the SPRING FNS program when implemented at scale. This study surveyed a cohort of pregnant and lactating women (PLW) who participated in an FNS beginning in November 2014. The FNS curriculum includes modules on vegetable gardening, native chicken rearing and pond fish culture, among other key nutrition topics. Data were collected from a cohort of 440 PLW enrolled in 44 FNS of 38 sub-districts under Barisal and Khulna divisions. Participants were interviewed three times: 1) before beginning the FNS sessions (Phase 1); 2) immediately after the FNS sessions were completed (Phase 2); and 3) one year after the completion of FNS activities (Phase 3). We used adjusted Wald test to examine changes in diet diversity among the 386 women who were surveyed in all three phases. Multiple linear regression analysis was used to find the effect of FNS elements on women's dietary diversity scores.

Results: The proportion of households that cultivated vegetables in the homestead, reared chicks and cultured fish, increased significantly between phases 1 and 2 (95%, p<0.0001; 87%, p<0.001; 95%, p<0.05) and was sustained in phase 3. We observed significant improvements in women's consumption of legumes, eggs, flesh foods, vitamin-A rich fruits and vegetables after phase 1. The mean dietary diversity score of women increased from 3.9 in phase 1 to 6.0 in phase 2 (p<0.0001) and 5.6 in phase 3 (p<0.0001). Multiple linear regression revealed that the dietary diversity score

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increased on average by 0.22 (p<0.05), 0.26 (p<0.05) and 0.32 (p<0.001) among women who cultivated vegetables in the homestead, reared chickens and cultured fish respectively compared to women who did not follow these practices.

Conclusions: SPRING's FNS intervention enhanced food production practices, resulting in a diversification of women's diets among FNS participants.

Keywords: Diet community Bangladesh diversity SPRING

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MULTISECTORAL NUTRITION IN PRACTICE: ACCELERATING STUNTING REDUCTION THROUGH DECENTRALIZED MULTISECTORAL PLATFORMS IN YOROSSO DISTRICT, MALI

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Background and objectives: Despites a decrease in the stunting rates in Mali, the estimated number of stunted children has increased from 0.90 to 0.94 million between 2012 and 2015. Sikasso, the Mali's most fertile region, was the most affected by stunting. Thus, the Government of Mali in collaboration with UNICEF and European Union has targeted Sikasso for the Africa Nutrition Security Partnership aimed at strengthening the enabling environment for multisectoral nutrition (MSN) focusing on stunting in Africa. This paper describes the project achievements with district MSN platform in Yorosso

Methods: A triangulation of methods were used including: a) documentation of workshop and meetings; b) key informant interviews; and c) SMART survey data to assess the impact of the intervention.

Results: Following a district multi-stakeholder workshop on nutrition, participants committed to implement key nutrition actions, which were compiled to form the district MSN road map. The road map was validated by the high level political authority at this level. An administrative decision was issued to officially establish the MSN platform with the mandate to coordinate, monitor and evaluate nutrition related plans of various actors; facilitate joint planning and implementation of high impact interventions; and advocate for mainstreaming nutrition into development plans. Platform members were capacitated in multisectoral planning and implementation. The platform increased awareness and understanding of multidimensional nature of nutrition and stimulated coordinated implementation of nutrition sensitive interventions from health, agriculture, education and WASH. Overall nine sub-district platforms and 94 village MSN support groups were operationalized. There was a significant reduction in stunting rate in the district (30.2% in 2012 to 15.4% in 2016). Budgeting for nutrition in the local development plan was a major challenge. Additional challenges include staff turn-over requiring continuous renewal of advocacy/sensitization efforts and capacity building and capacity gaps within government and other stakeholders.

Conclusions: Involvement and leadership of the high level authority was crucial for the involvement of all stakeholders while commitment of the participating stakeholders to the platform principles and road map has accelerated improvement in nutrition indicators.

Keywords: Multisectoral nutrition; stunting; coordination, Sikasso, intervention

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144/1703

ALIGNMENT OF WHEAT AND MAIZE FLOUR FORTIFICATION STANDARDS WITH WHO RECOMMENDATIONS IN COUNTRIES WITH MANDATORY FORTIFICATION

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Background and objectives: In 2009, the World Health Organization issued wheat and maize flour fortification recommendations for five micronutrients (iron, folate, vitamin B12, vitamin A, zinc). In 2016, WHO updated maize flour fortification recommendations for the same nutrients plus thiamine, riboflavin, niacin, pyridoxine, and pantothenic acid. WHO recommendations include fortification compounds and nutrient levels that, based on

per capita flour intake or availability, should be considered when only one food is fortified. This review evaluated alignment to WHO recommendations of flour fortification standards in countries with mandatory fortification.

Methods: Countries' grain availability and fortification standards were obtained from the Food and Agriculture Organization, the Food Fortification Initiative, and WHO. For each nutrient, countries' standards were assessed against WHO recommendations for compounds (e.g. recommended or not, not specified) and nutrient levels (e.g. less than, equal to, greater than).

Results: Official fortification standards were obtained for 61 of 85 countries with mandatory wheat flour fortification and for 15 of 16 countries with mandatory maize flour fortification. The number of standards with nutrients specified ranged from 60 for iron to 14 for vitamin B12 in wheat flour, and from 14 for iron to 0 for pantothenic acid for maize flour.

For wheat flour, among countries with standards, the number of standards with nutrient levels equal to or greater than WHO recommendations were 23 of 56 (folic acid), 3/21 (zinc), 2/14 (vitamin B12), and 2/14 (vitamin A). For maize flour, the corresponding numbers were 5/14 (folic acid), 0/13 (thiamine), 9/13 (riboflavin), 4/13 (niacin), 2/7 (vitamin B12), 2/10 (zinc), 3/9 (vitamin A), and 0/5 (pyridoxine).

For countries that included recommended iron compounds in their standards, 20/60 wheat flour and 3/14 maize flour standards had nutrient levels equal or greater than WHO recommendations for all iron compounds.

Conclusions: Preliminary results suggest that for most nutrients in countries' wheat and maize flour fortification standards using the suggested fortification compound, nutrient levels are lower than WHO recommendations. If these flours are the only fortified foods in countries, this may affect the public health impact of flour fortification in countries.

Keywords: Grains, enrichment, policies, micronutrients

144/1739

IMPLEMENTATION OF A TOOL TO EVALUATE POLICY ACTIONS AND COMMITMENTS OF CHAIN RESTAURANTS IN CANADA

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Background and objectives: Food company policies play an integral role in influencing the quality of the food environment and overall dietary habits. The objective of this study was to test methods to evaluate restaurant company commitments relating to the food environment, obesity and non-communicable diseases (NCDs).

Methods: This study builds on work of the International Network for Food and Obesity / non-communicable Diseases Research, Monitoring and Action Support (INFORMAS) to monitor and benchmark food environment policies globally. The Business Impact Assessment – Obesity and related population-level nutrition (BIA-Obesity) tool adapts methods to evaluate nutrition-related commitments, performance and disclosure practices of the largest global food companies and distributors across four sectors (packaged food manufacturers, beverage manufacturers, restaurants and supermarkets). This preliminary study examined company commitments of the ten largest restaurant chains in Canada across eight domains (corporate nutrition strategy, relationships with external organizations, policy positions, product reformulation, product and menu labelling, promotion to children, product pricing and availability and selection) using company websites, social media accounts, annual reports, and media releases were scanned to identify policies.

Results: Ten top companies representing a total of 30% of the Canadian foodservice market share were included in this preliminary evaluation, including national and multinational companies. Of the ten companies, six mentioned 'nutrition' or 'health' in their mission statement or had a nutrition strategy; however, none mentioned obesity or NCDs. Eight companies reported having reformulated products for one or more nutrient, five reported ongoing reformulation, and two provided specific targets for future reformulation. Two chains published commitments to limit advertising to children, varying in strength. While all companies had nutrition information available on websites, only one company voluntarily listed calorie information on menu boards. No companies pub-

lished availability and selection policies, and few details on policies regarding funding relationships with external organizations or company policy positions were published on websites. Company scores according to the BIA-Obesity tool will be discussed.

Conclusions: Few major restaurant companies in Canada have published policy commitments to improve the food environment. Future work will include verifying policies with companies, testing these methods for scale up in other countries, and comparing company commitments to actions.

Keywords: Food industry, policy, food environment, food marketing

Further collaborators: For INFORMAS.

144/1758
THE DOUBLE BURDEN OF MALNUTRITION IN COLOMBIAN PREGNANT WOMEN

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Background and objectives: In Colombia, double burden of malnutrition (DB) has been evaluated by the coexistence of overweight and anemia at family level and at individual level in non-pregnant woman and children under 5 y old. However, DB has not been evaluated in pregnant population. Our goal was to estimate prevalence of DB in Colombian pregnant women.

Methods: We analyzed data from the Food and Nutrition National Survey 2010. Sample for this analysis comprised healthy pregnant women with available data of height, weight, hemoglobin, ferritin and C reactive protein. Nutritional status of participants was classified based on BMI for gestational age proposed by Atalah et al. Hemoglobin and ferritin were corrected based in WHO recommendation. The criteria for the evaluation of DB were coexistence of: 1) overweight and anemia, 2) overweight and iron deficiency anemia, or 3) overweight and iron deficiency (low ferritin).

Results: Data from 1761 pregnant woman were obtained; 15.9%, 52.3 %, and 31.8% in first, second and third trimester of gestation, respectively. Prevalence of DB according with criteria 1, 2, and 3 were, respectively: 6.1% (95%CI: 5.1-7.3), 4.4% (95%CI: 3.6-5.5), and 16.9% (95%CI: 15.2-18.7). By criteria 1, DB was 0.7% (95%CI: 0.2-2.9) first, 6.3% (95%CI: 4.9-8.0) second and 8.3% (95%CI: 6.3-10.9) third trimester of gestation. By criteria 2, DB was 0% first, 4.0% (95%CI: 2.9-5.4) second and 7.2% (95%CI: 5.3-9.7) third trimester of gestation. By criteria 3, DB was 4.3% (95%CI: 2.5-7.5) first, 16.4% (95%CI: 14.1-18.9) second and 23.1% (95%CI: 19.8-26.8) third trimester of gestation.

Conclusions: In Colombian DB in pregnant women increased during gestation course. Furthermore, DB evaluated by coexist of overweight and iron deficiency affects at least one of four women during gestation. Because the potential health implications of DB on the life course, it is necessary that national surveys focus some analysis on this condition.

Keywords: Double burden malnutrition, pregnant women, iron deficiency, anemia, overweight

Further collaborators: Acknowledgments: Instituto Colombiano de Bienestar Familiar which provided date base.

144/1761
INITIAL SITUATION ASSESSMENT ON SCHOOL FOOD AND NUTRITION IN AFRICA

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Background and objectives: The United Nations Food and Agriculture Organization (FAO) is working to promote sustainable school food and nutrition in Africa. Recently FAO Africa undertook a regional situational analysis of school food and nutrition with the objectives to provide a regional perspectives of SFN programmes and policies in Africa and identify main gaps, challenges and opportunities in the delivery of SFN programmes in Africa, with particular reference to the nutrition and agriculture linkages.

Methods: A quantitative questionnaire was sent out to 46 African Union member states with FAO country offices where a team of stakeholders completed the survey. Forty one countries complete the questions.

Results: 90% of African countries are running at least one form of School feeding programme. However only four countries have universal programmes and most programmes are highly targeted. Four countries out of 41 have no school feeding programmes. Countries have prioritized school feeding objectives in in term of educational outcomes and hunger and secondly to deal with nutrition. Over-nutrition is not considered an important issue for consideration. About 54% of the Countries do not have dietary guidelines and 12% need to revise their guidelines. Ten specific challenges were highlighted by the survey: (1) Low coverage of schools; (2) Lack of policy or legal framework; (3) Weak political will and government ownership; (4) Lack of nutrition guidelines/standards for school meals; (5) Weak institutional arrangements and multi-sectoral coordination; (6) Insufficient financial, human, and technical capacities; (7) poor linkages with nutrition education; (8) Inadequate quantity and quality of school meals; 9) Poor infrastructure/facilities and 10) Lack of monitoring and evaluation mechanism.

Conclusions: Despite the fact that providing healthy, diversified, safe and nutritionally balanced meals in African schools is

recognized as a vital intervention to alleviating hunger & malnutrition and for children to grow well and learn well, current SFN have several weaknesses. Sustainable School Food and Nutrition should be re-designed to ensure sustainability, and improve nutrition knowledge.

Keywords: School feeding, dietary guidelines, assessment, nutrition education, policies

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144/1767

MONITORING OF THE NATIONAL OIL AND WHEAT FLOUR FORTIFICATION PROGRAMME IN CAMEROON: APPLICATION OF A PROGRAMME IMPACT PATHWAY FRAMEWORK

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Background and objectives: Since 2011 Cameroon has mandated the fortification of refined vegetable oil with vitamin A (target=40 IU/g, range=33-50 IU/g), and wheat flour with iron (60 mg/kg) and zinc (95 mg/kg). A 2012 interim impact assessment in Yaoundé and Douala indicated 76% of wheat flour samples were fortified and indicators of iron and zinc status in women and children were greater relative to prefortification values. However, only 44% of oil samples were fortified and indicators of vitamin A status were unchanged. We assessed Cameroon's food fortification programme using a programme impact pathway framework to identify barriers to optimal programme performance.

Methods: Using semi-structured interviews, data on inputs and processes were collected from factories of all active domestic producers of refined vegetable oil (n=9) or wheat flour (n=10). Twelve sentinel sites were selected for market and household surveys, including assessment of frequency of fortified food consumption by women and children (600 households total). Food samples were collected from factories, markets, and households for measurement of vitamin A (iCheck) and iron and zinc (ICP-OES) content.

Results: All factories had in-house methods (mostly qualitative) for testing the micronutrient content of fortified products, while 68% presented quality certificates for recent premix purchases. Industries cited premix import taxes and access to external laboratories as constraints. All but one factory oil sample had vitamin A content > 33 IU/g. Among the sentinel sites, 87% of n=393 market oil samples contained detectable vitamin A; 43% had levels > 33 IU/g. Among household oil samples, 86% contained detectable vitamin A; 46% contained > 33 IU/g. All factory flour samples appeared to be fortified, but only ~18% had mineral levels within 10% of the target. Among composite flour samples from markets

and households the mean iron and zinc content was 25 mg/kg and 43 mg/kg, respectively, ~45% of target levels.

Conclusions: The availability of fortified oil is encouraging and may partially reflect recent growth in the share of domestic oil production. The low levels of iron and zinc in wheat flour indicate the need for programme support, possibly through premix procurement and technical support for micronutrient analysis.

Keywords: Fortification, Micronutrient, Programme impact pathway, Implementation science, Vitamin A

144/1777

DUTCH FOOD-BASED DIETARY GUIDELINES: HEALTH AND SUSTAINABILITY COMBINED IN THE WHEEL OF FIVE

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Background and objectives: End 2015 the Health Council of The Netherlands published the Dutch dietary guidelines 2015 which focus on dietary patterns and foods related to the prevention of chronic diseases, and take sustainability into account. The Netherlands Nutrition Centre (NNC) translated these guidelines to the general public, in order to offer practical tools that support behavioral change towards a healthier and more sustainable diet. The Wheel of Five (WoF) is the national counselling model.

Methods: With a mathematical approach (using Optimeal®) that takes multiple criteria into account the RIVM calculated optimal diets for different target groups (based on age, gender, activity level, preference and ethnicity). Criteria for this optimization were: complying with the Dutch dietary guidelines 2015, meeting the dietary reference values for energy and nutrients and fitting in with the different target groups' customary dietary patterns. Composition of foods consumed by each target group, and a ratio for foods inside and outside the WoF were considered. Maximum levels were set for the use of animal products. Based on the optimal diets the NNC established recommendations for daily amounts of

various food groups for the different target groups. RIVM calculated the nutrient content and greenhouse gas emissions (GHGE) of the recommendations.

Results: The Wheel of Five shows recommended dietary patterns that combine health benefits and nutrient provision, based on foods that are customarily eaten in the Netherlands, taking sustainability into account. Foods high in saturated fatty acids, trans fatty acids, sodium, sugar or low in fiber are outside the WoF. The advice is to eat mainly foods from the WoF. Foods outside the WoF should be eaten neither too often nor in large quantities. GHGE was reduced by around one third in diets omitting meat or by chosing diets that contain more sustainable products within each food group.

Conclusions: The translation of the Health Councils' dietary guidelines resulted in a renewed Wheel of Five, the national counselling model. Using the Wheel of Five as a frame of reference, people can get an impression of their own dietary pattern, and an understanding of those areas in which they could make improvements.

Keywords: Food-based dietary guidelines, health, sustainability

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144/1805

CHANGES IN THE COMPOSITION OF THE FOOD SUPPLY IN ANTICIPATION OF THE IMPLEMENTATION OF THE CHILEAN LAW OF FOOD LABELLING AND ADVERTISING: AN INFORMAS-BASED APPROACH

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Background and objectives: In 2012 Chile passed the Law of Food Labeling and Advertising (Law 20.606). The study objective was to evaluate potential anticipatory changes in the composition of the food supply ahead of the implementation of this law in June 2016. The law specifies limits for solids (per 100g) and liquids (per 100ml) in a 4-year increasingly stricter implementation, applying only to products with added sodium, sugars and/or saturated fat ("critical nutrients"). A product can have up to four "High in" front-of-pack warning labels, one for each critical nutrient and calories.

Methods: The INFORMAS framework for monitoring the composition of the food supply was used. In February 2015 and 2016, fieldworkers photographed a representative sample of pack-aged food products (n=5421 and n=5479) from 6 different supermarkets in Santiago, Chile. Foods were excluded if they required reconstitution, had missing information or if total labelled energy was estimated as incorrect (n=942). The initial (2016) and final (2019) limits were used to evaluate if foods would receive a "High in" Calories, Sodium, Sugars and/or Saturated Fats (initial/final, solids: >350/275 kcal; >800/400 mg; >22.5/10 g; >6/4 g; liquids: >100/70 kcal; >100/100 mg; >6/5 g; >3/3 g).

Results: Seven percent of foods had no added critical nutrients (n=720). In both 2015 and 2016, 63% of products had critical nutrients exceeding at least one initial limit indicative of a "high in" warning. Over 80% of snack foods, breakfast cereals/bars, sweet bakery goods and sweets would be classified as "high in calories", and over 80% of the latter two categories also as "high in sugars". Many (75%) savory sauces/spreads would be classified as "high in saturated fat". In 2015, only processed meats had >50% of products (54%) that surpassed the initial "high in sodium" limits that declined to 45% in 2016. Under the final phase limits, 17% of foods would have zero warning labels.

Conclusions: Between 2015 and 2016, only slight anticipatory changes in the food supply were detected. Most products will have to be reformulated or removed from the market if to avoid at least one front-of-package warning label.

Keywords: Law 20.606, INFORMAS, critical nutrients, food environment, Chile

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144/1807

PARENTS' COOKING SKILLS REDUCE CHILDREN'S CONSUMPTION OF ULTRA-PROCESSED FOODS

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Background and objectives: The consumption of ultra-processed foods is increasing in many countries and one of the possible determinants is the decrease of home cooking. Considering that parents are key people for children's health, this study analyzed the influence of parents' cooking skills on the children's consumption of ultra-processed foods.

Methods: Cross-sectional study with 657 child-parent pairs from nine private schools in São Paulo, Brazil. Food consumption data were collected through children's dinner dietary recall and food items were classified according to the 'NOVA Classification'. The parents' ccooking skills were evaluated using the Cooking Skills Index – Brazil (CSI-Brazil), a 0-100 index specially designed

for this research and based on the Brazilian's Dietary Guidelines (2014). Linear regression analysis was used to test associations between the parents' cooking skills and the ultra-processed foods contribution on the total dinner energy intake, adjusting for socio-demographic variables: parent's age, gender, race, marital status, education, employment status; per capita family income and number of children in the house.

Results: The average age of the parents was 38.3 years old (SD 6.3) and the children's was 7.8 (SD 1.1). The parents were mostly women (93.2%), white (62.2%), married (88.3%), with incomplete higher education or more (51.4%), employed (71.4%), with per capita family income of up to ~USD 320.00/month (37.8%). These parents reached an average of 78.8 points (SD 14.8) according to the Cooking Skills Index – Brazil. Children's average dinner energy intake was 672.2 kcal, with 31.3% coming from ultra-processed foods. The average intake of ultra-processed foods ranged from 37.2% of total energy in the first quintile of the CSI-Brazil to 28.1% of total energy in the last quintile. The analysis showed that the increase of the parents' cooking skills was directly associated with the decrease of consumption of ultra-processed foods (β=-0.18 by quintile of the CSI-Brazil; p=0.008), remaining after adjustment (β=-0.16; p=0.020).

Conclusions: The findings of this study, the first that explores that relationship in Brazil, suggest that parents' cooking skills protect their children against the consumption of ultra-processed foods, indicating the need for a revaluation of cooking in order to promote adequate and healthy eating.

Keywords: Food. Culinary. Diet quality. Children. Parents.

144/1808

EFFICACY OF A LOCALLY-PRODUCED MULTIPLE MICRONUTRIENT-FORTIFIED READY-TO-USE SUPPLEMENTARY FOOD (RUSF) FOR CHILDREN UNDER TWO YEARS IN CAMBODIA

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Background and objectives: Cambodia's progress in combatting malnutrition has stalled. In 2014, 32% of all children under five years were stunted, 24% were underweight and 10% were wasted. This is due in part to poor quality complementary foods leading to insufficient nutrient intakes. Therefore, UNICEF, the Cambodian Ministry of Agriculture, Forestry and Fisheries and IRD developed a locally-produced multiple micronutrient fortified lipid-based nutrient supplement (LNS) that can be used as a Ready-to-Use Supplementary Food (RUSF). The novel RUSF can be given to children to increase their intake of protein, energy and micronutrients.

This trial assessed the RUSF's efficacy in reducing growth faltering in comparison to CSB++, Sprinkles and a control group.

Methods: The trial was a nonblinded, cluster-randomised control trial. Healthy children aged 6-17 months (n=486) were allocated to one of three intervention groups or the control group for six months. The main outcome was anthropometric status (WHZ, HAZ, WAZ, MUAC).

Results: None of the interventions could completely prevent growth faltering, but children consuming the novel RUSF appeared to falter at a lower rate. The lowest decreases in base-endline z-scores were for the RUSF group, for WAZ [RUSF: -0.01 (-0.14, 0.11); control: -0.14 (-0.26, -0.01)]; HAZ [RUSF: -0.27 (-0.49, -0.05); control: -0.36 (-0.57, -0.15)]; and WHZ [RUSF: 0.00 (-0.17, 0.17); control: -0.10 (-0.28, 0.07)]. Increases in MUAC (cm) were greatest for CSB++ [CSB++: 0.27 (0.08, 0.47); RUSF: 0.22 (0.03, 0.42)].

Older children had slightly better outcomes, and children with lower anthropometric measures at baseline had larger increases over the intervention period, showing that the interventions were helpful for children with poorer nutritional status. Children who consumed more had better weight-related outcomes (WAZ and WHZ), but not HAZ, suggesting that weight is more amenable to intervention than height.

Conclusions: These results suggest that neither the commonly used supplements (Sprinkles and CSB++) nor the novel RUSF could prevent growth faltering. However, in comparison to the control group, all the supplements (particularly the novel RUSF, but also CSB++ and to a lesser extent, Sprinkles) contributed to improved nutritional status.

Keywords: Ready-to-use supplementary food (RUSF), lipid-based nutrient supplement (LNS), complementary feeding, CSB++, Sprinkles.

144/1816

COMPATIBILITY BETWEEN DIMENSIONS OF SUSTAINABLE DIETS (NUTRITIONAL ADEQUACY, EXPOSURE TO FOOD CONTAMINANT AND 30% REDUCTION OF GREENHOUSE GAS EMISSION): AN ANALYSIS BASED ON INDIVIDUAL DIET MODELING

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Background and objectives: To test the compatibility between nutritional adequacy, acceptable exposure to food contaminant and 30% reduction of greenhouse gas emissions at individual level.

Methods: Dietary data from the French national survey (2006) were crossed with the "SUStable" database (Gazan et al., 2016) which summarizes, for 204 representative food items, nutritional composition, 27 contaminants (including pesticides, heavy metals, mycotoxins, non dioxin-like polychlorinated biphenyls (NDL-PCBs) and dioxin-like compounds) and GreenHouse Gas Emissions (GHGE). Intakes of nutrients and contaminants, and GHGE were estimated for each adult (n=1808). For each individual, 4 iso-caloric modeled diets departing the least from his/her observed diet were designed to fulfill i) French nutrient recommendations (NUT model), ii) French recommendations and a 30% reduction of GHGE from observed (NUT_30%GHGE model), iii) French recommendations without exceeding observed contaminant exposures (NUTOX model) and iv) all together (NUTOX_30%GHGE). In each scenario, the percentage of individuals for whom it was not possible to model a diet was estimated. In case of infeasibility, the incompatible constraints (i.e. the constraints that made the model infeasible) were identified.

Results: The percentage of infeasible modeled diets was 1.4%, 25.3%, 2.7% and 27.5% in the NUT, NUTOX, NUT_30%GHGE and NUTOX_30%GHGE models respectively.

In infeasible NUT models, the constraint on energy (i.e. isocalory) was always incompatible with constraints on fiber, vit E and vit B1. In the NUT_30%GHGE models, constraints on energy and GHGE (i.e. 30% reduction) were always incompatible with each other.

Among infeasible NUTOX_30%GHGE models, the most frequent infeasible constraints were water (99.6%), GHGE (99.6%), fibre (96.4%), energy (95.9%), inorganic mercury (95.8%), calcium (93.4%), Methylmercury (89.6%), Non dioxin-like PCBs (89.4%), hexachlorobenzene (75.7%), PB (73.5%), potassium (65.7%) and CD (62%), DHA+EPA (60.2%).

Conclusions: For the first time, nutritional, toxicological and environmental dimensions were combined to design sustainable diets with individual diet modeling. The results showed that all dimensions are compatible for a majority of French adults. Compatibility between nutritional and environmental goals would be feasible for the majority of French adults. However, reaching those goals without exceeding observed contaminant exposures would be difficult or even infeasible, underlining the need to decrease the contamination of food to promote diet sustainability.

Keywords: Individual diet modeling, contaminant exposure, sustainable diet, nutritional adequacy, greenhouse gas emissions

DIETARY CHANGES NEEDED TO REACH NUTRITIONAL ADEQUACY AND REDUCE GREENHOUSE GAS EMISSIONS BY 30% WITHOUT INCREASING CONTAMINANT EXPOSURE: AN ANALYSIS BASED ON INDIVIDUAL DIET MODELING

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Background and objectives: To identify individual dietary changes that simultaneously combine nutritional adequacy, acceptable exposure to food contaminant and 30% reduction of greenhouse gas emissions.

Methods: Dietary data from the French national survey were crossed with the "SUStable" database (Gazan et al., 2016) which summarizes, for 204 representative food items, nutritional composition, 27 contaminants (including pesticides, heavy metals, mycotoxins, non dioxin-like polychlorinated biphenyls (NDL-PCBs) and dioxin-like compounds) and GreenHouse Gas Emissions (GHGE). Intakes of nutrients and contaminants, and GHGE were estimated for each adult (n=1808). For each individual, 4 iso-caloric modeled diets (using linear programming) departing the least from the observed diet were designed to fulfill i) French nutrient recommendations (NUT model), ii) French nutrient recommendations and a 30% reduction of GHGE from observed (NUT_30%GHGE model), iii) French nutrient recommendations without exceeding observed contaminant exposures (NUTOX model) and iv) all together (NUTOX_30%GHGE). The sub-sample of adults having a feasible diet for each model was kept for analyses. Solid energy density (SED), diet cost and food content were compared in observed and modeled diets.

Results: Seventy-two percent of adults had a feasible solution for each model. In nutritionally adequate diets (NUT model) SED decreased compared to observed diets (144 vs 179kcal/100g) and diet cost and GHGE increased (8.3 vs 7.2 euros/d; 4574 vs 4325 g CO_2eq/d, in NUT and observed diets, respectively). In the NUTOX_30%GHGE diets, SED (178kcal/100g) did not differ from the observed and diet cost (6.7 euros/d) decreased. Compared to observed diets, vegetables, refined starches, meats and tea-coffee increased or remained stable in the NUT diets (+55g/d, +3g/d, +3g/d, +73g/d respectively) but decreased in NUTOX_30%GHGE diets (-22g/d, -18g/d, -49g/d, -306g/d respectively) due to contaminant constraints for refined starches and tea-coffee, GHGE reduction constraint for meats and both constraints for vegetables. Fresh fruits, fish and water increased in NUT diets (+148g/d, +21g/d, °561 g/d, respectively) but that increase was attenuated in the NUTOX_30%GHGE diets (+104g/d, +1.5g/d and 450g/d, respectively), mainly due to contaminant constraints.

Conclusions: Nutritional, environmental, toxicological, cultural and economic goals should be considered simultaneously when designing sustainable diets, as the food choices needed to achieve them separately aren't necessarily the same.

144/1856

NUTRITIONAL STATE, NUTRIENT INTAKE AND PHYSICAL ACTIVITY IN PRIMARY SCHOOL CHILDREN: A REPRESENTATIVE SAMPLE FROM SAO PAULO, BRAZIL

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Background and objectives: There is growing interest in investigating the prevalence and factors associated with obesity in children. Brazil is experiencing a nutritional transition characterized by a reduction in the prevalence of nutritional deficits and an increase in overweight and obesity. However, there are only limited data on dietary habits and behaviors of Brazilian children. Our objective was to evaluate nutrient intakes, eating patterns, weight status, level of physical activity and associated demographic characteristics of primary school children in the metropolitan region of Sao Paulo, Brazil.

Methods: A cross-sectional study in 1000 children aged birth-12y was conducted in the metropolitan region of Sao Paulo, including 439 7-9y olds. Participants were randomly selected and stratified by sex, age and social class. Weight status (underweight, normal, overweight or obese) was calculated based on measured height and weight and evaluated using the Body Mass Index, according to World Health Organization criteria (WHO, 2007). Physical activity and screen time were measured using the Children Physical Activity Questionnaire adapted to the recommendations of the Brazilian Society of Pediatrics (SBP, 2008). Two non-consecutive 24-hour recalls were conducted to estimate food and nutrient intakes. Energy, macronutrient and micronutrient intakes were calculated using Brazilian and American food composition tables. Statistical analysis were performed using SPSS version 18.0.

Results: Almost 50% of the primary school children aged 7-9y in the metropolitan region of Sao Paulo were found to be overweight (25.6%) or obese (23.6%) and also to have unhealthy lifestyles. We observed high levels of sedentary behavior (prevalence of low physical activity was 49% and 75.3% of school children reported screen-time of more than four hours daily). Caloric intakes were high (1728 ± 680 kcal / day) and were above recommendation for children at this age-range with a low physical activity level. In general, the children had inadequate daily intakes of calcium (62%) and vitamin D (90%).

Conclusions: The prevalence of overweight and obesity among primary school-aged children in Sao Paulo is already high, with low levels of physical activity, high screen-time, and an energy rich diet. Prevention strategies are needed to reverse this trend, with opportunities for school-based interventions and improved parental education.

144/1858

IMPACT OF A DIGITAL FACEBOOK CAMPAIGN ON THE PURCHASE AND CONSUMPTION OF FOOD IN MEXICAN FAMILIES WITH CHILDREN UNDER 12 YEARS: A SOCIAL MARKETING STRATEGY

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Background and objectives: Social networking sites have been widely used in public health and prevention interventions to change behavior and improve healthy habits. The nutrition transition in Mexico has been associated with a sharp rise in obesity rates. Whereas traditional foods continue to be consumed, urban dwellers have adopted diets with more animal products, vegetables, fruits, fast foods and soft drinks. Among the drivers of food choice are availability, cost, cultural norms, personal beliefs and the proximal food environment. Higher obesity ratesare being observed in urban areas.

The emergence of social media has transformed health-related communication and changed the way people consume health information. This intervention study aimed to evaluate the impact of a digital campaign on changes in the habits of purchase and food consumption of Mexican families in urban areas.

Methods: A quasi-experimental study wasimplemented around a locally-designed digital campaign. It lastedfive months with pre and post campaign evaluations. The intervention consisted of a United for Healthier Kids online campaign to promote healthy eating habits. Selection criteria: A subset of households with children under 12 years of age, desktops or laptops with access to the Internet, socioeconomic level a/c and c +, belonging to nationally representative consumer panel of Kantar in Mexico. They are chosen to represent and reflect consumer behavior.

Results: Pre-intervention households with higher socioeconomic levels spent more on low nutritious foodsof whichcaloric beverages wereconsumed most. After three months of interventionconsumption of fruits and vegetables was increased, especially in households with children under 4 years old (p <.001) where 1 in2 consumed these foods 3 or more times per week and 9 of every 10 households consumed them during lunch.

Conclusions: A locally designed digital campaign to encourage the purchase and consumption of healthy foods resulted in increased consumption of vegetables and fruits and decreased consumption of pastry and fast food among the target group. This digital campaign with appropriate customization offers the possibility of being a useful addition to existing efforts that could be implemented in other communities to promote healthy eating habits.

144/1867

CAN CONDITIONAL CASH TRANSFER COMBINED WITH NUTRITIONAL SUPPLEMENTATION PLAY A ROLE IN REDUCING CHILD STUNTING IN RURAL MALI?

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Background and objectives: The World Food Program implemented a conditional cash transfer intervention (~€2.30 per month) coupled with a nutritional supplementation (Plumpy'doz®), targeting pregnant women and children under two during the 1,000-day window of opportunity, to prevent stunting in Kayes region, Mali. The objective of this study was to assess the impact of the intervention on child stunting.

Methods: We conducted a cluster randomized trial, with health community centers (CHCs) randomized in 4 intervention arms: Arm 1, control; Arm 2, cash to women attending prenatal follow up and postnatal visits (childhood immunization and growth monitoring); Arm 3, distributions of Plumpy'doz® (PPDoz) to children attending growth monitoring sessions and Arm 4, cash and PPDoz. In all 4 arms, the program provided health and nutrition education activities as a basis. We compared repeated cross-sectional samples of 12-42 months old children surveyed before the intervention (2013, n=5046) and at the end of the intervention (2016, n=5098), through a difference-in-differences approach using logistic or linear regression. A qualitative process evaluation (PE) study conducted one year before the end of the program provided insights on program implementation.

Results: In arms 2 and 3, the prevalence of stunting decreased from 36% to 32% and 34% to 29%, respectively, while it remained stable in the control arm as in arm 4. The interaction was not statistically significant (p-value=0.10). Significant impact of the program was measured on secondary outcomes: mothers' knowledge (p-value<0.001), growth monitoring: number of weighing (p-value <0.01), percentage of women having slept under insecticide-treated mosquito net during pregnancy (p-value=0.01) and proportion of women having experienced fever during pregnancy (p-value<0.001). The PE identified program complexity, implementation delays at the start of the program, irregular distributions and a low amount of the cash as the main barriers for achieving impact.

Conclusions: Positive trends have been observed and some indicators have improved significantly through the program. However, a complex intervention, as well as a difficult implementation context may explain the modest impact on children's anthropometrics.

144/1988

MTHFR GENOTYPE AND ITS INTERACTION WITH RIBOFLAVIN AS DETERMINANTS OF BLOOD PRESSURE IN PREGNANT AND NON-PREGNANT WOMEN

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Background and objectives: Several meta-analyses have reported that the common 677C→T polymorphism in the MTHFR gene is associated with an increased risk of hypertension in pregnancy. Previous trials from this center in non-pregnant hypertensive adults have shown that riboflavin can lower blood pressure specifically in those with the MTHFR 677TT genotype. However, this relationship has not been examined in relation to pregnancy. The study aimed to investigate the MTHFR 677C→T polymorphism and its interaction with riboflavin in pregnant and non-pregnant women.

Methods: Data for this study were generated from two existing cohorts, namely the Irish National Adult Nutrition Survey (NANS) and participants from a trial of Folic Acid Supplementation in the Second and Third Trimester (FASSTT) in pregnancy.

Results: In non-pregnant women from NANS (n=347), those with the MTHFR 677TT genotype compared to the CC genotype had significantly higher mean±SD systolic (117.2±13.5 vs 110.5±11.6 mmHg; P=0.002) and diastolic (78.3±11.4 vs 73.3±9.6 mmHg; P=0.003) blood pressure; CT genotype had intermediate blood pressure values. This genotype effect was influenced by prevailing riboflavin status, such that blood pressure differences among the three genotypes were greatest in those with lower riboflavin status, and not significant among participants with higher riboflavin status. When pregnant women from the FASSTT trial (n=226) were examined at the 14th gestational week (GW), those with the TT genotype compared those with CC/CT genotypes were found to have significantly higher blood pressure. In addition, the TT genotype group showed a greater increase in mean ±SD blood pressure from the 14th to the 36th GW (increase in diastolic blood pressure of 11.0±7.9 vs 4.2±11.1mmHg; P=0.013).

Conclusions: These results suggest that the MTHFR 677TT genotype adversely influences blood pressure in women of repro-

ductive age and during pregnancy. A higher riboflavin status can however attenuate the effect of this genetic variant on blood pressure. A randomized controlled trial in pregnant women is necessary to investigate the effect of riboflavin on blood pressure during pregnancy in women stratified by MTHFR genotype and such a study is underway at our center.

Keywords: Blood pressure. pregnancy. MTHFR 677 C→T. riboflavin.

VEGANISM, VEGETARIANISM AND BONE MINERAL DENSITY: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: The number of vegans and vegetarians has increased in the last decades. However, the impact on these diets on health, particularly on bone mineral density (BMD) is still under debate.

The aim of this systematic review and meta-analysis was to provide an overview of the current knowledge of vegetarian and vegan diets on BMD in children and adults.

Methods: A systematic search of Pubmed, Scopus, and Science Direct was conducted from 1988 to March 2017, with data extraction and quality assessment performed independently by two researchers following the PRISMA methodology. Two meta-analyses were performed comparing omnivorous to vegetarians and to vegans. Effect sizes with the Hedges g in random effect models were carried out and beta coefficients according to the method of moments were calculated to test possible influences of age, sex and ethnicity. Fourteen observational studies met the inclusion criteria and were included in the meta-analyses.

Results: Vegetarians presented lower BMD compared to omnivorous in femoral neck (g= -0.202; CI -0.45, -0.015) and lumbar spine (g=-0.308; CI -0.555, -0.060). Vegans also presented lower BMD compared to omnivorous in femoral neck (g=-0.494; CI -0.799, -0.189) and lumbar spine (g=-0.674; CI -1.152, -0.195) (p<0.05). The coefficient of heterogeneity varied between 0% and 83%. For the lumbar spine, Asians had smaller differences on BMD between vegetarians and omnivorous (B=0.360; p=0.005) and between vegans and omnivorous (B=1.139; p<0.001) than Caucasians.

Conclusions: Vegetarians and vegans present lower BMD values when compared to omnivorous suggesting additional control over this population.

Keywords: Vegeterians, vegans, omnivorous, bone mineral density, meta-analysis.

IMPACT OF A CASH TRANSFER PROGRAM TARGETING THE "1000 DAYS PERIOD" ON LOW BIRTH WEIGHT AND GROWTH RETARDATION: A CLUSTER RANDOMIZED TRIAL IN TOGO

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Background and objectives: In northern Togo, the Government, the World Bank and Unicef have implemented an intervention program in two rural regions aiming at promoting children's nutrition, health and rights. The program consisted of a monthly cash transfer (CT) of 8.40 USD given to women during the "1,000 days period" (from conception until the child reaches the age of two), combined with Behavior Change Communication activities (BCCA). The program's impact on growth retardation and low birth weight was analyzed.

Methods: In both regions, 162 villages were randomized into either an intervention group (CT+BCCA) or a control group (BCCA). Two repeated cross-sectional surveys were conducted among random samples of 6-30 mo old children and their mothers before the intervention (baseline, n=2,658) and two years after the start of the intervention (endline, n=2,031). Standardized anthropometrics of children were measured to determine growth retardation prevalence, defined as a weight-for-height Z-score<-2 SD. Birth weights were collected from health cards to determine low birth weight (LBW) prevalence (birth weight<2500g). A difference-in-differences analysis was performed to assess the impact of the intervention on these indicators, using logistic regressions. First priority was given to intention-to-treat (ITT) analysis. Per protocol (PP) analysis was also performed due to program's implementation issues: at endline, only 400 mothers out of the 1396 surveyed from the intervention group actually received the CT.

Results: Using ITT analysis, the prevalence of growth retardation decreased from 30.3% to 26.7% between baseline and endline in beneficiaries, while it increased from 28.1% to 30.6% in non-beneficiaries, but the difference between groups was not statistically significant (p-value=0.12). The PP analysis showed

further decrease in growth retardation prevalence between the two rounds among beneficiaries (30.3% to 24.2%) and a statistical difference between the intervention and control groups (p-value=0.03). The CT program also had a positive impact on the proportion of children with LBW which dropped from 13.5% to 7.2% between baseline and endline among beneficiaries, and remained stable among non-beneficiaries (9.5% versus 11.6%) (p-value=0.02). Similar results were observed in PP analysis.

Conclusions: Despite implementation issues the CT program contributed to reduce low birth weight and growth retardation.

Keywords: Cash transfer program, growth retardation, low birth weight, Togo

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144/2293

CAN UNICEF'S COMMUNITY INFANT AND YOUNG CHILD FEEDING COUNSELLING PACKAGE BE SUCCESSFUL AT SCALE? RESULTS FROM A LARGE-SCALE EVALUATION IN NIGERIA

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Background and objectives: In 2010 UNICEF developed the Community Infant and Young Child Feeding (C-IYCF) Counseling Package of generic materials to promote specific practices known to have an impact on nutritional status, morbidity, and mortality. Despite widespread uptake of the package by over 60 countries, very little research has been done to examine the impact of the package. To help fill this evidence gap, the USAID-funded Strengthening Partnerships, Results, Innovations in Nutrition Globally (SPRING) project, the Nigerian Federal Ministry of Health, and UNICEF have just completed an evaluation of the effectiveness of this package, implemented at scale in one local government area (LGA) where approximately 140,000 people live in Kaduna State, Nigeria.

Methods: The intervention included a series of sensitization meetings, training of health workers and community volunteers, support group meetings, review meetings, and community mobilization events. Implementation processes and costs were closely tracked. To evaluate the effectiveness of the C-IYCF package in changing IYCF knowledge, attitudes, and practices as well as nu-

trition outcomes we used a mixed methods approach. We conducted baseline (Dec 2014 – March 2015) and post-intervention (Jan – March 2017) household surveys in the intervention LGA and in one comparison LGA. We also conducted semi-structured interviews to collect information on IYCF knowledge and attitudes among local government, health workers, and community leaders.

Results: We observed significant improvements in knowledge and attitudes among pregnant women, mothers, and community leaders. As a result, practices changed. At baseline, 30.9% of children under 6 months old in the intervention site (N=366) were exclusively breastfed. After the intervention, 49.9% of children under 6 months old (N=709) were exclusively breastfed. The percentage of infants 6-8 months old who had received solid foods during the previous day increased from 56.0% (N=250) to 64.1% (N=287). Maternal nutrition practices also improved – the percent of women reporting that they ate more during her last pregnancy increased from 35.6% (N=1,752) to 50.0% (N=761).

Conclusions: After implementing the C-IYCF Counselling Package at scale in one LGA, knowledge, attitudes, and IYCF practices had improved. This study demonstrates that the C-IYCF package is an effective and feasible approach for implementation at scale.

Keywords: Nutrition, scale, community-based, infant and young child feeding (IYCF)

144/2305

LEVEL OF IMPLEMENTATION OF BEST PRACTICE POLICIES FOR CREATING HEALTHY FOOD ENVIRONMENTS: AN ASSESSMENT BY INDEPENDENT (ACADEMIA, CIVIL SOCIETY AND LEGISLATORS), GOVERNMENT, AND PRIVATE SECTOR ACTORS

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Background and objectives: Unhealthy food environments are a major driver of obesity and non-communicable diseases (NCDs). Government actions are essential to prevent these conditions. The international network INFORMAS developed protocols to evaluate and benchmark these actions. The Food Environment Policy Index (Food-EPI) was created to assess them. The objective of the study is to determine the level of implementation of policies for healthy food environments in Mexico with reference to international best practice.

Methods: The Food-EPI tool and process were adapted to the Mexican context. 72 indicators were assessed. Evidence for imple-

mentation was gathered for all. An online questionnaire was answered by 70 actors. These actors were categorized into three groups: 1) independent(n=36 academia, civil society, and legislators), 2) government(n=28), and 3) private sector(n=6). After the online assessment, prioritization workshops were held for each group separately. A consensus workshop with independent and government actors was held to propose concrete actions to be implemented.

Results: 5 indicators were identified as priority: 1) labeling easy to interpret, 2) incentives to increase the supply of healthy foods, 3) guidelines to prevent conflict of interest, 4) budget to tackle obesity and NCDs, and 5) promotion of healthy foods in schools.

Four types of cases were identified: 1)The groups coincide: in the indicator on labeling in fast food restaurants, the groups rated with very little level of implementation. 2)Independent and government coincide: In the indicator on monitoring of overweight and obesity in children and adults, both rated with high level of implementation. 3)Independent and industry coincide: In the indicator on monitoring of food promotion, both rated with very little level of implementation. 4)Independent and government differ: In the indicator on presidential support to nutrition independent rated with very little level of implementation, and government rated with high level of implementation.

Conclusions: The food environment is a complex and multidimensional system. Therefore, when analyzing it, all actors that have influence should be considered. This assessment is useful to identify policy agreements and oppositions. The consensus is a platform for continued policy dialogue towards cross-sectoral coherence and effective actions to address the burden of NCDs and obesity in Mexico.

Keywords: Healthy food environments, INFORMAS, obesity prevention, government policies, Non-communicable diseases

Conflict of Interest Disclosure: The authors declare that this study was funded by the Canadian International Development Research Centre (IDRC). No conflicts of interest were identified.

MAPPING THE AVAILABILITY OF HEALTHY FOOD IN BUENOS AIRES

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Background and objectives: Dietary behaviors are a result of a complex relation between multiple factors: individual, mental, social and environmental. In recent years there has been a surge in interest in understanding how the environment influences the health of a population, both directly and also in forming the context in which decisions for it are made. It has been widely studied that availability and accessibility are key factors for the adoption of healthy lifestyles. The presence of food shops and the availability of healthy products at them are important contributors to the dietary

patterns of a population. Therefore, we proposed constructing a georeferenced map of healthy food in the city of Buenos Aires to facilitate its consumption.

Methods: This study is part of the #MeHaceBien project of the Hospital Italiano de Buenos Aires and was carried out together with Nutrition students at the Universidad Isalud. Taking into account the limitations on human resources initial we decided to include healthy food stores with low visibility, stores that would be accessible to vulnerable groups and/or shops promoting a non-industrialized and non-agrotoxic diet. The methods of the search used were virtual (websites), fieldwork and interviews with people knowledgeable in the area. Data collection was carried out between April and June 2016. All resources were validated. A georeferenced map was created on Google Maps indicating location, telephone number, website address, food offered with days and times.

Results: a total of 401 health food store were mapped, such as supply fairs neighborhood (110), fish markets (53), health food stores (100), organic food retailers (42), and restaurants that focused on healthy, gluten-free, vegan or organic foods (95). In addition vegetable garden and healthy cooking classes were identified.

Conclusions: We believe that healthy food mapping could be an innovative tool to facilitate accessibility and adherence to healthy eating, as well as a future opportunity for collaborative work with the community to map healthy foods in their neighborhoods.

Keywords: Health food, Food availability, Mapping food.

RELIABILITY OF HEMOCUE ON THE ANEMIA DIAGNOSTIC IN UNDER FIVE YEARS OLD CHILDREN

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Background and objectives: Controlling iron deficiency anemia is a priority in the public health agenda. There are many methods for diagnosing anemia. However, some of them did not have their performances evaluated among children below five years of age. This study evaluated the reliability of portable hemoglobinometer HemocueÒ in the diagnosis of anemia in children.

Methods: This was carried out with children aged 6-59 months assisted at the Unified Health System in the city of Rio de Janeiro (n=357). Blood samples was collected by capillary puncture and placed in microcuvets for immediate hemoglobin (Hb) concentration assessment. From the first finger puncture two drops were taken (D1 and D2) for assessing instrument reliability and from the second finger puncutre, a third drop (D3) was taken to deter-

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mine the reliability of the method. Values obtained with D1 were considered the reference and Hb=11g/dl was adopted as the cutoff point for anemia diagnosis. Mean and standard deviation of Hb values were calculated and the agreement analyses of the anemia diagnosis were made using Cohen's Kappa (k) and prevalence- and interviewer bias-adjusted kappa (ka). The values of k and ka were classified according to Byrt (1996).

Results: Mean and SD of Hb values of D1, D2 e D3 were 12,03±1,12, 11,90±1,15 e 12,00±1,10, respectively. By Cohen's Kappa the agreement of the diagnostics was fair comparing D1 with D2 (k=0.42) and D1 with D3 (k=0.36). Considering the ka, the agreement was good when comparing D1 with D2 (ka=0.62) and D1 with D3 (ka=0.60).

Conclusions: The reliability of both the instrument and the method was good, suggesting stability of the instrument in the diagnosis of anemia in children.

Keywords: Reliability; anemia; children; Hemocue.

144/2321

FRUIT AND VEGETABLE CONSUMPTION IN EIGHT LATIN-AMERICAN COUNTRIES: RESULTS FROM ELANS STUDY

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Background and objectives: It has been recognized that fruit and vegetable intake (FVI) are important to prevent chronic diseases such as cancer, coronary heart disease and diabetes. World Health Organization (WHO) recommended a minimum of five servings of fruit and vegetables or 440 g per day. The aim of this study is to determine the intake of fruits and vegetable by sex, age and SES in eight Latin-American countries.

Methods: Data from the ELANS study, conducted in eight Latin-American countries (Argentina, Brazil, Colombia, Costa Rica, Chile, Ecuador, Peru and Venezuela) was analyzed using descriptive statistics. The ELANS study interviewed 9218 subjects (4409 males and 4809 females) of the main cities in each country. The FVI was collected using two 24 hours' dietary recall, following the multiple pass methodology. The analysis was performed by age group, gender and socioeconomic level (SES).

Results: The mean FVI in the eight countries was 200 g/day (males 202 g/day, females 198 g/d), being the highest in Ecuador

(282 g/day) and lowest in Colombia (161 g/day). It is important to highlight that the FVI is highest in males than females in all countries except Brazil, Peru and Argentina. The FVI increases with age, ranging from 176 g/day (CI 90.4–261.6) at 15-19 years of age to 226 g/day (133–319) at 50-65 years of age. Despite this increase with age, 70.99% of the 50-65y interviewed did not reached recommendations in any of the two days compared to 80.95% of the 15-19y group (p<0.001). As expected, the intake was lower in the low SES 180 g/day (CI 98.8 – 261.2) and higher in the high SEL 224 g/day (CI 128 – 320). Only 4.2% of overall population met the recommendation in both days of interview, and 19.13% did it in at least one day.

Conclusions: The findings reinforce the low intake of FIV by the Latin-American population, since 95.8% did not reach the recommendation in both days. In addition, this low intake was independent of sex, age or SES. Programs and policies to encourage FVI are required to help mitigate future health issues associated with inadequate FVI.

Keywords: Fruit and vegetable intake, Latin-America, Multiple pass method, ELANS,

Further collaborators: On behalf of the ELANS Study Group

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ADDRESSING DIETARY DIVERSITY BY SCALING UP MULTI-SECTORAL INTEGRATED NUTRITION INTERVENTIONS IN AFRICA

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Background and objectives: Malnutrition is a contributing factor in 45% of deaths of children under 5 years, and in developing countries, more than 3.5 million children under 5 die each year with undernutrition as an underlying cause. In Africa, stunting rates average about 30% or higher. Complementary feeding can prevent 6% of all deaths in children 6-23 months. Improved

dietary diversity (DD) is one of the 10 proven nutrition-specific interventions as well as a measure of food security and agriculture practices to address stunting. The objective of this paper is to describe how the USAID-funded Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) Project addressed DD through scale up of integrated multi-sectoral nutrition interventions in four African countries.

Methods: Targeting the first 1000 days, Ghana, Nigeria, Senegal and Uganda used slightly different approaches to scale up evidenced-base interventions. Using these examples, the paper describes experiences, successes, and challenges of SPRING programs in addressing dietary diversity. Where available, baseline and endline survey data and/or DHS data will be presented to complement programmatic experiences and routine data.

Results: In Nigeria where children's DD is 19.3%, IYCF training of facility and community-based health workers improves their counselling of mothers and family members. In Ghana (DD =28.1%), SPRING partners with the government to improve IYCF through WASH, mother support groups and nutrition-sensitive agriculture. In Senegal (DD = 27.4%), SPRING works through partnerships with government and NGOs to improve knowledge and practices in nutrition-sensitive agriculture. In Uganda (DD = 12.8%), to improve the provision and consumption of nutrient-rich fortified foods, SPRING works with government to strengthen national policies and practices. Previously in Uganda, SPRING supported IYCF at facility and community levels in three districts.

Conclusions: A transformation in nutrition programming is needed if malnutrition is to be addressed successfully. In order to sustain food and nutrition security, health, agriculture, and water and sanitation along with many other sectors must be mobilized in an integrated multi-sectoral way. Using evidenced-based approaches as well as building the evidence, we have begun to demonstrate how to promote dietary diversity to address chronic undernutrition within the African context.

Keywords: Multi-sectoral nutrition, Africa, diet diversity

against a variety of acute and chronic disorders. We here, share some of our observations reported in Lactation Management Center (LMC) established by Bangladesh Breastfeeding Foundation (BBF) to deliver different services on lactation management.

Methods: The BBF-LMC in a central area of Dhaka city included the services to the pregnant and lactating mothers are: mothers/family counseling on BF and on various aspects of maternal nutrition & demonstration on appropriate positioning & attachment during breastfeeding, solving difficulties, relactation, breast-milk expression & scientific method of breast massage 'OKETANI'.

Results: In BBF-LMC, 232 mothers aged (mean±SD) 29.0(±4.3) years with a child from 1 day to 2.5 years were served over the last 2 years from March, 2015 to March, 2017. Average birth weight of the children was 2.8(±0.4) kg and measured body weight of the children 4.8(±1.8) kg. About 78.4% (183) came in 1st visit, 15.5% (36) for 2nd, 4.3% (10) for 3rd and 1.2% (3) came for 4th visit. Most (32%) of the mothers were not confident to feed their baby while 21% didn't know appropriate positioning and attachment during breastfeeding. About 24% mothers had poor knowledge on BF and appropriate complementary feeding (CF) whereas 21% complained about low milk flow. Breast engorgement, flat/ inverted/cracked nipples were observed among 14% of the mother. Besides, 12% of mother came for relactation. In BBF-LMC, 72% received counseling on BF and CF while correct positioning & attachment demonstrated for 21% mothers. Oketani massage was given to 28% mother and 4% were taught milk expression. Seventeen who came with poor confidence & milk flow came in 2nd visit for demonstration and needed Oketani, 14 came for only follow-up while 5 came for recipe book for CF. In 3rd visit, 4 came for follow-up their inverted/cracked/engorged breast and 5 came for Oketani while in 4th visit all came for only follow-up who were doing successful BF.

Conclusions: Most of the mothers who have received the services at the BBF-LMC were satisfied both physically and mentally.

Keywords: Lactation Management Center. Breastfeeding.

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LACTATION MANAGEMENT CENTER FACILITATED BY THE BANGLADESH BREASTFEEDING FOUNDATION: AN ATTEMPT WITH PRUDENTIAL OUTCOME

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Background and objectives: Breastfeeding confers short and long-term benefits on child and mother by protecting children

ANEMIA IN WOMEN AND CHILDREN IN UTTAR PRADESH, INDIA: THE CONTRIBUTION OF NUTRITIONAL, ENVIRONMENTAL, INFECTIOUS, GENETIC, AND UNDERLYING SOCIAL DETERMINANTS

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Background and objectives: Anemia affects more than half of Indian women and children but the contribution of its causes is unknown. We examined the contribution of nutritional, environmental, infectious, genetic, and social determinants of anemia in rural and urban women and children living in Uttar Pradesh (UP).

Methods: We conducted a state-representative, cross-sectional survey of rural and urban households in 25 districts of UP between October and December 2016. We collected information on socio-economic factors, diet, water and sanitation (WASH), household hunger, anthropometry, stool, and venous blood in 1238 non-pregnant women 18-49 years and children 6-59 months of age. We are analyzing venous samples for malaria, hemoglobin, ferritin, transferrin receptor, hepcidin, retinol, folate, zinc, vitamins B12 and D, C-reactive protein, α1-acid glycoprotein, and β-thalassemia. Blood laboratory analyses are ongoing and will be completed by May 2017. Preliminary statistical analyses use inflammation-adjusted iron biomarkers only from 10 of the 25 districts. We are using structural equation modeling to examine the pathways through which diet, household hunger, iron, WASH, and anthropometry are associated with hemoglobin concentrations. Preliminary models indicate appropriate fit and we report standardized coefficients.

Results: 36% of women and 54% of children were anemic; 42-50% of these women and children also had iron deficiency. In women, ferritin concentrations were more strongly and significantly ($p<0.05$) associated with hemoglobin in rural than in urban areas (standardized $\beta=0.33$ vs 0.28, respectively). In rural areas, dietary diversity and WASH were significantly directly associated with women's hemoglobin. In children, ferritin was more strongly associated with hemoglobin concentrations in urban than in rural areas ($\beta=0.38$ vs 0.17). WASH was significantly indirectly associated with hemoglobin through height-for-age z-scores.

Conclusions: Preliminary findings suggest a multi-causal etiology of anemia in women and children in UP. We will present an updated comprehensive analysis of blood indicators, stool parasites, dietary intake, and genetic factors that will clarify the contribution of the majors causes of anemia in this population that can be used to guide preventive measures.

Keywords: Anemia, causes of anemia, iron, infection, diet, water and sanitation

INCREASING WAIST CIRCUMFERENCE OF INDIAN SCHOOL CHILDREN: WHERE SHOULD THE ACTION BE?

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Background and objectives: Childhood obesity, accompanied by an increased waist circumference (WC), which is linked to an increased risk of adult chronic diseases, is rapidly increasing in urban India. The pathogenesis of childhood obesity is multi-factorial, combining genetic pre-disposition and environmental factors. Home and school are major contributors to the environmental factors. The objective of this study was to use a sibling-pair model to quantify the contribution of home environment to an increased waist circumference (WC) in children.

Methods: Children aged 3-16 years from middle income urban schools in Bangalore, India were measured between 2008 and 2011 and data on 2896 siblings were obtained. Anthropometric measurements of weight, height and waist circumference were performed according to standard protocols. Additional details on demographics, diet, lifestyle, behavior and reported parental anthropometrics were also collected. The intraclass correlation at the home level represented as sibling pairs (level 2) and school level (level 3) were obtained using multilevel modelling, Factors at individual (level 1) and home were also considered in the model. Parental weight and height were used to partly explain the genetic factors.

Results: The prevalence of abdominal obesity (waist circumference percentile>75) was higher at 20% than overweight/obesity prevalence which was only 12%. A multi-level linear regression model for WC percentile with no covariates (simple variance component model) gave an intraclass correlation of 0.36 such that 36% of the variability in WC of siblings could be attributed to the siblings living in the same house. The fractional variability attributed to the school was 16%. Maternal and paternal overweight status were positively associated with the waist circumference of the children. The percentage variability of BMI attributable to sibling pair was comparable to that of WC.

Conclusions: The maximum variability of waist circumference in children was attributed to them being siblings, thus ascer-

taining the importance of home based interventions. Schools also have a substantial role to play in bringing about positive changes and can be considered as another action point for intervention.

Keywords: Waist circumference, school age, siblings, multi-level model

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ROLE OF FOLATE AND THE METABOLICALLY RELATED B-VITAMINS IN BRAIN HEALTH IN OLDER ADULTS: THE TUDA STUDY

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Background and objectives: Folate and the metabolically related B-vitamins involved in one-carbon metabolism may be important for maintaining brain health in aging but few studies have investigated the biomarker status of all relevant B-vitamins. The aim of this study was to examine the role of folate, vitamin B12, vitamin B6 and riboflavin in mental and cognitive health in older adults.

Methods: Participants were recruited (n 5186) to the Trinity, Ulster, Department of Agriculture (TUDA) Ageing Cohort study in 2008-2012, from across the Island of Ireland; of these, a sub-sample (n 587) of participants were reinvestigated 5 years after the initial TUDA study. Cognition was assessed using the Mini-Mental State Examination (MMSE), the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and the Frontal Assessment Battery (FAB). Depression and anxiety were assessed using the Centre for Epidemiologic Studies Depression (CES-D) and the Hospital Anxiety and Depression (HADS) scales. Biomarkers of all the relevant B-vitamins were determined.

Results: At baseline, poor B-vitamin status (i.e. lowest 20%) was associated with an increased risk of depression (by 47-78%) for folate (p 0.003), vitamin B6 (p 0.034) and riboflavin (p 0.011), whereas only vitamin B6 deficiency was associated with anxiety (p 0.010) and cognitive dysfunction (p ≤0.001). Furthermore, at the 5 year follow up assessment, lower biomarker status at baseline (i.e. below median value) of vitamin B6 and riboflavin, but not folate or vitamin B12, were significant predictors of the rate of cognitive decline, as measured by change in MMSE (vitamin B6 p 0.020) and RBANS (vitamin B6 p 0.008; riboflavin p 0.018). Concentrations of all B-vitamin biomarkers increased significantly with increasing intake of fortified foods and with supplement use, while non-consumers of fortified foods or supplements had the lowest status of all B-vitamin biomarkers.

Conclusions: These results suggest that better B-vitamin status can have a positive impact on mental and cognitive health older adults. Optimization of B-vitamin status, via fortified foods or supplements, may offer a means of protecting brain health in aging.

Keywords: B-vitamins. One-carbon metabolism. Cognition. Depression. Aging.

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PROTEIN INTAKE AND THE DEVELOPMENT OF TYPE 2 DIABETES

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Background and objectives: Short-term trials suggest a beneficial effect of high protein intake on obesity and other diabetes risk factors, however, epidemiological studies observed positive associations of dietary protein with type 2 diabetes (T2D) risk. We aimed to examine, in a large prospective cohort, associations of intake of different sources of protein with insulin resistance, prediabetes, and T2D; and the role of obesity in these associations.

Methods: This study has been performed in the Rotterdam Study, a prospective cohort of subjects ≥45 years in the Netherlands. Prediabetes and T2D were diagnosed on the basis of medical records and fasting glucose and insulin concentrations, which were measured every few years in our research. We included 6814 subjects who were free of T2D at baseline, of whom 5795 were without prediabetes. Protein intake was assessed with the use of validated food-frequency questionnaires and expressed in energy percentages (E%). We used multivariable cox proportional hazard regression to analyze the associations between protein intake and risk of prediabetes and T2D; multivariable linear mixed models to analyze the associations with insulin resistance; and joint models to examine the role of repeatedly measured obesity data in this association . For all models, we used nutrient density substitution models to examine macronutrient substitution effects.

Results: We documented 643 cases of T2D during a median 7.2 years of follow up; and 931 cases of prediabetes during 5.7 years. In multivariable models, higher intakes of total protein were positively associated with insulin resistance, risk of prediabetes (hazard ratio (HR)=1.35 (95%CI 1.20-1.51) per 5 energy-percent), and risk of T2D (HR=1.38 (95%CI 1.20-1.60)). Additional adjustment for repeatedly measured BMI or waist circumference atten-

uated these associations, but associations remained significant. Results: **Conclusions:** Our results suggest that a higher intake of protein, mainly from animal sources, is associated with insulin resistance, and a higher risk of developing prediabetes and T2D. Our findings also suggest that obesity partly but not fully mediates this association.

Keywords: Macronutrients, protein, diabetes, epidemiology, cohort

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MULTISECTORAL ANEMIA PLATFORM STRENGTHENING: LESSONS LEARNED IN SIERRA LEONE AND UGANDA

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Background and objectives: Reduction of anemia requires a multisectoral and country-driven approach. In order to understand how countries coordinate efforts across sectors to set agendas and develop anemia strategies, the USAID-funded Sustaining Partnerships, Results, and Innovations for Nutrition Globally (SPRING) Project documented the approach undertaken in Sierra Leone and Uganda.

Methods: We used an instrumental case study approach to document the country experiences in anemia coordination in Sierra Leone and Uganda. Data were collected between 2015 and 2017 via two rounds of semi-structured interviews with key stakeholders in each country, and participant observations from National Anemia Working Groups and National Anemia Stakeholder meetings. A total of 43 key informant interviews were conducted. Data were thematically coded to identify recurrent factors that facilitated or inhibited anemia coordination efforts. Codes were used to develop key findings, which were supported by illustrative quotes.

Results: Experiences in Sierra Leone and Uganda were unique to their context, but three overarching issues emerged with respect to creating an enabling environment. Use of data helped facilitate the creation of such an environment by serving as an advocacy tool, generating awareness, and helping to align sectoral and donor priorities. Second, collaboration through the establishment of a multisector National Anemia Working Group resulted in enhanced networking opportunities, stronger working relationships, and in some instances decreased duplication of efforts. Third, district representation as part of national level collaboration efforts was often lacking; there was a need for improved feedback loops between national and district efforts.

Conclusions: Commitment and active participation from all relevant sectors is critical to move efforts forward and strategically address anemia in Sierra Leone and Uganda. Fostering multisectoral collaboration and providing a structure for national strategy development was important to set the agenda at the national level, and results from these efforts will be translated to sub-national levels, where multisectoral planning and implementation can strengthen the delivery of anemia programs. The experiences in these two countries can help global and country stakeholders learn from and adapt their efforts to address anemia in their context.

Keywords: Anemia multisectoral planning coordination enabling environment

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INCORPORATING FRESH FOODS IN DAILY MEAL IN NAIROBI URBAN SLUM SCHOOLS EFFORTS TO INCREASE DIETARY DIVERSITY

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Background and objectives: School Meal Programmes in Kenya have aided in improving students nutrition status as an essential element to improve their health and well-being since inception in 1980. KDHS 2014 reported that only 21% of children in the lowest wealth quintile consumed 4 or more food groups. Traditionally the national school meal contributed to the reduced dietary diversity by providing the caloric requirement with only three food groups, grains, pulses and oil. Beginning May 2016, WFP began incorporating fresh fruits and vegetables as a fourth food group into the diets of over 7,000 students. Transition into Fresh Foods for School Meals Programme (FF4SMP) provides a diversified basket offering the required level of energy and meeting the dietary diversity of at least four food groups. We are going to highlight the operational aspect of the Fresh Foods for School Meal Programme for students in the urban slums of Nairobi.

Methods: WFP supports School Meals in seven of the poorest and most vulnerable unplanned urban settlements in Nairobi, Kenya; Kangemi, Kawangware, Mathare, Kibera, Kariobangi, Mukuru and Makandara. Piloting of the project by adding ksh 2 (0.02 USD) in 88 schools in a phased approached over a year. Two modalities were tested to obtain the fresh food ration, 1) through cash transfers and school self procurement and 2) fresh food through outside catering that uses repurposing cosmetically unacceptable fresh foods (CUFFs).

Results: The food basket piloted includes maize, beans, oil and salt complemented by a serving of fresh vegetables or fruit. The

diversified food basket is possible for under 11 ksh/meal/day. The food basket with avocado met 35% of daily kcal requirement while the vegetable option met 31%. The difference in cost for the two was 0.39 cents. The budget for this pilot reaching 77,000 students for term 3, 2016 and term 1, 2017 is $489,322 with expected challenges of control over food quality and safety and uncertainty in accessing resources.

Conclusions: Fresh Foods pilot baskets have high nutrition value than traditional basket benefiting kids highlighting the need for its roll out countrywide and contributed to a higher dietary diversity.

Keywords: Schools, children, dietary diversity, Kenya

144/2394

REPURPOSING COMMERCIALLY UNACCEPTABLE FRESH FOODS IN SCHOOL MEALS IN NAIROBI URBAN SLUM PRIMARY SCHOOLS

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Background and objectives: Kenya's second largest horticultural export is fruits and vegetable, mainly to the UK and Europe. However, over 115,000 MT of cosmetically unacceptable fresh food (CUFFs) are discarded yearly due to strict standards set for export. Although the food is perfectly fit for human consumption, it doesn't meat the certain shape or color standards set for resale in the international markets and is then discarded in a variety of ways. WFP is aiming to develop an alternative market for these CUFFs by redistributing them into the school meals programme as an effort for students to receive a high quality low-cost fresh food ration.

School meals are a cost-effective safety net: they attract and retain learners in school, they contribute to alleviating short term hunger and for many children they constitute a significant portion of their daily energy and nutrient intake. Incorporating a fourth food group, consisting of fresh vegetables and fruits, contributes to improved dietary diversity and increased nutritional value.

Methods: Participants include 3 schools in the urban slums of Nairobi, Kenya, reaching almost 2,000 students daily. Schools receive a daily prepared hot meal that includes maize, beans, oil, salt and a fresh fruit or vegetable. The source of the fresh food ration comes from previously rejected fresh produce based on cosmetic standards only and is fit for human consumption. The cosmetically unacceptable fresh food (CUFF) would have been traditionally discarded by the packhouse.

Results: Contribute to the reduction of 115,000 MT of food annual food waste and increase the nutrition density of the school meals by diversifying the food basket. Increase access to low cost fresh nutritious foods. Contribute to the local economy by creating number of micro-entrepreneurial opportunities along the value chain. It will create a reproducible scalable model with global impact, particularly in countries with high horticulture exports and WFP supported school meals.

Conclusions: Developing a sustainable way to incorporate previously rejected food into Kenyan food systems, has the potential to create a reproducible scalable model with global impact, particularly in countries with high horticulture exports and WFP supported school meals.

Keywords: Food waste, schools, Kenya, dietary diversity.

144/2408

EGG VS ORGANIC EGG PREFERENCES OF TURKISH CONSUMERS ACCORDING TO FOOD VALUE SCALE

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Background and objectives: People choice of healthier food have positive effects on healthy life. Therefore, the priorities of consumers varies and attitudinal, motivational, demographic and behavioural factors has impact on food choices. This study was designed to determine the food values when purchasing organic and non-organic eggs among Turkish consumers by food value scale.

Methods: In order to determine the values that consumers give importance in organic and non-organic egg , the food value scale was administered. The questions on on socio-demographic characteristics and organic food preferences were also included in the questionnaire. The sample comprised healthy adults, 385 women and 123 men, ranged from 19 to 64 years. The questionnaires were analysed with the statistical programme SPSS

Results: The vast majority of participants were normal weight (11% underweight, 60% normal weight, 22% overweight and 7% obese). More than half of the consumers were young adult individuals aged 19-24 years (56.9%). 17.1% of the population is between 25-34 years, 10.4% is between 35-44 years, 11.6% is between 45-54 years of age and 3.9% is between 55-64 years of age. Compare to unhealthy eaters, It has been shown that healthy eaters pay more attention to naturalness for eggs and organic eggs when compared with taste ($p<0.05$). Healthy eaters also pay more attention to naturalness for eggs and organic eggs when compared with price ($p<0.05$). Although there was no statistical difference in the price and nutritional value of egg and organic egg preferences in healthy eaters ($p>0.05$), but in organic egg consumers thought nutritional value was more important than the price when compared to egg ($p<0.05$). In addition there was a significant difference in the values of environmental impact when compared with price in egg preference but not in organic egg ($p>0.05$)

Conclusions: This study showed naturalness, nutritional value and environmental impact were the most important values for

consumers in egg preferences. Food values were related with the food preferences of consumers. Since food values have an influence on food choices, it can be use to identify effective strategy to promote healthy eating habits.

Keywords: Organic foods, Food value scale, food choice.

IMPACT OF METHODOLOGICAL CHOICES WHEN DEVELOPING A FOOD BASED DIETARY GUIDELINES WITH DIET OPTIMIZATION TECHNIQUES

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Background and objectives: Diet optimization is a mathematical approach that simultaneously takes multiple factors into account (such as limits between which intake of foods and nutrients should satisfy, and an optimization function) and facilitates the development of food based dietary guidelines (FBDG). This approach can be used to reduce subjective decision-making in guideline development. However, also when using diet optimization, subjective choice options cannot be avoided.

Objective: To provide insight into the effects of methodological choice options when developing FBDG with diet optimization techniques.

Methods: With data from young men aged 19 to 30 years from the Dutch food consumption survey the impact of different choice options were illustrated, by calculating the optimal diet for nine scenarios compared to a reference scenario. The choice options were related to the selection of food groups, the determination of food composition per food group, the current consumption per food group, the criteria and the optimization function.

Results: The present study demonstrates that, even though diet optimization techniques are less prone to subjective decision-making, choice options encountered in the development process remain to affect the final FBDG. The impact of the different choices options varied. A substantial effect occurred when increasing the number of food groups and/or the nutrient density of food groups (by including only healthier foods). Whereas a minimal effect was observed for different weighing factor for the food composition and introducing additional constraints. In- or excluding fortified foods in the nutrient composition calculation had an unclear effect.

Conclusions: Various methodological choices impact the resulting optimized diet for FBDG when using optimization techniques. Considering the various choices and recording of the decisions made is therefore essential.

Keywords: Food-based dietary guidelines, health, food composition, food consumption, optimization.

FOOD AND BEVERAGE REFORMULATION WOULD MAKE IT EASIER TO REACH SIMULTANEOUSLY ALL NUTRITIONAL RECOMMENDATIONS IN THE FRENCH ADULT POPULATION

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Background and objectives: Reaching nutritionally adequate diet is possible but may require significant deviation from observed consumptions. The objective was to evaluate whether food and beverage reformulations following the Nestlé Nutritional Profiling System (NNPS) could reduce this necessary deviation in the French population.

Methods: Dietary data from the French national survey was crossed with the French food composition database (CIQUAL-2013). The category-specific NNPS classified all in-scope foods (70% of consumed foods) into "PASS" or "FAIL". Nutritional intakes were estimated for each adult (n=1808) according to 3 scenarios based on: i)the original food composition database (BASELINE), ii)a "reformulated" database in which the nutrient composition of FAIL products was adjusted to the NNPS standards (REFORMULATION) and iii) a replacement of FAIL products by the most nutritionally similar PASS products from the same category (SUBSTITUTION).

Mean Excess Ratio (MER,%/d) and Solid Energy Density (SED,kcal/100g) were calculated on observed diets. For each scenario, starting from each observed diet, a new iso-caloric modeled diet was designed (Maillot,PLoSOne,2017), to fulfill French nutrient recommendations and stay as close as possible to the observed one. The optimization process priorized the modification of the amount of foods already consumed (repertoire foods), and foods which were not consumed could be added if necessary (non-repertoire foods). The total dietary deviation (TDD) was calculated as the sum of the absolute difference between observed and optimized amount of repertoire foods plus the amount of non-repertoire foods added.

Results: The MER and SED were improved in REFORMULATION (100%/d and 154kcal/100g) and SUBSTITUTION (103%/d and 146kcal/100g) scenarios compared to BASELINE (130%/d and 165kcal/100g). The TDD was significantly reduced in the REFORMATION and the SUBSTITUTION scenarios compared to BASELINE (1253g/d, 1226g/d and 1412g/d respectively). This was explained by a smaller increase of repertoire foods (661g, 609g vs 742g respectively), a smaller decrease of repertoire foods (-474g, -503g vs -520g respectively) and less additions of non-repertoire foods (118g, 113g vs 152g respectively).

Conclusions: Nutritional reformulation of the food supply according to the NNPS profile reduces the dietary effort required to achieve nutritionally adequate diets.

Keywords: Individual diet modeling, Nestlé Nutritional Profiling System, substitution, reformulation, diet quality

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GENDER SPECIFIC DETERMINANTS OF STUNTING AMONG RWANDAN CHILDREN 6-23 MONTHS OLD

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Background and objectives: Stunting is a major public health concern in developing countries, with a disproportionate global burden affecting South-East Asia and Sub-Saharan Africa. Although a disparity in childhood stunting to the disadvantage of boys has been reported, it is not universal across countries. Moreover, the difference between the sexes seems rather extreme in Rwanda where boys have been affected more than girls for over a decade. We aimed to identify factors that explain the difference in stunting between boys and girls aged 6-23 months in Rwanda.

Methods: Cross-sectional data of 1533 children aged 6-23 months were collected from ten districts with a high burden of malnutrition in Rwanda. Predictors of stunting prevalence were modelled by Cox proportional hazard regression with robust variance, stratified for sex.

Results: Stunting significantly affected boys more than girls with a weighted prevalence of 43.3% vs. 28.0%, respectively. The multivariate analysis showed that living in a female-headed household (PR=1.20, 95% CI=1.09-1.31), off-farm occupation of the mother (PR=1.12, 95% CI=1.1.04-1.21), diarrhea (PR=1.07, 95% CI=1.01-1.13) and malaria (PR=1.27, 95% CI=1.16-1.39) were significant risk factors for stunting in boys solely. For both sexes, consistent significant risk factors were large household size (PR=1.20, 95% CI=1.11-1.30 in boys and PR=1.18, 95% CI=1.06-1.31 in girls), low wealth category (PR=1.17, 95% CI=1.10-1.1.24 in boys and PR=1.27, 95% CI=1.16-1.28 in girls), use of untreated drinking water (PR=1.15, 95% CI=1.09-1.22 in boys and PR=1.18, 95% CI=1.09-1.28 for girls) and dietary diversity below the minimum (PR:1.11, 95% CI= 1.03-1.21 in boys and PR=1.39, 95% CI=1.24-1.55 in girls).

Conclusions: The risk for stunting among boys remains substantially higher than among girls in Rwanda. This is most prominently related to morbidity, female headship of the household and off-farm occupation of the mother.

Keywords: Rwanda, Stunting, children of 6-23 month old, gender specific determinants.

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UNDERSTANDING BARRIERS AND FACILITATORS FOR BREASTFEEDING, DONOR HUMAN MILK, AND KANGAROO MOTHER CARE AMONG MOTHERS AND INFLUENCERS OF PRETERM AND SICK NEONATES IN INDIA

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Background and objectives: With the highest number of preterm, low birth weight, sick babies in the world, an integrated approach to newborn care is essential in India. Increasing access to human milk through human milk banks (HMB) has the potential to reach 5 million babies in India annually. Thus, assessment on knowledge of breastfeeding practices, kangaroo mother care (KMC) and perception of donor human milk among mothers and influencers of preterm and sick neonates was undertaken as a baseline prior to strengthening Mother Baby Friendly Initiative Plus (MBFI+) model that integrates breastfeeding promotion, KMC, and providing safe donor human milk to vulnerable babies.

Methods: Focus group discussions with mothers, influencers of preterm and sick neonates who have received donor milk, mothers who have donated milk and are potential donor and recipient at two facilities in Mumbai, India.

Results: More than half of the mothers were aware of the benefits of breastfeeding and nearly half were aware about the duration of exclusive breastfeeding. Most mothers and fathers were aware that colostrum should be fed to babies while few mothers stated that it is harmful. Most mothers mentioned that doctors during antenatal care told them about their diet, but no information was given on breastfeeding. Some mother shared challenges faced with feeding preterm, LBW babies. Only mothers who practiced KMC were aware of the practice and benefits. Overall, low awareness about human milk banking among mothers and influencers was found. Donor mothers and fathers were comfortable with donating milk once they knew it is life-saving and did not compromise supply for their own baby. All mothers accepted use of donor milk as per the unit norms, however, some parents had concerns about quality and safety as they were not aware of the process followed in a HMB. Most grandmothers were not comfortable with either donating or receiving donor human milk.

Conclusions: There is a need for capacity building and behavioral change communication strategies targeted at mothers and influ-

encers about MBFI+ interventions right from the antenatal period so that mothers receive adequate support and information to help increase access and uptake of human milk for vulnerable babies.

Keywords: Breastfeeding, human milk bank, preterm, kangaroo mother care, donor human milk.

144/2840

USING TARGETED BENEFICIARY SURVEYS TO MEASURE NUTRITION OUTCOMES IN LOW-RESOURCE SETTINGS FOLLOWING INTENSIVE INTERVENTIONS: EXAMPLES FROM THE SPRING PROJECT IN BANGLADESH, GHANA, AND NIGERIA

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Background and objectives: Nutrition projects face challenges when measuring behavior change in low-resource settings. Projects often lack resources to carry out population-based surveys with comparison groups, and time lags between surveys can limit usefulness for program management. Further, projects may not reach enough people to enable dose-response surveys to detect significant behavior change at population level during project timeframes. Some of these issues can be addressed using "beneficiary surveys" among people reached by project interventions.

Methods: In Bangladesh, Ghana, and Nigeria, the SPRING Project used beneficiary surveys to measure select nutrition outcomes. In all cases, SPRING also used secondary analysis from existing large-scale surveys among similar populations and regions, before interventions began. Beneficiary survey results were compared against those population-based surveys, providing a rough indication of project effect on outcomes. In Bangladesh, SPRING surveyed a cohort of 386 women before and after nine-month "farmer nutrition schools" (FNS), and again one year later. In Ghana (N=420) and Nigeria (N=371), beneficiary surveys (endline only) were carried out after one+ years of exposure to SPRING activities.

Results: In Bangladesh, diet diversity and other indicators increased significantly among participants following the nine-month FNS program. Women consuming 5+ out of nine food groups increased from 29% to 83% immediately following FNS, remaining high (76%) one year later. Secondary analysis of existing survey data among similar populations and similar timeframe showed negligible change (20% to 21%). In Nigeria, exclusive breastfeeding among support group beneficiaries was 61%, compared to 29% in a comparable population-based survey in the same area before SPRING activities began. In Ghana, the percentage of households with handwashing stations near latrines was 62% in a survey of SPRING beneficiaries, compared with 2.5% in a population-based baseline.

Conclusions: Beneficiary-only surveys can be an economical way for projects to learn about behavior change in target populations, especially if results can be analyzed against population-based surveys with comparable indicators and sampling. SPRING's experience suggests that behavior change can occur rapidly in small populations reached with intensive, multifaceted interventions. Achieving population level change takes longer due largely to issues of scale.

Keywords: Nutrition, surveys, behavior change, diet diversity, breastfeeding.

Track 4: Nutrition and Management of Diseases

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THE CHALLENGES AND SUCCESSES OF SALT, SUGAR AND FAT REDUCTION PROGRAM TO PREVENT NCDS (IRAN EXPERIENCES)

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Background and objectives: In January 2015, WHO released a global estimate report which showed more than 1.9 billion overweight adults including 600 million obese people. Unbalanced diets and low physical activity can contribute to chronic diseases. % 65 of Iranian adults 40-64Y are overweight and obese, %45 with hypercholesterolemia and %47 are hypertensive, 16% identified and non-identified diabetes.

The studies show that %80 of CVD and Diabetes and %40 of cancers are preventable by controlling the above risk factors and dietary patterns have a pivotal role in the control of NCD's.

Methods: Two main restrictive policies which performed by Iranian authority to minimize the consumption of fat, salt and sugar: The first one is putting the tax for unhealthy food products and the updated list of unhealthy food products are published every year by Ministry of Health. In this program, tax of unhealthy foods spends on healthcare system. The second strategy is designing of a food traffic light labeling system which easily helps to estimate amounts of fat, salt, sugar and trans-fatty acids in one serving of food products.

Results: This system of labeling is mandatory for all of the industrial food products. We succeeded to reduce %1- 2.5 salt in bread, snacks, cheeses and sauces. The standard of salt in bread decreased from %2.3 to %1.8 and then %1 in 2016.

According to the legislation and operational plans SFA in oil products was reduced to <%25 and in food products such as snacks, biscuits and confections <%30. TFA was reduced from >%20 to <8% in food products and <%2 in edible oils in 2016.

Conclusions: As a Future plan, the road map in the national nutrition policy and food security in Iran by 2025 is mainly emphasizing on NCDs.

Keywords: Challenges, Successes, Salt, Sugar, Fat, Reduction, Program, Prevention, Non-Communicable Diseases.

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DIETARY INTAKE OF FIBRE AND GUT MICROBIOTA IS RELATED TO LOWER LEVEL OF GLYCOPROTEIN ACETYLATION, A MARKER OF LOW-GRADE INFLAMMATION, IN OVERWEIGHT PREGNANT WOMEN

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Background and objectives: Overweight may induce health complications during pregnancy. One suggested mechanism arises from low-grade inflammation that has been linked with aberrant metabolic responses such as deranged glucose metabolism. Diet and gut microbiota may regulate low grade inflammation. Therefore the objective was to explore the relation of dietary fibre intake and gut microbiota richness with serum markers of low-grade inflammation in pregnancy.

Methods: Overweight and obese women (BMI 30.7±4.4 kg/m2, n=100) were studied in early pregnancy (≤17 weeks). Intake of fibre was calculated from 3-day food diaries. Faecal microbiota composition was analysed using 16S rRNA gene sequencing. Glycoprotein acetylation (GlycA, determined by NMR) and high-sensitive C-reactive protein (hs-CRP) were used as markers for low-grade inflammation. The alpha diversity, measured as Chao1, observed OTUs, phylogenetic diversity and the Shannon index were calculated using alpha rarefaction values at sequence 36382. Spearman's correlation was used to evaluate the associations between the variables.

Results: Dietary fibre intake correlated inversely with GlycA (ρ=-0.316, p=0.002, n=95). Also, the gut microbiota richness indexes correlated inversely with GlycA; Chao (ρ=-0.281, P=0.007), phylogenetic diversity (ρ=-0.238, P=0.022) and observed number of OTUS (ρ=-0.271, P=0.009). No association were detected between fibre or gut microbiota with hs- CRP.

Conclusions: Higher dietary intake of fibre and gut microbiota richness were related to lower maternal inflammatory status, measured as glycoprotein acetylation. The suggested mechanism how fibre may induce beneficial effects on maternal metabolism may take place through fibre induced alterations in gut microbiota richness. This finding opens novel opportunities in designing approaches for modification of diet and microbiota to induce beneficial alterations in maternal inflammatory status with potential to improve the health of both the mother and child.

Keywords: Fibre, inflammation, GlycA, gut microbiota richness, pregnancy.

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POSTPRANDIAL LIPID RESPONSES AFTER LONG-TERM INTAKE OF DAIRY PRODUCTS VARYING IN FATTY ACID COMPOSITION

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Background and objectives: Consumption of modified dairy products with a saturated fatty acid (SFA)-reduced, mono-unsaturated fatty acid (MUFA)-enriched content may have beneficial effects on the fasting cholesterol profile but their effects on metabolic perturbations during the postprandial state, a significant contributor to the pathogenesis of atherosclerosis, remain unknown. Specifically, it is important to consider the effects of sequential meals on postprandial metabolism, as this more accurately reflects Western dietary patterns. We investigated whether consumption of fatty acid (FA)-modified dairy products altered postprandial metabolic responses, when compared to dairy foods with a FA composition typical of retail products (control).

Methods: A 12-week, randomised, crossover, double-blinded controlled dietary intervention was conducted in fifty-one adults at moderate CVD risk (RESET study; NCT02089035). Using a food-exchange model, two iso-energetic high-fat (38% total energy (TE)), high-dairy diets that contained milk, cheese and butter: control (dietary target: 19%TE SFA; 11%TE MUFA) and modified (16%TE SFA; 14%TE MUFA) were implemented. Before and after each intervention period, a sequential two-meal, high-fat postprandial investigation was performed. Using mixed models, changes from the baseline study visit in postprandial serum tria-cylglycerol, glucose, apolipoprotein B (apoB) and insulin responses were reported as incremental area under the curve (iAUC) for 0-480min postprandially and following breakfast (0-330min) and lunch meals (330-480min), that were rich in control or modified dairy products.

Results: A differential effect was observed for the apoB responses from 0-480min and 0-330min, with attenuations observed in iAUC following the modified diet (P<0.01 and P<0.0001, respectively). No differences were evident between diets for other outcome measures.

Conclusions: Chronic consumption of FA-modified dairy products decreased postprandial apoB responses, suggesting a potentially beneficial acute effect of these foods on TAG-rich lipo-

proteins metabolism. Supported by the Medical Research Council (Ref: MR/K020218/1), with food in-kind from Arla Foods UK and AAK (UK) Ltd.

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METABOLICALLY UNHEALTHY OBESITY IN SPANISH PREPUBERTAL CHILDREN AND ITS ASSOCIATION WITH CARDIOVASCULAR RISK BIOMARKERS

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Background and objectives: Childhood obesity is associated with metabolic complications that can derive into a higher risk of cardiovascular diseases (CVD). Some individuals with obesity do not display metabolic abnormalities, called metabolically healthy (MH), as opposed to those exhibiting metabolic alterations, called metabolically unhealthy (MU). The objective was to evaluate the association between CVD biomarkers and MU status in prepubertal children.

Methods: 930 Spanish prepubertal children (622 overweight/obese, 462 males) aged 5 to 10.9 years were recruited. Anthropometric measurements were taken and adiponectin, leptin, resistin, myeloperoxidase (MPO) and total plasminogen activator inhibitor 1 (tPAI-1) were analyzed. Children were classified as having normal-weight or overweight/obesity using age- and sex-specific BMI cut-off points. MU status was based upon fulfillment of one or more of the following criteria: ≥90th percentile of SBP and/or

DBP for age, sex, and height; >90th percentile of TG for age, sex, and race; <10th percentile HDL-C for age, sex and race; ≥100 mg/dL glucose; >2.5 HOMA. A general linear model adjusted for age and BMI was used to assess differences between groups and a linear regression analysis was performed to evaluate the association between biomarkers and MU obesity using the software SPSS.

Results: In children with overweight/obesity, MU prevalence was 62.5% and in normal-weight children, 23.9%. In children with overweight/obesity, plasma concentrations of resistin (P=0.010), leptin (P=0.022), tPAI-1 (P=0.011) and MPO (P=0.001) were higher and adiponectin (P=0.008) was lower in MU than in MH children, while adjusting for age and BMI. Linear regression analysis indicated an independent association between tPAI-1 (β=0.215, 95% CI: 0.085–0.167, P<0.001) and MPO (β=0.167, 95% CI: 7.607–18.742, P<0.001) and MU status.

Conclusions: MU obesity is associated with a high fibrinolytic and vascular stress in prepubertal children. The measurement of biomarkers such as tPAI-1 and MPO could aid in the detection of children at high CVD risk, for their inclusion in adequate prevention programs.

Keywords: Metabolically unhealthy obesity, children, prepubertal, cardiovascular diseases.

Methods: Randomized, simple-blind, placebo-controlled clinical trial, 54 patients with T2DM received 520mg DHA+EPA-enriched fish oil (FOG) or placebo (PG) daily for 24 weeks. Baseline and final anthropometric and biochemical measurements included leptin and adipokine concentrations. We obtained dietary intake by multiple 24-hour recalls.

Results: Waist circumference and glucose showed significant reductions in FOG (p=0.001 and p=0.011 respectively). Glycosylated hemoglobin (p=0.009 and p=0.004), leptin (p=0.000 and p=0.000) and leptin to adiponectin ratio (p=0.000 and p=0.000) decreased significantly in both groups after supplementation (FOG and PG respectively); while serum resistin levels (FOG p=0.000 and PG p=0.001), insulin (FOG p=0.000 and PG p=0.000), and HOMA-IR (FOG p=0.000 and PG p=0.000) increased significantly in both groups. EPA (p<0.000) and DHA (p=.001) intake was higher in FOG.

Conclusions: We found a significant beneficial effect of six-month n-3 PUFA supplementation only on waist circumference and glucose. Acknowledgments: This project was financed by CONACyT, and is part of JCMG's thesis to obtain the degree of Master in Health Science. Key words: type 2 diabetes mellitus, adipokines, n-3 PUFA.

Keywords: Type 2 diabetes mellitus, adipokines, n-3 PUFA

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EFFECT OF SUPPLEMENTATION WITH FISH-OIL OMEGA-3 POLYUNSATURATED FATTY ACIDS ON ADIPOKINES IN SUBJECTS WITH TYPE 2 DIABETES MELLITUS IN MEXICO

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Background and objectives: Background: Type 2 diabetes mellitus (T2DM) is associated with chronic low-grade inflammation, characterized by an increase in secretion of pro-inflammatory adipokines and a decrease of anti-inflammatory adipokines, worsening insulin resistance (IR). Omega-3 polyunsaturated fatty acids (PUFA), through their potent anti-inflammatory effects could help improve insulin sensitivity and the inflammatory profile, supplementation with PUFA in subjects with diabetes decreases inflammatory markers such as C-reactive protein and interleukin-2, little is known about their effects on adiponectin, resistin and leptin. Objective: Investigate the effect of n-3 PUFA on metabolic indicators of T2DM Mexican adults.

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MUCOSAL LEVELS OF IGE+ AND IGA+ CELLS AND ANTIBODIES IN PROTEIN DEFICIENT RATS DURING TRICHINELLA SPIRALIS INFECTION

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Background and objectives: This study was aimed to analyze, in Trichinella spiralis-infected rats, the effect of protein deficiency on antibody (Ab) levels and IgE+ and IgA+ cells counts in lung and intestine (relevant organs in protection against this pathogen).

Methods: Weaning Wistar rats received a protein-deficient diet (PD, 6.5% casein) or a control diet (C, 20% casein). After ten days, both groups were orally infected with T. spiralis muscle larvae (ML); non-infected rats served as controls.

The organs were obtained at different days post-infection (p.i.). The numbers of IgA+ and IgE+ cells were determined by immunofluorescence. Total and specific Ab (against ML) were determined by ELISA in tissue extracts. Data were analyzed using the two-way ANOVA.

Results: Total IgE and IgG1 increased in C group from day 9 p.i. in both organs. In lung also IgG2a increased from day 9 p.i. In intestine IgA decreased from day 3 p.i. Although the same kinetics were observed in PD group for all isotypes, Ab levels were lower than in C group and did not increase significantly compared to non-infected animals. Specific IgG1 was significantly lower in PD group in both organs.

In lung IgE+ cells increased, compared to non-infected controls, in C group from day 3 p.i. (p<0.05) and in PD group from day 33 p.i. (p<0.01). In intestine IgE+ cells increased in C group from day 3 p.i. (p<0.001) and in PD group from day 6 p.i. (p<0.01). C group presented more IgE+ cells in both organs. No significant changes were observed for IgA+ cells in any group.

Conclusions: Protein deficiency seems to affect the mucosal levels of Ab and IgE+ cells during Trichinella spiralis infection. Given the important role of IgE in helminthiases, this may explain the severe infection previously found in PD rats.

Keywords: Trichinella spiralis. Protein deficiency. IgE and IgA. Antibodies. Mucosal immunity.

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NMR METABOLOMIC SIGNATURES REVEAL PREDICTIVE PLASMA METABOLITES ASSOCIATED WITH LONG-TERM RISK OF DEVELOPING BREAST CANCER

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Background and objectives: Combination of metabolomics and epidemiological approaches opens new perspectives for ground-breaking discoveries. The aim of the present study was to investigate for the first time whether plasma non-targeted metabolomic profiles, established from a simple blood draw from healthy women, could contribute both to predict the risk of developing breast cancer within the following decade and to better understand the etiology of this complex disease.

Methods: A prospective nested case-control study was set up in the SU.VI.MAX cohort, involving 206 breast cancer cases diagnosed during a 13y follow-up, and 396 matched controls. Non-targeted NMR metabolomic profiles were established from baseline plasma samples. Multivariable conditional logistic regression models were computed for each individual NMR variable and for combinations of variables derived by principal component analysis.

Results: Several metabolomic variables from 1D NMR spectroscopy were associated with breast cancer risk. Women characterized by higher fasting plasma levels of valine, lysine, arginine, glutamine, creatine, creatinine, and glucose and lower plasma levels of lipoproteins, lipids, glycoproteins, acetone, glycerol-derived compounds and unsaturated lipids had a higher risk of developing breast cancer. P-values ranged from 0.00007 (ORT-3vsT1=0.37[0.23-0.61] for glycerol-derived compounds) to 0.04 (ORT3vsT1=1.61[1.02-2.55] for glutamine).

Conclusions: This prospective study showed that baseline NMR plasma metabolomic signatures reveal predictive metabolites associated with long-term breast cancer risk. These results provide interesting insights to better understand complex mechanisms involved in breast carcinogenesis and evoke plasma metabolic disorders favorable for carcinogenesis initiation. This study may contribute to develop screening strategies for the identification of at-risk women for breast cancer well before symptoms appear.

Keywords: Metabolomics, breast cancer, NMR, plasma, prospective study.

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EFFECT OF STIGMASTEROL ISOLATED FROM THE CALYXES OF BOMBAX COSTATUM ON HYPERLIPIDEMIC ALBINO RATS

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Background and objectives: Hyperlipidemia or hypercholesterolemia often occurs in conjunction with glucose intolerance, obesity, diabetes and metabolic syndromes. The study evaluated the effect of stigmasterol administration on total cholesterol, low density lipoprotein cholesterol, triglycerides and high density lipoprotein cholesterol contents of poloxamer-407 induced hyperlipidemic albino rats.

Methods: Thirty albino rats were divided into 6 groups of 5 rats each. Poloxamer-407 was dissolved in saline (1g/ml, 4 degree centigrade) and administered to the rats in group 2-6 by intraperitoneal injection at a dose of 1g/kg body weight to induce hyperlipidemia. The injections were given at days 1 and 3. Rats in group 1 were not induced and were fed rat chow and water only (control). On induction of hyperlipidemia, rats in group 2 were fed rat chow and water alone (2nd control). Rats in group 3 were fed rat chow, water and atorvastatin a standard drug (positive control) while rats in group 4-6 were fed rat chow, water and different doses (50, 100 and 200mg) of stigmasterol isolated from the calyxes of Bombax costatum, respectively. Blood samples were obtained from all the rats by cardiac puncture at baseline and endline. Total cholesterol (TC), triglyceride (TG) low density lipoprotein cholesterol (LDLC) and high density lipoprotein cholesterol (HDLC) were determined on the blood samples.

Results: The different doses of stigmasterol (50, 100, 200 mg) decreased TC, TG, LDLC and increased HDLC in the rats. The group given 50mg stigmasterol had the highest decrease in TC (12.99%) and TG (21.13%) relative to the group given standard drug atorvastatin, which had 7.2% decrease in TC and 6.31% decrease in TG. The group of rats given 200mg stigmasterol had the highest decrease in LDLC (13.55%) relative to the group given the standard drug atorvastatin (10.41%) while the group given 100mg stigmasterol had the highest increase in HDLC (11.86%) relative to the group given the standard drug atorvastatin (5.21%).

Conclusions: The different doses of stigmasterol were more effective in improving hyperlipidemia in albino rats relative to the standard drug atorvastatin.

Keywords: Hyperlipidemia, atorvastatin, stigmasterol, albino rats.

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BLUE MUSSEL (MYTILUS EDULIS) INTAKE DECREASES DISEASE ACTIVITY (DAS-28 CRP) IN FEMALE PATIENTS WITH RHEUMATOID ARTHRITIS: RESULTS FROM A RANDOMIZED CROSS-OVER DIETARY INTERVENTION

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Background and objectives: There is unfortunately an ambiguous evidence base for the relation between diet and Rheumatoid Arthritis (RA) and not possible to optimize treatment combining both pharmacological treatment and lifestyle factors. The aim of this study was to test whether a diet rich in blue mussels, an environment sustainable seafood option, in addition to conventional medical treatment could reduce disease activity and improve quality of life in patients with established RA.

Methods: Women with established RA and DAS28>3.0 were recruited to a randomized 2x11-week cross-over dietary intervention. The participants continued with their medication and habitual diet but exchanged one cooked meal a day, five days a week with a meal including 75 g blue mussels or 75 g meat. Diets were switched after an eight week washout period. Blood samples were collected and analysed for blood lipids, erythrocyte sediment rate (ESR) and C-reactive protein (CRP). Tender and swollen joints were also examined at start and end of each dietary period. Data regarding patient global health, pain and fatigue (Visual Analog Scales, VAS), disability (Health Assessment Questionnaire) and quality of life (SF36) were recorded. As primary outcome variable, the composite measure DAS28 including the number of swollen and tender joints out of 28, patients' estimation of global health on a visual analog scale (VAS) and ESR was chosen.

Results: Twenty-three women (n=14 seropositive, n=9 seronegative) completed the intervention. Intake of the blue mussel diet reduced DAS28 CRP significantly (p=0.048) compared to control diet. The positive effect was due to a combination of a decreased CRP, fewer tender joints and a significantly lower rating in VAS global health (p=0.041). The numbers of EULAR criteria responders, that is based on DAS28, were significant higher when consuming blue mussel diet compared to control diet (p=0.036). Further, several aspects of quality of life such as fatigue (p=0.021) and mental health (p=0.008) was significantly improved by the blue mussel diet.

Conclusions: A substitution of meat with blue mussels reduced disease activity and improved quality of life in women with RA. Further analysis on biomarkers explaining the results and larger trials including blue mussels is necessary to confirm the results.

Keywords: Rheumatoid arthritis, diet, shellfish, Mytilus Edulis, DAS 28.

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VITAMIN D SUPPLEMENTATION ASSOCIATED WITH LIFESTYLE INTERVENTION ENHANCED THE LOSS OF ABDOMINAL FAT MASS IN OBESE ADOLESCENTS: A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL (NCT02400151)

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Background and objectives: Obesity in children was associated with lower concentration of vitamin D and higher metabolic risk factors. In adults, adiposity loss was correlated with increase

of 25(OH)D level (Pannu et al, 2016, Nutr Res). We hypothesized that combining vitamin D intake with a weight loss program may have a stronger effect on adiposity. We aimed to examine the effect of cholecalciferol (VD) supplementation with a lifestyle intervention on body fat and inflammatory status in obese adolescents.

Methods: Twenty-six 12-17 yr-old obese adolescents (OA) (BMI-Z score=4.0±06) were randomized into two arms: OS (n=13) were supplemented during 3 months with 4000 IU/d of VD given in a fruit juice and, ONS (n=13) received a fruit juice without VD. All OA followed a weight-loss program consisting of a reduction of 500 kcal per day combined with 180 min/week of supervised moderate-to-vigorous intensity exercise. Serum 25(OH)D, body fat (DEXA), inflammation (IL-6 and hs-CRP) were measured at inclusion and after 3-months. Changes of the parameters (in %) were compared between the both arms.

Results: At inclusion, 70% OA were deficient in 25(OH)D (< 50 nmol L-1). The deficiency was similar between OS and ONS groups. After 3 months, 25(OH)D significantly increased without any difference between OS and ONS (59% vs 36%, p=0.08). 25(OH)D also increased in ONS group probably due to both sun exposure and outdoor physical activities during the intervention study. Abdominal fat mass decreased by 14% for the both groups. Interestingly, the change of 25(OH)D was strongly correlated with the change of abdominal fat mass in OS (r=-0,76, p<0.01), but not in ONS (r=-0,41, p=0.19). Note that inflammatory markers decreased in both groups without any significant difference between OS and ONS (-42% vs -33% for IL-6, -37% vs -61% for hs-CRP).

Conclusions: We showed that i) the loss of abdominal adiposity mediated by a lifestyle program (diet and exercise) was correlated to the increase of plasma 25(OH)D level in obese adolescents; ii) vitamin D supplementation enhanced the effect of a lifestyle program on abdominal fat mass loss. We concluded that vitamin D supplementation should be recommended with a weight loss program in obese adolescents.

Keywords: Cholecalciferol, obesity, adolescent, adiposity, inflammation.

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TENOMODULIN GENETIC VARIANTS ON THE X CHROMOSOME ARE ASSOCIATED WITH CHILDHOOD OBESITY

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Background and objectives: Current genetic association studies are usually focused on autosomal variants only, and the sex chromosomes are often neglected. In recent years, a number of statistical techniques and strategies have been widely described making much easier overcoming X-chromosome technical hurdles and including this region within genetic studies. Tenomodulin (TNMD) is a Xq22 chromosome anti-angiogenic locus which has been recently linked to different obesity-related phenotypes. These results have not been replicated to date. Given these facts, we have conducted a genetic association analysis in Spanish children population including several TNMD SNPs as potential candidate markers for obesity and metabolic dysfunctions.

Methods: A total of 915 DNA samples from 258 normal weight, 177 overweight and 480 obese Spanish children (438 males, 477 females) were genotyped for seven TNMD SNPs and associations with anthropometric measurements and glucose metabolism were investigated. To handle with the X-chromosomal location of TNMD, specific association analysis design (Clayton's statistics and sex stratified regression analysis) as well as specific quality control

criteria were implemented in R code and PLINK software. Adjustments for BMI, age and sex were done when necessary.

Results: In our population, two previously reported linkage disequilibrium (LD) blocks were observed: haploblock-1 (rs2073162, rs2073163, rs4828038, and rs1155974) and haploblock-2 (rs11798018, rs5966709 and rs4828037). All markers are located through all of TNMD sequence domains and are representative for the region. Several obesity-related phenotypes were gender-specific and separately associated. We identified rs4828038_T as one of the tag SNPs within the haploblock-1 and the one with the strongest association signals. Particularly, this variant showed association with anthropometric measurements such as BMI (P=0.0099, BETA=1.466) and BMI z-score (P=0.0035, BETA=0.636) in males. Regarding to glucose metabolism phenotypes, genetic associations with insulin resistance were observed; HOMA index (P=0.0105, BETA=0.226) and insulin levels (P=0.0184, BETA=0.919) in the female-male mixed group; and glucose levels (P=0.0130, BETA=2.137) in males.

Conclusions: These data show that TNMD variants are associated with obesity and alterations in glucose metabolism in children population and, therefore, replicate some previous findings from adult human population.

Keywords: Childhood obesity, glucose metabolism, genetics, tenomodulin, X chromosome.

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FUNCTIONAL BIOMARKERS OF VITAMIN B6 DEFICIENCY AND MORTALITY IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Low plasma concentrations of the direct vitamin B6 status marker pyridoxal-5'-phosphate (PLP) are common in renal transplant recipients (RTR). It is not known whether a low direct vitamin B6 status has functional, i.e. intracellular, consequences and, if so, whether such consequences are associated with increased risk of mortality. Hence, we aimed to assess the association of plasma PLP with functional vitamin B6 status and to explore the potential association of functional vitamin B6 status with mortality in RTR.

Methods: In a longitudinal cohort of 687 stable RTR with a median [interquartile range (IQR)] follow-up of 5.4 [4.8-6.1] years, and 297 healthy controls, plasma PLP was measured by a validated high performance liquid chromatography assay. Vitamin B6 deficiency and sufficiency were defined as plasma PLP <20 and ≥20 nmol/L, respectively. In addition, 3-hydroxykynurenine (3-HK) and xanthurenic acid (XA) were analyzed by a validated liquid chromatography tandem mass spectrometry assay. As functional biomarker of vitamin B6, 3-HK/XA-ratio was assessed, with higher ratio reflecting worse functional vitamin B6 status. Cross-sectional and prospective associations were assessed by linear and Cox regression analyses, respectively, in which adjustments were made for potential confounders.

Results: Median plasma PLP was 29 [17-50] nmol/L in RTR (31% deficient) and 41 [29-60] nmol/L in healthy controls (11% deficient) (P<0.001). 3-HK/XA-ratio in RTR was 2.38 [1.68-3.49], compared to 2.13 [1.63-2.71] in healthy controls (P<0.001). The differences in plasma PLP and 3-HK/XA between controls and RTR were independent of age, sex, and kidney function. In RTR, 3-HK/XA-ratio was inversely associated with plasma PLP (β=-0.20, P<0.001). During follow-up, 147 (21%) RTR died. 3-HK/XA-ratio was associated with all-cause mortality (hazard ratios (HR) [95% confidence intervals] 1.31 [1.15-1.45], P<0.001). This prospective association was independent of age, gender, smoking, BMI, kidney function, alkaline phosphatase, high-sensitivity C-reactive protein, alcohol intake, energy intake, and plasma PLP (HR 1.26 [1.08-1.48], P=0.003).

Conclusions: Vitamin B6 deficient RTR have worse functional vitamin B6 status than healthy controls and vitamin B6 sufficient RTR. Importantly, worse functional vitamin B6 status in RTR is independently associated with increased risk of mortality.

Keywords: Vitamin B6, Functional Biomarkers, Kynurenines, Renal Transplantation, Long-Term Mortality.

EFFECTS ON DIET INTAKE FROM THE HEALTHY START PRIMARY INTERVENTION

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Background and objectives: Evidence of effective obesity prevention interventions is limited, and hence new strategies are needed. This study reports the dietary intervention effects from the 15 month primary obesity prevention intervention (Healthy Start).

Methods: The "Healthy Start primary intervention study" aimed to prevent excessive weight gain among Danish obesity-prone normal weight preschool children. The intervention was conducted during 2009-2011, and focused on improving the child's diet, physical activity and sleep as well as managing stress in the families of the young children. Children were considered obesity prone if they had either a high birth weight ($\geq$ 4,000 g), a mother with a pre-pregnancy BMI$\geq$ 28 kg/m2), or low maternal education (<10 years of schooling). From a baseline population of 543 Danish normal weight preschool children, 285 completed the intervention with complete information on dietary intake at the baseline- and follow-up examination. Information on diet intake was obtained using a 4-day dietary record, from which a diet quality index assessing complance with the Danish national dietary guidelines was constructed. Linear regression per protocol and intention-to-treat analyses of differences in total energy-, macronutrients-, fruit-, vegetables-, fish- and sugar sweetened beverages intakes and diet quality index between the two groups were conducted.

Results: Children in the intervention group had a lower total energy intake after the 15-month intervention compared to the control group (Group mean: 5.3 vs. 5.6 MJ; p=0.02). We found no effect of the intervention on the individual macronutrients-, fruit-, vegetables-, fish- and sugar sweetened beverages intakes or the diet quality.

Conclusions: Our results suggest an overall effect of the Healthy Start primary intervention on total energy intake. However, no effects were seen for the individual components of children's dietary intake.

Keywords: Obesity, prevention, diet, children, intervention.

FASTING AND RESTRICTIVE DIET TO LOSE WEIGHT AMONG CANCER SURVIVORS: PROFILES, SOURCES OF NUTRITIONAL INFORMATION, KNOWLEDGES AND OPINIONS: RESULTS FROM THE NUTRINET-SANTÉ COHORT

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Background and objectives: Cancer survivors need to get more actively involved in their disease, notably through their nutritional behavior. For instance restrictive diets may be considered, including fasting practice or restrictive diets to lose weight. For the moment, no previous study has investigated theses both types of restrictive diets among cancer survivors.

Aims of this study were to describe profiles of patients having practiced fasting or restrictive diet to lose weight after cancer diagnosis and to investigate knowledges/opinions of these patients and their sources of nutritional information, among cancer survivors in a large web based cohort.

Methods: In the NutriNet-Santé cohort, 10,309 cancer survivors received the "Sources of information and knowledges/opinions about nutrition" questionnaire in June 2016. Among them 2,942 completed it in October 2016. Associations were explored by multivariate logistic regression adjusted for socio-professional and lifestyle factors.

Results: 4.5% of participants had already practiced fasting practices since their diagnosis. They were more likely to be women (p=0.01), youngers (p=0.03), with higher educational level (p=0.003), lower incomes (p=0.004), to use dietary supplements (p=0.03) and practice higher physical activity (p=0.01). 32.2% of patients had practiced restrictive diet to lose weight since diagnosis with higher proportion of women (p<0.0001), professionally

active (p<0.05), breast cancer (p=0.0008), overweight (p<0.0001), and of patients using dietary supplements (p=0.0002). Logically, patients reporting believe to the effect of fasting on improved cancer prognosis were more likely to practice fasting (p<0.0001). Contrary, there was no relation between patient's knowledges of the links between overweight and cancer prognosis and tendency to practice restrictive diet (p=0.4). Patients who practiced fasting after cancer diagnosis were less likely to have receive nutritional information by a healthcare professional (p=0.001) and less likely to be proposed nutritional monitoring (p=0.002). Patients who practiced diet after cancer diagnosis were less likely to have received nutritional information by a healthcare professional (p<0.0001) and less likely to be proposed nutritional monitoring (p=0.0002).

Conclusions: These results show that fasting was practiced for its impact on their disease, while diet was not practiced to their cancer. Discussing this matter with a healthcare professional or following a nutritional program would have an impact on practicing a restrictive diet.

Keywords: Fasting, Diet, cancer survivors, nutritional knowledges, nutritional opinions.

Further collaborators.

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REHABILITATION OF INFANTS UNDER-6 MONTHS OLD WITH SEVERE ACUTE MALNUTRITION: A RANDOMIZED, CLINICAL TRIAL OF THREE RECOVERY DIETS: INFANT FORMULA, F-100 DILUTED AND F-100

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Background and objectives: Challenges in managing severe acute malnutrition (SAM) in infants under-6 mo (u6m) old have been widely reported over the past decade. Current guidelines do not explicitly mention about any specific dietary management of infants u6m olds. Both facility-based and community-based programs face difficulties in their management. Thus, information is required on effects of rehabilitation diets in u6m old infants suffering from SAM. The study was intended to compare the body weight gain, energy intake, and potential renal solute load of infants u6m old with SAM when fed F-100, diluted F-100 or infant formula during the rehabilitation phase.

Methods: Double blind randomized clinical trial comparing infant formula, F-100 diluted and F-100 was conducted at the Nutrition Rehabilitation Unit (NRU) of Dhaka Hospital, International Centre for Diarrhoeal Disease Research, Bangladesh (icddr,b), Dhaka, Bangladesh. One hundred and fifty-three u6m old infants with SAM were enrolled who were admitted for diarrhea and other illnesses. After recovering from illnesses, infants were randomly assigned to any of the three diets. During first 2 d, diets were fed at 130ml/kg/d in 12 feeds and then 10 ml more at each feed until some is left. Diets were offered in 8 feeds thereafter. Two ml blood was collected on study d 1, 3, and 7 for measuring serum electrolytes, creatinine and osmolality. Spot urine samples were also tested for specific gravity and osmolality:creatinine. Renal solute load and potential renal solute was calculated. Infants were discharged from NRU when gained 15% of the admission bodyweight or as soon as they became oedema free or had oedema free weight-for-length Z-score ≥ -2.

Results: There was no difference in dietary intake (g/d) across the study groups (p=0.18), but infants consumed more energy (kcal/d) who received F-100 (p<0.001). Infants gained significantly more weight when fed F-100 and F-100 diluted than those who received infant formula (p=0.023). Potential renal solute load was significantly more in those fed with F-100 (<0.0001), but was within normal limit.

Conclusions: Both F-100 diluted and F-100 and can be used as an effective rehabilitation diet in u6m old infants suffering from SAM.

Keywords: Infants under-6 months, severe acute malnutrition, F-100 diluted, F-100.

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GENETIC POLYMORPHISM OF PPAR GAMMA MODIFIED THE EFFECTS OF METFORMIN ON BMI Z-SCORE IN OBESE CHILDREN

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Background and objectives: Metformin has demonstrated to be efficacious in the treatment of obese adults. We have found lower BMI z-score in prepubertal obese children treated with metformin. It is known that genetic variation is one of the factors affecting the response to pharmacology treatment. PPARGC1A gene encodes transcriptional coactivators that regulate numerous metabolic processes. The presence of single-nucleotide polymorphisms (SNPs) of this gene modified the effects of metformin in adults at high risk of type 2 diabetes. The objective was to determine a differential response to metformin treatment on BMI z-score in obese children depending on the PPARGC1A genotypes.

Methods: A total of 134 obese children aged 7 to 14 (68 females; 66 males) from a randomized, prospective, double-blind placebo-controlled, multicenter trial (NºEudraCT:2010-023061-21) were included in this study. Patients received 1g/day of metformin or placebo along with healthy lifestyle recommendations for six months. Anthropometry measurements were taken in fasting at the beginning and at the end of the trial. Two PPARGC1A SNPs were analyzed, rs8192678_T and rs2970852_T (exonic and intronic, respectively). Multivariate linear regression model including a SNP*treatment interaction term and confounding factors was used to analyze differences in BMI z-score change between genotypes and treatment groups. Bonferroni correction for controlling for multiple testing was used.

Results: The BMI z-score decreased significantly after metformin treatment in comparison to placebo intervention (P=0.047). Regarding to genetics, an intriguing statistically significant association was found between the rs8192678_T and change in the BMI z-score (P=0.0095). Particularly, we reported a BMI z-score reduction of 0.432 greater for each minor T allele copy in comparison to non-carriers (95% CI:0.11-0.75; P=0.0095). Interestingly, in our population, this exonic SNP seems to be in linkage disequilibrium (D'=0.98) with the another analyzed variant, the rs2970852_T, which has already been associated with variability in metformin response.

Conclusions: The exonic rs8192678_T SNP of PPARGC1A is associated with a greater reduction in BMI z-score. These results suggest that the variability of PPARGC1A sequence may have an important role in the pharmacogenetic of metformin. Understanding how genetic variation affects metformin response could help to promote more effective use of the drug for the treatment of childhood obesity.

Keywords: Metformin, childhood obesity, PPARGC1A, single-nucleotide polymorphisms, pharmacogenomics.

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144/1282

POSTPRANDIAL BLOOD GLUCOSE, INSULIN AND GASTROINTESTINAL HORMONE RESPONSE TO STARCHY FOODS; RELEVANCE FOR TYPE 2 DIABETES

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Background and objectives: Prolonged high blood glucose concentrations after the consumption of starchy foods are implicated in the development of metabolic diseases. Decreasing the glycemic and insulinemic response to these foods might be beneficial for both the prevention as well as management of type 2 diabetes. To elucidate underlying mechanisms, we investigated the glucose kinetics and metabolic responses of starchy foods with various food structures.

Methods: Healthy male volunteers were studied consuming different 13C-enriched wheat products while receiving a primed-continuous D-[6,6-2H2]glucose infusion. The dual-isotope technique enabled calculation of glucose kinetics: rate of ap-

pearance of exogenous glucose (RaE), endogenous glucose production, and glucose clearance rate (GCR). In addition, postprandial plasma concentrations of glucose, insulin, glucose-dependent insulinotropic polypeptide (GIP), glucagon-like peptide-1 (GLP-1) and bile acids (BA) were analyzed. Several fiber-rich wheat products were prepared with different structural features (pasta, bread with 85% broken wheat kernels, flat bread).

Results: When comparing a slowly and a rapidly digestible starchy food product, the digestibility of starch is not always reflected by the glucose response. Pasta was slowly digestible, but resulted in a similar high glycemic response as compared to control bread, but lower insulinemic response. Digestibility of starch, as reflected by the RaE, correlated very well with GIP. For GLP-1 this relationship was less clear, and the response was influenced by the presence of broken wheat kernels. BA may play a role in this regard. The influence of the incretins, mainly GIP, on insulin concentrations and thereby also on GCR could often explain the total glucose responses, although GCR was also regulated independently of insulin after flat bread consumption.

Conclusions: Slower intestinal uptake of glucose from a starchy food product can result in lower postprandial insulin and GIP concentrations, but not necessarily in a lower glycemic response, because of a slower GCR. Even without reducing postprandial glycemia, products with slowly digestible starch can have beneficial long-term effects. Food processing can be a relevant parameter to affect the metabolic outcome and thereby an important factor in the prevention of the development of metabolic diseases.

Keywords: Starchy foods, glycemic response, gastrointestinal hormones, type 2 diabetes, stable isotopes.

144/1593

DIETARY APPROACH TO STOP HYPERTENSION (DASH) DIET IS ASSOCIATED WITH A LOWER RISK OF RENAL FUNCTION LOSS AND ALL-CAUSE MORTALITY IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Incidences of renal function loss and all-cause mortality are high in renal transplant recipients (RTR), with high blood pressure as an important risk factor for both. The aim of this study is to investigate whether a dietary pattern resembling the Dietary Approach to Stop Hypertension (DASH) diet is associated with these adverse events in RTR.

Methods: In this prospective cohort study, we included adult RTR with a functioning graft for > 1 year. Dietary data were collected using a validated 177 item Food Frequency Questionnaire, with 632 RTR eligible for analyses. For each of the 8 dietary components of the DASH diet, a score was attributed to each subject according to sex-specific quintiles of dietary intake. The 8 component scores were summed up to calculate the overall DASH-score. Cox regression models were used to study the associations of the DASH-score in tertiles with renal function loss, defined as graft failure or doubling of serum creatinine, and all-cause mortality.

Results: Mean ± SD age was 53.0 ± 13.2 years, 57% were male. Median [interquartile range, IQR] time between baseline and transplantation was 5.7 [1.9-12.1] years. The DASH score varied between 12 and 37, with a median [IQR] score of 24.0 [20.0-27.0]. Both systolic and diastolic blood pressure were significantly lower in RTR in the highest tertile of DASH score compared to the lowest tertile. Use of antihypertensive drugs did not differ between the tertiles. During median [IQR] follow-up of 5.3 [0.2-6.8] years, 119 (18.8%) RTR had renal function loss and 128 (20.3%) RTR died. RTR in the highest tertile of DASH-score had a lower risk of renal function loss (HR: 0.59; 95% CI: 0.35-0.99, p=0.04) and all-cause mortality (HR: 0.50; 95% CI: 0.31-0.81, p=0.004) compared to the lowest tertile, independent of potential confounders including age, gender, eGFR, proteinuria, primary renal disease, and time between transplantation and baseline.

Conclusions: Adherence to the DASH diet is associated with a 40% lower risk of renal function loss and a 50% lower risk of all-cause mortality after renal transplantation. These data suggest that healthy nutrition is of paramount importance in renal transplant recipients.

Keywords: DASH, renal function loss, all-cause mortality, renal transplantation.

144/1780

ADHERENCE TO THE 2015 DUTCH DIETARY GUIDELINES AND ITS ASSOCIATIONS WITH MORTALITY AND INCIDENCE OF NON-COMMUNICABLE DISEASES IN THE ROTTERDAM STUDY

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Background and objectives: In order to prevent chronic diseases in the general population, the Health council of the Netherlands recently presented new national food-based dietary guidelines, based on evidence from 29 systematic reviews of prospective cohort and interventional studies on effects of nutrients, foods and dietary patterns on risk of major chronic diseases. Although the

guidelines are based on extensive previous research, the association of adherence to these overall dietary guidelines with chronic diseases has not yet been evaluated. Therefore, we aimed to examine the criterion validity of these guidelines by examining the association of adherence with all-cause mortality and with the incidence of the ten chronic diseases on which the guidelines were based.

Methods: We studied 9,701 participants of the Rotterdam Study, a population-based prospective cohort in individuals aged 45+. Dietary intake was assessed at baseline with a food-frequency questionnaire. We examined adherence (yes/no) to fourteen items of the guidelines: sufficient vegetables, fruit, whole-grains, legumes, nuts, dairy, fish, and tea; high ratio whole:total grains and healthy:total fat; and low intake of red and processed meat, sugar-containing beverages, alcohol, and salt. Adherence was evaluated as sum-score of these components (0-14). Information on disease incidence (coronary heart disease, stroke, heart failure, type 2 diabetes mellitus, chronic obstructive pulmonary disease, breast cancer, colorectal cancer, lung cancer, cognitive decline, and depression) and all-cause mortality during a median follow-up period of 12.2 years (95%-range 2.3-23.0) was obtained.

Results: Using Cox proportional-hazards models adjusted for sociodemographics, lifestyle, and BMI, we observed that a one more component of the guidelines adhered to was associated with 3% lower risk of mortality (HR=0.97, 95%CI 0.96;0.99). Furthermore, adherence was associated with lower risk of stroke (HR=0.95, 95%CI 0.92;0.99), chronic obstructive pulmonary disease (HR=0.94, 95%CI=0.91;0.98), colorectal cancer (HR=0.91, 95%CI=0.85;0.97), and depression (HR=0.97, 95%CI=0.95;0.999), but not with incidence of coronary heart disease, type 2 diabetes, heart failure, lung cancer, breast cancer, or dementia.

Conclusions: To conclude, adherence to the Dutch dietary guidelines was associated with a lower mortality risk and a lower risk of developing some but not all of the chronic diseases on which the guidelines were based.

Keywords: Dietary guidelines, validation, diet quality, mortality, chronic diseases.

144/1944

NUTRIENT PATTERNS WITH DIABETES AMONG ADULT RURAL POPULATION IN INDIA AND ITS ASSOCIATED FACTORS SOCIO-ECONOMIC STATUS, OBESITY AND PHYSICAL ACTIVITY – A CROSS SECTIONAL NATIONAL NUTRITION MONITORING

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Background and objectives: A major proportion of Indian population are living in rural areas. The prevalence of diabetes is increasing in epidemic proportions even among rural population in India and its consequences are very severe on human body. The Objective of the study was to examine association of nutrients intake and diabetes, identify patterns of nutrients and determine whether these nutrient patterns are associate with socio-demographic, and body mass index, WHR and diabetes among rural adults in India.

Methods: It was a cross sectional study carried in 10 major states in India by NNMB among rural population. Fasting blood samples were collected in total of 13810 men and 18043 women of 18 year and above. Nutrients were calculated from 24hr recall diet survey. Factor Analysis was applied to study the nutrient patterns. Multiple linear regression models were fitted and computed respectively for each of the retained factor scores on socio-demographic and obesity variables. Prevalence of diabetes was calculated and associations computed with nutrient patterns by logistic regression.

Results: The prevalence of diabetes was significantly associated with BMI, WHR, physical activity, and socioeconomic factors. Three nutrient patterns were explained 70.7% of the total variance in men, while it was 78.1% in women. First factor explained 43.8% of variation in men by nutrients like zinc (0.91), thiamine (0.91) protein (0.82), energy (0.81), niacin (0.80), iron (0.78) and riboflavin (0.77). The Second factor explain 13.8% variations by nutrients like vitamin A and C, thiamine and niacin; 3rd factor 17% by Vitamin A & C and almost similar observations were made in case of women with 4 loading factors. The first component was significantly associated with wealth index, age of the subject, BMI and physical activity status. Similar findings also observed in case of women. Second factor analysis was significantly associated fat and B12 intakes. Wealth index and BMI were significantly associated with rest of nutrient patterns.

Conclusions: The prevalence of Diabetes is strongly associated with nutrient patterns, obesity, physical activity and socioeconomic status. Care may be taken to educate community on the risk of nutrients for development or control of diabetes among rural adults in India.

Keywords: Nutrient Pattern, Factor Analysis, Obesity, Vitamins, macronutrients.

144/1959

EFFECT OF CINNAMON ON MORPHOLOGY AND PHYSIOLOGY OF LIVER IN RATS

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Background and objectives: The study on cinnamon was initiated to assess its overall effect on morphology and physiology of liver in rats and to extrapolate the results to humans.

Methods: The study was conducted in the department of Human Nutrition, Agricultural University, Peshawar, Pakistan. Seventy two female albino rats weighing 180-270g were divided into groups I, II and III, each having 24 rats. Group I was for placebo, II for 4mg and III for 12 mg cinnamon per day respectively. The total duration of the experiment was 60 days, out of which, 40 days were for cinnamon and the last 20 days were without cinnamon. Six rats from each group were sacrificed at day 0 to get the base line data for all groups prior to the start of experiment. Six rats from each group were sacrificed at days 20, 40 and 60 for obtaining blood sample for biochemical analysis and removing liver for viewing structural changes. Liver functions namely bilirubin, alkaline phosphatase (AP), alanine transaminase (ALT), albumin, globulin, albumin to globulin (A/G) ratio were determined by using standard methods. The changes in cellular structure of liver were viewed under Olympus BX51 microscope.

Results: Cinnamon did not significantly change the concentrations of AP, ALT, globulin and A/G ratio throughout the study period. Bilirubin was non-significantly (P>0.05) changed at day 20 but significantly (P<0.05) increased at days 40 and 60, as compared to the values at day zero. Also albumin was non-significantly changed at day 20 but significantly increased at day 40 but non-significant at day 60, as compared to the value of albumin at day zero.

The cellular structure of liver was normal showing normal portal tract, bile duct surrounded by cords and trabeculae of hepatocytes with intervening sinuses and kupffer cells up to day 20, but mild inflammation, showing increased lymphocytes was observed at days 40 and 60.

Conclusions: In the light of this study, if results of rats are valid for human, then cinnamon safety is doubtful for liver physiology and morphology. It is suggested that further studies may be conducted to verify the safety of cinnamon intake.

Keywords: Cinnamon safety, Morphology, Physiology, Liver.

Conflict of Interest Disclosure: Sindhu Mathew, T. Emilia Abraham, Khan A, Rui wang, Ruijiang wang.

Further collaborators.

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144/2171

SOCIAL JET LAG, OBESITY AND NON-COMMUNICABLE CHRONIC DISEASES

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Background and objectives: Studies have suggested that disruption of the circadian system, such social jetlag (a measure of the difference between sleep times on work days and days off) may lead to obesity and influence metabolic parameters. Although social jetlag have already been associated with overweight in other populations, little is known about the associate of these factors with chronic diseases commonly related to obesity. The objective of this study was to analyze the association of social jetlag between anthropometric and obesity status among individuals with chronic diseases.

Methods: The study was cross-sectional using volunteers [n=792, 581 (73%) female, average age 55.9 ± 12.4] with non-communicable chronic diseases: obesity, systemic arterial hypertension, type 2 diabetes mellitus or dyslipidaemia; who were attended at outpatient clinics of the public health service of the city of Uberlândia-MG (Brazil). The volunteers answered a questionnaire that assessed: demographic, physical activity and habitual sleep pattern; and anthropometric characteristics [height, weight, body mass index (BMI) and waist circumference] were determined. From the medical records of the volunteer clinical and biochemical information was collected. Obesity status has been classified in three levels: non-obese: BMI<30 kg/m2; healthy obese: BMI ≥ 30 kg/m2 and less than three high-risk biomarkers for metabolic syndrome; and unhealthy obese: BMI ≥ 30 kg/m2 and high-risk values on three or more biomarkers for metabolic syndrome. Social jetlag was calculated based on the absolute difference between mid-sleep time on weekends and weekdays.

Results: Multivariate logistic regression adjusted for possible confounding variables indicated a higher risk of being overweight (BMI > 25 kg/m2) for individuals that presented social jetlag (>1 h) (odds ratio [OR]= 2.0, confidence intervals [CI] = 1.2–3.6, p=0.006]; and a risk of being an unhealthy obese (OR=1.8, CI=1.1–2.8, p=0.01) for individuals that presented social jet lag (>1 h) in comparison with those without social jet lag (<1 h).

Conclusions: Social jet lag is associated with higher odds of being overweight and unhealthy obese, confirming that circadian misalignment may predispose improper weight gain and metabolic syndrome.

Keywords: Social jetlag, Sleep, Obesity, Overweight, Unhealthy obesity.

144/2584

RECOVERY, RELAPSE, AND EPISODES OF DEFAULT IN THE MANAGEMENT OF ACUTE MALNUTRITION IN CHILDREN IN HUMANITARIAN EMERGENCIES: A SYSTEMATIC REVIEW

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Background and objectives: This systematic review, commissioned by the Humanitarian Evidence Programme (HEP) and carried out by a research team from the University of Sheffield, represents the first attempt to apply systematic review methodology to establish the relationships between recovery and relapse and between default rates and repeated episodes of default or relapse in the management of acute malnutrition in children in humanitarian emergencies in low- and middle-income countries.

Methods: Quantitative, mixed methods academic literature and grey published programme reports were identified and reviewed. Peer-reviewed literature search was conducted in 14 academic databases. Grey literature, including programme reports, were searched in Google Scholar, websites of relevant organisations, and by engaging with stakeholders in the nutrition field. Studies published prior to 1980 were excluded, as were any papers not published in English.

Results: A total of 9,574 articles, studies and programme reports relating to acute malnutrition were retrieved from the searches conducted. Following the removal of duplicates, screening and quality appraisal, 24 articles and reports were eligible for review. 23 of these focused on sub-Saharan Africa: eight were conducted in Malawi, 5 in Ethiopia, 3 in Niger, 3 in Sudan and the remaining 4 in Angola, Chad, Kenya and Sierra Leone. One study was conducted in Afghanistan. Most studies and programme reports reported on quantitative outcomes and only two contained both quantitative and qualitative outcomes. The 22 quantitative studies included 8 clinical efficacy and effectiveness trials using randomized controlled designs, 7 observational cohort studies, and 7 programme evaluation reports. Only 6 of the 24 studies included in this review addressed the issue of relapse and/or reported relapse rates. None of the studies addressed the relationship between relapse and default or return default, and little evidence was found on the long-term impact of programmes implemented to manage MAM and SAM in emergencies.

Conclusions: This review provides further confirmation that RUTF used in an outpatient setting is effective at promoting recovery from SAM and reducing mortality. It could not be established whether default rates reported were lower according to the WHO 2013 protocol. Data relating to relapse is limited and need further research.

Keywords: Acute malnutrition, Children, Humanitarian, Emergency, Systematic Review.

Further collaborators. DFID/Oxfam GB, Feinstein International, UKAiD, Erin Boyd, Mark Manary and Seth Adu-Afarwuah.

144/2586

MOLECULAR BASES UNDERLYING THE CHEMO PREVENTIVE EFFECTS OF DOCOSAHEXAENOIC ACID

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Background and objectives: Colorectal Cancer (CRC) is the third most commonly cancer around the world. Nutraceutical are food products like drug which share health benefits in prevention and treatment of many diseases. The nutraceuticals like omega-3 Docosahexaenoic acid may have chemopreventive activities Docosahexaenoic acid (DHA) is an omega-3 fatty acid and it may be considered as potential therapeutic agent for colon cancer.

Methods: Colon cancer was induced by injecting 6-8-week-old, rats weighing 200-250 g (Pasteur Institute of Iran, Tehran) with 10 mg/kg 1,2-dimethylhydrazine (DMH) twice per week for 12 weeks. 26 male Wistar rats divided in to two groups. DHA group treated with 400 mg/kg DHA (n=13). VEGF (Vascular endothelial growth factor) and mTOR levels in colorectal cancer were examined by Western blotting.

Results: DHA reduced VEGF expression by 34.3 ± 1.7 vs. control group 71.2 ± 3.4 (Protein expression/b-actin expression). DHA reduced mTOR expression by 32.1 ± 1.2 vs. control group 65.2 ± 3.8 (Protein expression/b-actin expression).

Conclusions: mTOR dysregulation has a vital role to play in many types of cancers. The current study suggested that DHA is able to inhibit VEGF and mTOR expression in colon cancer cells and DHA is a potent therapeutic agent that can inhibit tumor growth and angiogenesis in vivo by decreased phosphorylation of mTOR and subsequently the blockage of VEGF secretion in tumor cells pathway.

Keywords: mTOR , VEGF, DHA, Colon cancer.

THE ASSOCIATION BETWEEN MINDFULNESS AND THE METABOLIC SYNDROME IS MODIFIED BY HISTORY OF DEPRESSION

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Background and objectives: The Metabolic syndrome (MetS) is a major public health burden since it predisposes to cardiovascular diseases, which are leading causes of death in developed countries. In addition to lifestyle habits, specific psychological characteristics have been shown to be associated with the MetS. Dispositional mindfulness, which is defined as non-judgmental awareness of the present moment, has recently been associated with eating disorders and overweight and could therefore be associated with the MetS. We aimed to examine in a cross sectional design the relationship between mindfulness and the MetS in a large sample of the adult general population and the influence of history of depression on this association.

Methods: A total of 17,490 adults participating in the Nutri-Net-Santé study who had completed the Five Facets Mindfulness Questionnaire and attended a clinical and biological examination were included. Multivariable logistic regression models adjusted for socio-demographic and lifestyle factors were performed to assess the relationship between mindfulness (and its subscales) and the MetS and cardiovascular risk factors.

Results: Among individuals with a history of depression, those with higher mindfulness were less likely to have a MetS (OR: 0.73, 95% CI: 0.57-0.93), a high waist circumference (OR: 0.79, 95% CI: 0.67-0.95), a low HDL-cholesterol level (OR: 0.73, 95% CI 0.55-0.95) and a high fasting blood glucose level (OR: 0.69, 95% CI: 0.54-0.89) (all p < 0.05). In those without history of depression, individuals with higher mindfulness were less likely to have a high waist circumference (OR: 0.89, 95% CI 0.82-0.97) (p < 0.01).

Conclusions: These findings support the importance to take individual psychological factors into account, and in particular mindfulness, in relation with the MetS, especially in people with a history of depression.

Keywords: Mindfulness, metabolic syndrome x, risk factors, depression.

DIETARY INTAKE OF NUTRIENTS AND COMPROMISED PERIODONTAL HEALTH: THE CONCORD HEALTH AND AGEING MEN PROJECT

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Background and objectives: More than half of Australian adults aged 65 years and older have moderate to severe periodontal disease. Yet in the older population, research specifically examining the association between diet and periodontal health is limited. The aim of this study was to examine the association between dietary intake of nutrients and periodontal health in older men participating in the Concord Health and Ageing Men Project (CHAMP) study.

Methods: A preliminary analysis was conducted on the 294 men, (mean age: 84 years, SD: ±3.7 years), who had completed a standardised validated dietary assessment and had a comprehensive oral health examination during the CHAMP 8-year follow up. Having three or more teeth with at least one site with a Probing Depth (PD) ≥3mm, or at least one site with an Attachment Loss (AL) of ≥5mm were used as indicators of compromised periodontal health. Nutrients were categorised into quartiles and logistic regression was used for all statistical analysis.

Results: The prevalence of compromised periodontal health was high, with 64% of men had three or more teeth with at least one site that had a PD ≥ 3mm, while 85% of men had three or more teeth with at least one site that had an AL ≥ 5mm. After adjustment for potential confounders, men in the lowest quartile of percentage of energy from protein intake were much more likely than those in the highest quartile to have PD ≥ 3mm: OR 2.59(95% CI:

1.14 – 5.88). Men in the lowest quartile of folate intake were much less likely to have AL ≥ 5mm: OR 0.35(95% CI 0.12 – 0.99). The mean percentage of energy from protein intake was 18.4% (SD: ± 3.7%), and the mean intake of folate was 407.1µg (SD: ± 202.1µg). Beef was the main food source contributing to protein intake and vegemite was the main food source contributing to folate intake.

Conclusions: These preliminary results highlight that there is a complex association between the dietary intake of nutrients and the periodontal health of older men.

Keywords: Nutrition. Periodontitis. Diet. Older adults.

144/2806

IMPROVING THE MANAGEMENT OF SEVERE ACUTE MALNUTRITION AMONG INFANTS AND CHILDREN THROUGH CAPACITY BUILDING: FINDINGS FROM AN EVALUATION STUDY WITH MALNUTRITION ELEARNING

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Background and objectives: The University of Southampton and International Malnutrition Task Force developed Malnutrition eLearning to reduce child mortality by Severe Acute Malnutrition (SAM) through training health professionals globally. Since made available in 2010, over 14,000 from 100+ countries used the course. To investigate its effectiveness, a 2-year evaluation study was conducted from 2015, face-to-face in Ghana and Central America (CA), and online in other countries.

Methods: Using a mixed method approach, the study explored if and how Malnutrition eLearning supported knowledge gain and behavioural change (application of knowledge in clinical practice), and resulting clinical outcomes in the management of SAM. Assessments, questionnaires and interviews/focus groups were conducted with individual in-service and pre-service participants pre- and post-training, and 12 months of medical records data collection, observations and hospital personnel interviews were carried out from participating healthcare institutions.

Results: Total 1,261 health professionals (Ghana:915, CA:142, other countries:201), and 10 hospitals and 2 community health centres in Ghana and 2 hospitals in CA participated in the study.

3,955 (pre:01/08/2014–31/07/2015) and 3,737 (post:01/08/2015–31/07/2016) medical records of children (0-60 months) were collected from the hospitals, and summary data on malnutrition cases (pre:76, post:67) from community health centres.

Individual participants scored significantly higher in the post assessment (mean difference(SD): 14.0(12.5), 95%CI(12.7, 15.2), p<0.001). 87% of in-service health professionals (102/117) applied their knowledge and changed clinical practice in screening, assessment, diagnosis and management of SAM. This group demonstrated retained knowledge 6-month after the training (mean difference from pre-assessment(SD): 12.7(11.7), 95%CI(10.4, 15.0),p<0.001). Significant increases (p<0.001) in recording malnutrition-markers, i.e. length/height and weight-for-length/height z-score, and diagnosed SAM cases (pre: 491(12.4%), post: 810(21.7%)) were observed. Mortality by SAM was declined from 26(5.9%) to 14(1.9%) (p<0.001). The community centres initiated the management of SAM (pre:0/32, post:7/21).

Conclusions: The results suggest that Malnutrition eLearning is effective in training the WHO guideline on the management of SAM. After a 2-day self-directed training with Malnutrition eLearning, the participants not only gained knowledge but were also able to apply the knowledge in their clinical practice, leading to significant impacts on clinical outcomes.

Keywords: Management of Severe Acute Malnutrition, capacity building, nutrition sensitive intervention, eLearning, WHO guidelines on SAM management.

Further collaborators: Carmen Isabel Velásquez de West, Carmen Portillo, Andrew Penn, Sally Hickman.

144/3017

EFFECTS OF BIOTIN STATUS ON GLYCEMIC CONTROL IN RATS

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Background and objectives: Biotin, as a coenzyme of carboxylases, plays an important role in the process of neoglycogenesis, amino acid decomposition, fatty acid synthesis and energy metabolism in humans and mammals. In recent studies, it has showed that large dose of biotin supplement can be taken as drug to treat hyperglycemia, through potential mechanism of mediating gene regulation of histone biotinylation. The main source of body biotin are main from dietary intake and intestinal bacterial synthesizing, so biotin deficiency is rare, the relationship between biotin status and glycemic control should be studied.

Methods: 60 healthy SD rats (F/M half to half) weighting (100±10) grams were fed with non-biotin diet with raw egg white replacing casein to induce biotin deficiency model (NB), then divided into 6 test groups, daily oral given 0, 2, 4, 10 µg biotin, 1g resistance dextrin (RD, as a stimulant of intestinal source) or mix-

ture of 4 μg biotin and 1g RD respectively. Additional 20 rats fed with diet based on AIN-93 as blank control. After 8 weeks intervention term, blood biotin and 3HIA-carnitine, glucose and lipid level, organ pathology, intestinal bacterial were evaluated.

Results: From the 2nd day of NB diet feeding, serum biotin immediately appeared lower than the control group, while 3HIA-carnitine increased (P<0.05) . Till 10 w, serum glucose and insulin level significantly decreased in NB rats, in comparison with control (5.67±2.08 mmol/L vs. 7.51±1.28 mmol/L, 83.22±13.06 mIU/L vs. 95.47±17.74 mIU/L , respectively, P<0.05), especially in female rats. Blood triglyceride trendsed to increase.

After biotin intervention, both biotin status and glucose and insulin back to normal level (4, 10 μg/d). Fatty liver and kidney damage with failed function induced by biotin deficiency did not recover after intervention. In this study, wide-range genome expression profile analysis showed the great differences in the pathways related to fatty acid degradation, PPAR signaling pathway, fatty acid metabolism, arachidonic acid metabolism and biosynthesis of unsaturated fatty acids between control and NB rats, indicating the potential effects of biotin status on glycemic control. Resistance dextrin did not show any effect in this study,

Conclusions: Biotin may be an essential factor for glycemic control.

Keywords: Biotin, 3HIA-carnitine, glycemic control, gene express

Track 5: Nutrients and Nutritional Assessment

144/214

WOMEN'S EMPOWERMENT AND THE NUTRITIONAL STATUS OF CHILDREN AGED BETWEEN 6-59 MOTHS

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Background and objectives: The Central Province of Zambia contains the majority of the nation's malnourished children, despite being the most productive province in terms of Agriculture. Most studies in the province have not paid attention to the importance of women empowerment and the nutrition outcomes of the population. In light of this knowledge gap, this study focused on the Women's empowerment and the nutrition status of children. The overall objective of the study was to determine the extent to which women are empowered in agricultural activities in Kapiri-Mposhi district in the Central Province of Zambia.

Methods: The study assessed the extent to which women are empowered in agricultural activities. This study sought to determine the association of women empowerment and nutritional status of children aged 6-59 months in Kapiri-Mposhi district in the Central Province of Zambia. A cross-sectional descriptive study was conducted using a structured questionnaire. A total of 100 households were randomly sampled and the nutritional status of one child from each household assessed using anthropocentric measurements. A total of 100 children were included in the study.

Results: Up to 21% of the children were stunted; 2% were wasted; and 9% underweight. There was a significant relationship between access to credit or income opportunities and Z-scores for stunting (HAZ) and wasting (WHZ) (p< 0.05).

Conclusions: This study has established that most women are not empowered.

Keywords: Children, Nutrition, Women empowerment

144/225

WHAT IS NUTRITIONAL STATUS? PERSPECTIVE OF WOMEN IN IBADAN NIGERIA

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Background and objectives: Good understanding of nutrition is fundamental to adequate nutritional status, health and well-being. In spite of several efforts to address malnutrition in Nigeria, the burden of poor nutritional status remains largely unfettered, especially among women. The burden obesity and underweight is prevalent in urban and rural settings respectively. This study explores the perspectives and understanding of nutritional status among women in Ibadan, Nigeria using qualitative approaches.

Methods: Four (4) focus groups were conducted among 27 women (15-49 years) identified by a multi-recruitment strategy from 285 households in urban and rural areas of Ibadan Nigeria, after duly informed consent. Using a predefined protocol, discussants' responses were explored with semi-structured but moderator-led discussions centred on 3 main themes; understanding of nutritional status, the type of food eaten to enhance good nutritional status and what major factor influences food choices in households. Responses were digitally recorded and professionally transcribed; all discussion transcripts were checked for accuracy and completeness, edited before analysis to directly include content pertaining to the themes and analysed using team-based qualitative analysis methods.

Results: Though discussant responses varied by age and region of residence, most discussants' consider the type of body shape they possess and avoidance of foods made up of fat as their indicator for good nutritional status. In addition, while young women and those residing in urban neighbourhoods consider taste and appetite, older and married women consider their spouse's food choices and stage of growth as a major factor that influences their food choices. The economic power of household is a major motivation that informs food choices of discussants and their households. Furthermore, most discussants were unfamiliar with the concept of food intakes and its implication on their nutritional status.

Conclusions: Nutrition education intervention strategies that integrate adequate management of monetary resources to promote consumption of right combination of foods is indispensable in enhancing the good nutritional status of women.

Keywords: Nutritional status, Women, Focus Discussion, Nigeria.

144/272

MULTIFORTIFICATION OF BOUILLON IN CENTRAL AND WEST AFRICA: FEASIBILITY & IMPACT

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Background and objectives: Up to 38% of schoolchildren in West Africa suffer from goiter and iron deficiency anemia, which leads to early mortality, impairment of physical/cognitive development and poor school performance. Condiments such as bouillon are regularly use by families across the region to enhance the taste of home-cooked meals, making this product a useful vehicle for delivering micronutrients. Homogeneous, stable, and impacful multifortification bouillon is challenging as color, aroma, and flavor of the condiment can easily change during manufacturing, shelf-life and consumption.

The aim of this work is to develop a stable multifortified (iron and iodine) Maggi® bouillon cubes for industrial scale production and commercialization in Central and West Africa and assess its impact on the reduction of micronutrient deficiencies.

Methods: Stability of multifortified Maggi® bouillon cubes was extensively studied through assessment of color, aroma, flavor, and texture of the condiment during manufacturing, shelf-life, and consumption. Local preparations rich in polyphenols were tested to ensure stability. Process adaptation and optimization for proper micronutrients homogeneity were implemented. Nutritional impact was assessed through the development of a statistical model based on the principles of the Global Burden of Disease using nutritional data from Ivory Coast.

Results: Commercialization of stable multifortified Maggi® bouillon cubes was accomplished in 2012 as a mean to complement mass fortification programs. Key points for its industrializations and acceptability by consumers were: 1) product stability and sensory properties in traditional African recipes; 2) safety and nutritional relevance; 3) ensuring micronutrient homogeneity and safety; 4) no price increased. Multifortified Maggi® bouillon cubes was estimated in Ivory Coast to reduce by 4.7% the economic burden and 5.7% health burden in DALYs.

Conclusions: Multifortification of Maggi® bouillon cubes is an effective approach to reduce malnutrition in Ivory Coast (reducing by 4.7% the economic burden and 5.7% health burden in DALYs). Its implementation was challenging as stability, homogeneity, safety, cost, consumer acceptance, and nutritional impact were critical to ensure successful acceptance by consumers. Challenges going forward includes: bioavailability and density of micronutrients

Keywords: Fortification, Micronutrients, Bouillon, Public health.

COMPARISON OF OBESITY STATUS OF SCHOOL CHILDREN BY BODY MASS INDEX AND BY BODY COMPOSITION USING A STABLE ISOTOPE DILUTION TECHNIQUE IN NAIROBI CITY COUNTY, KENYA

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Background and objectives: Changes in dietary intake, lifestyle and low physical activity contribute to obesity, the new silent killer which increases the risk of non-communicable diseases that threaten to burden already overstretched health services. Accurate and reliable indicators are required for early detection of childhood obesity and related health risks, for optimal nutrition intervention planning, monitoring and informing policy. Body Mass Index (BMI)-for-Age Z scores is widely used in epidemiological studies and screening for childhood obesity, however, it does not distinguish between body fat free mass and fat mass. Body fat accumulation and distribution is a better indicator of the risk of obesity and related diseases. This study assessed the accuracy of the BMI-based WHO classification of obesity for defining children as excessively fat by comparing it to the measure of body fatness using the criterion stable isotope method for body composition in school children in Nairobi City.

Methods: A cross-sectional study was conducted among 202 schoolchildren aged 8-11 year systematically sampled. A structured questionnaire was used to collect data on demographics, perceptions and knowledge about healthy habits, eating patterns, and physical activity. Anthropometry (BMI-for-Age Z scores) and body composition (fat mass and fat-free mass by deuterium dilution technique) was used to assess body fatness. Data was analysed using SPSS at significance $p<0.05$ at 95%CI.

Results: The prevalence of underweight, normal, overweight/overfat and obese/excessive fat in school children was 3.4%, 39.7%, 33.0% and 24.0% versus 6.9%, 84.2%, 5.6% and 3.3% by body composition using the deuterium dilution technique and BMI-for-Age Z scores respectively.

Conclusions: It is apparent that the WHO recommended BMI-for-age to classify overweight and obesity underestimates the prevalence of overweight and obesity based on measures of body fatness. This needs to be confirmed in a larger study. Evidence-informed interventions should be based on more accurate estimates of the prevalence of overweight and obesity than can be provided by BMI.

Keywords: Obesity, nutrition assessment, anthropometry, body composition.

NUTRITION-FOCUSED PROGRAM IMPROVES READMISSION RATES OF MALNOURISHED HOSPITALIZED PATIENTS REGARDLESS OF DISCHARGE DISPOSITION

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Background and objectives: Well defined discharge planning processes are key in limiting unwarranted hospital readmissions. Malnourished hospitalized patients are more likely than their well-nourished counterparts to experience readmissions if their nutritional needs are not appropriately addressed while in the hospital. We aimed to assess the impact of a hospital-based, comprehensive nutrition-focused quality improvement program (QIP) on readmission rates of malnourished patients discharged home with and without home health care services.

Methods: Data from 2588 patients (1269 QIP patients enrolled October 2014-April 2015, and 1319 retrospective historical controls admitted in the QIP hospitals October 2013-April 2014) were categorized into three discharge disposition categories including home without home health care (1266/48.9%), home with home health care (1043/40.3%), and other health care facility (e.g., inpatient rehabilitation, skilled nursing facility) (279/10.8%) patient subgroups. No patients going to other health care facilities were included in the pre-QIP cohort; therefore, no comparative analyses were pursued for this subgroup. QIP patients were admitted in four hospitals where electronic medical record (EMR) was upgraded to include Malnutrition Screening Tool (MST), and condition-specific oral nutritional supplements (ONS) were administered to all patients at risk for malnutrition (MST ≥ 2). In addition, nutrition education was provided to patients and caregivers during the inpatient stay and at discharge.

Results: Pre-QIP historical controls readmission rates were 22.2% (141/635) for patients discharged home without home health care, and 21.9% (150/684) for patients discharged home with home health care. Post-QIP readmission rates were 14.7% (93/631) and 18.7% (67/359) for the two patient groups; thus resulting in statistically significant relative risk reductions of 33.7% and 14.6% (p values < 0.05), respectively. These results were observed regardless of hospital length of stay, which was significantly reduced for both groups.

Conclusions: Unplanned 30-day readmissions among malnourished hospitalized patients discharged to home with and without home health care services can be significantly decreased through a nutrition-focused QIP that aims to screen, promptly administer ONS, and educate patients throughout their hospital stay and at dis-

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EFFECTS OF PHOTO-VOICE APPROACH ON 24-HOUR DIETARY RECALL ACCURACY AMONG UNIVERSITY OF IBADAN UNDERGRADUATE STUDENTS

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Background and objectives: The 24-hour recall is frequently used dietary assessment yet misreporting is common; therefore new approaches harnessing mobile technology are presently being explored. Photo-voice is an innovative qualitative method of participatory action research based on health promotion principles. However, it has not been used to its full potential in nutrition and dietetics. This study was designed to assess the effect of photo-voice approach on 24-hour dietary recall accuracy among undergraduate students.

Methods: This study was descriptive cross-sectional in design. Two hundred undergraduate students of University of Ibadan were selected using a simple random procedure from a pool of consenting students using WhatsApp-enabled smart phones. A semi-structured questionnaire was used to obtain information on socio-demographic characteristics and dietary intake. Respondents were prompted to capture and send every meal, snack and drink consumed daily and randomly selected for assessment over a 30-day period. Dietary intake was assessed using 24-hour multiple recall procedure, conducted using conventional approach and with the aid of photo-images. Nutrient intake was calculated using adapted Total Diet Assessment software and percentage difference in nutrient intake was calculated. Data were analysed using descriptive statistics and Chi-square test at p=0.05.

Results: Age was 21.0±1.8years, 57.5% were males and 95.0% lived on-campus. Intake of energy (1701.2±795.3; 1684.4±774.4) Kcal; protein (50.6±29.1; 50.1±28.1)g; fat (42.1±31.4; 41.6±27.2) g; and cholesterol (198.8±174.0; 188.4±172.0)g were higher with photo-voice than conventional approach respectively. Intake of Vitamin A (2149.5±1747.4; 2712.5±1903.4)RE; thiamin (1.1±1.0; 1.9±1.0)mg; and niacin (12.0±9.7; 12.4±10.4)mg were lower with conventional than photo-voice respectively. However, riboflavin (0.9±0.8; 0.8±0.6)mg; Vitamin B6 (0.9±0.7; 0.6±0.5)mg and B12 (1.7±1.1; 1.4±0.8)mcg were higher in conventional than photo-voice. Recall accuracy for intake of calorie (+15.2%; -8.2%); thiamin (+21.4%; -58.5%); riboflavin (+27.3%; -24.2%) and niacin (+17.6%; -12.3%) was significantly different in female and male respondents respectively. Also, recall accuracy for intake of folate (+27.8%; -12.2%); B12(-58.3%; +13.3%); Calcium(+11.3%; -17.9%); phosphorus(+11.9%; -9.3%); sodium(-8.2%; -10.9%); potassium(+20.4%; -17.3%); zinc(+10.9%;-2.6%); iron(+14.1%; -8.2%) and magnesium(+16.9%; -8.2%) was significantly different in female and male undergraduates.

Conclusions: Photo-assisted 24-hour recall shows mis-reporting of micronutrients intake masked in conventional 24-hour recall. Recall accuracy differ significantly by gender with over-reporting of nutrients intake among female students.

Keywords: Dietary assessment, innovative methodology, nutrient intake; over-reporting; underreporting.

144/679

VALIDITY OF BIOELECTRICAL IMPEDANCE ANALYSIS IN PREDICTING ADIPOSITY AMONG 8-11 YEARS OLD SENEGALESE SCHOOL-AGED CHILDREN

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Background and objectives: Childhood obesity is a serious public health challenge. Therefore accurate measurement of adiposity is essential to monitor the trend of child obesity in developing countries. This study aimed to develop and validate, for the first time, a bioelectrical impedance analysis (BIA) predictive equation for the assessment of adiposity among Senegalese school-aged children.

Methods: The study involved 151 pupils, 8-11 years old (74 boys, 77 girls) randomly selected from 4 elementary public schools in urban area of Dakar (Senegal). Weight and height were measured. Body composition: total body water (TBW), fat free mass (FFM) and percentage body fat (%BF) were determined by deuterium dilution method (DDM) used as the reference method. BIA was measured using multi-frequency analyzer and impedance index (height²/Z50 kHz) calculated. Stepwise backward multiple lin-

ear regression model was performed to develop the %BF equation in a subsample then validated it in the rest of the sample. Bland and Altman approach was used to assess the concordance between the two methods (bias and limits of agreement).

Results: Mean age (9.6±1.0 years) was comparable between boys and girls. FFM was higher in boys (24.6±6.9 kg) compared to girls (21.2±3.3 kg; P<0.001) and %BF lower in boys (5.1±4.6 kg) than in girls (5.3±3.8 kg; P<0.05). Overall, 11.3% of the children were obese (%BF ≥25% in boys, and ≥30% in girls). With BMI-z score, the prevalence of overweight/obesity was 4.6% (BMI>+1). The equation newly developed for the prediction of adiposity was: %BF= -1.10*height^2/Z50+3.14*sex+1.57*weight-4.347 (RMSE=4.5%, pure error=5.5%). The %BF estimated with the equation was highly and significantly correlated with the reference method (R^2=0.76; P<0.001). Bland-Altman analysis showed non-significant mean bias (0.19±5.6% fat; P=0.764) and limits of agreement ranged from -10.7 to 11.1%. When the equation was applied to the whole sample, there were non-significant difference between %BF measured by DDM (18.7%±9.7) and that predicted by BIA (18.2%±7.5).

Conclusions: The %BF equation developed in the present study could be used as an alternative and accurate tool for the measurement of adiposity among school-aged children. Further cross-validation studies in a larger independent sample of African pupils is suitable.

Keywords: Adiposity, BIA, deuterium, school-aged children, Senegal.

Further collaborators.

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PERCEPTION OF PRINTED AND DIGITIZED PHOTOS IN THE QUANTIFICATION OF THE GLOBODIET-BRAZIL FOOD PORTIONS – RESULTS FROM THE VALIDA STUDY

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Background and objectives: This validation study is a major component of an international 24-hour dietary methodology adapted for Latin-American countries, starting with Brazil. The objective was to evaluate the perception of food portion quantification using printed and digitized photos.

Methods: The study was developed in Curitiba/PR (Brazil) with 58 adults. A total of 20 foods were evaluated from the GloboDiet Brazilian Album (n=96 foods). Each food had a series with up to six portion sizes. Three photos of each food were selected, representing small, medium and large portion sizes. Participants visited the study site in two moments, with a minimum of one-week interval, to evaluate the same food for both printed and digitalized photos (either in computer screen or tablet). Each participant evaluated on average 12 foods per session, randomly allocated, and had up to two minutes to choose the picture that best represented each pre-determined portion presented to them, which could be: exactly as the original photo, differing in size or in format. The difference between the correct and chosen portion (i.e., error) was analyzed, as well as concordance in using the photos and Spearman correlations.

Results: The percentage of the mean error was -1.1% (DP=11,2) for printed photos and -3.6% (DP=14,3) for digitized ones, showing no statistically significant difference (p=0.27). The concordance in using the photos was 91% and 90% for the printed and digitized photos, respectively. The foods with the highest number of distal chosen portions were the popcorn and feijoada. The correlation between correct and the estimated portions varied from 0.68 (scrambled egg) to 0.95 (noodles and popcorn) for printed and from 0.51 (feijoada) to 0.97 (potato) for digitalized photos. Tablet evaluations presented the largest errors, especially in the group of people with less years of education (p<0,05) and when the portions were presented in a different format (p<0,001) than shown in the photo.

Conclusions: As conclusion, the perception of using food portion printed photos was, in general, satisfactory although some foods were not very well evaluated. Furthermore, the evaluations using tablet resulted in worse results. We hope such results will contribute to future developments of dietary methodologies in Latin America.

Keywords: Food portion, photos, perception, food consumption.

Further collaborators.

DEVELOPMENT OF CHINESE DIETARY INDEX FOR PREVENTING NON-COMMUNICABLE CHRONIC DISEASES AND ITS RELATIONSHIP WITH UNDERLYING RISK OF MAJOR CHRONIC DISEASES

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Background and objectives: To develop the Chinese Dietary Index for Preventing Non-communicable Chronic Diseases (CDI-NCD), to investigate the association between overall diet quality and underlying risk of major chronic diseases.

Methods: Based on the current Chinese Dietary Guidelines, Chinese Dietary Reference Intakes (DRIs) and literature on development of dietary indices and association between diet and non-communicable diseases, CDI-NCD consists of 18 components. Diet quality of 572 healthy adults aged 25-65 years from Chengdu was evaluated using the scoring system of CDI-NCD. Differences in indicators for underlying risk of obesity, diabetes, dyslipidemia and hypertension among participants with higher, moderate and lower diet quality were tested.

Results: The mean CDI-NCD score for our population was 103.5±15.1. The diet quality of females was higher than that of males (P=0.001). Participants with normal weight had better diet quality than those with excess weight (P=0.004). Participants with higher diet quality had the lowest values of body mass index, insulin, triglycerides, low density lipoprotein and highest value of high density lipoprotein.

Conclusions: The CDI-NCD could evaluate the overall diet quality among Chinese adults. High diet quality, indicated by a high CDI-NCD score, was associated with lower underlying risk of major chronic diseases like obesity and dyslipidemia.

Keywords: Nutrition, dietary assessment, chronic disease, diet, dietary index.

Further collaborators.

NUTRITIONAL STATUS OF BELOW 3 YEARS CHILDREN AND INFANT AND YOUNG CHILD FEEDING PRACTICES IN INDIA-FINDINGS OF NATIONAL NUTRITION MONITORING BUREAU (NNMB) SURVEY

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Background and objectives: Undernutrition is an important public health problem in India in spite of several nutrition intervention programs in operation since last 4 decades. The study was undertaken to assess infant & young child feeding practices and nutritional status of under 3 year children in rural area in 10 stated of India

Methods: A community-based, cross-sectional study was carried out in 10 states of India, using multistage random sampling method. Nutritional assessment was done using WHO Child Growth standard. Conceptual hierarchical framework was used as a basis for controlling for the explanatory factors in multivariate analysis

Results: A total of 4038 children below 3 years of age were covered. The study revealed that only 36% infants received breast feeding within 1 hour, while 37% received within 1-3 hours of birth. About 50% infants were exclusively breast feed up to 6 months. About 61% children of 6-11 months received complementary feeding at 6-8 month, 19% received before 6 months, while 17% has not yet received complementary feeding.

The prevalence of underweight, stunting and wasting was 38%, 42% and 22% respectively among less than 3 year children. It was observed that the risk of undernutrition among <3 year children was significantly (p<0.01) higher among boys, among children belonging to Scheduled caste and scheduled tribe communities, children from low income groups, among children of illiterate mothers and children without the facility of sanitary latrine. Among infants, the risk of underweight was significantly (p<0.01) higher among children belonging to scheduled tribe communities, children from low income groups, among children of illiterate mothers' children without the facility of sanitary latrine and among low birth weight babies, while the risk of stunting was higher among children belonging to low income groups, among children of illiterate mothers and children without the facility of sanitary latrine and among low birth weight babies.

Conclusions: Undernutrition is still an important health problem and is associated with income, community, literacy of mother, birth weight and sanitary latrine. Improving literacy status of mother thus improving socioeconomic condition and maternal nutrition during pregnancy and also sanitation & hygiene may improve the nutritional status of children

Keywords: Conceptual framework, Infant & young child feeding practices, income, nutrition assessment, undernutrition.

144/1078

REPORTED DIETARY INTAKE AND FOOD SOURCES OF ZINC, SELENIUM, AND VITAMINS A, E AND C IN THE SPANISH POPULATION: FINDINGS FROM THE ANIBES STUDY

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Background and objectives: Zinc, selenium, and the vitamins A (retinol and carotenes), E and C, all have specific biological functions that are involved mainly in the antioxidant defence system that has important implications for the development of chronic diseases. We aimed to assess the reported intake of these six nutrients, as well as the food that contributes to their sources of intakes.

Methods: Data were obtained from the Spanish ANIBES (Anthropometry, Intake and Energy Balance in Spain: anthropometric data, macronutrients and micronutrients intake, practice of physical activity, socioeconomic data and lifestyles) study, n=2009 (9–75 years old). The analyses were performed in the whole population and also in the plausible reporters after a misreporting analysis according to EFSA protocol. A three-day food record was used to collect the data.

Results: Mean reported intake for the whole population of zinc was 8.1±0.1 mg/d, (2.3-27.3 mg/d), selenium 75±1 μg/d, (14-265 μg/d), vitamin A 668 μg RE/d (2-11017 μg RE/d), retinol 364 ± 18 μg/d (0-10881 μg/d), carotenes 1735 ± 35 μg/d (13-13962 μg/d), vitamin E 7.0 ± 0.1 mg α-TE/d (0.7-55.2 mg α-TE/d) and vitamin C 84.4±1.4 mg/d (5.0-802.7 mg/d). The main source intakes for zinc were meat and meat products, for selenium were cereals and grains, for vitamin E oils and fat and for vitamin A and C vegetables.

Conclusions: There is an important percentage of the Spanish ANIBES population not meeting the recommended intakes for zinc, vitamin A and E, a reasonable percentage of people not meeting the recommendations of Vitamin C and a low percentage of people not meeting the selenium recommendations.

Keywords: ANIBES study, trace elements, vitamins, misreporting, food intake

144/1147

VITAMIN A AND IRON CONTENT IN COMMON COMPLEMENTARY AND WEANING FOODS FOR CHILDREN IN NORTH WESTERN TANZANIA AND CENTRAL UGANDA

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Background and objectives: The prevalence of Vitamin A and iron deficiencies among preschool children are 43% and 58.6% In Tanzania and 39% and 49% in Uganda respectively. These values are way beyond the WHO acceptable levels. The purpose of this work was to establish the vitamin A and iron adequacy of the most common weaning and complementary foods given to children in North western Tanzania and Central Uganda.

Methods: A cross-sectional study where 425 households selected through multistage sampling techniques were interviewed on the foods given to preschool children. Follow up home visits to randomly selected households were done to confirm details on preparation procedures. Six most common meals given to children were identified. Ingredients were obtained from the sites and transported to Department of food science, Universität für Bodenkultur (BOKU) Vienna, Austria within 48hours. Within 24hours of arrival, the meals were prepared following procedures validated by community and stored under refrigeration (-18 degrees C) to await analyses (<14days). HPLC analysis and microwave digestion followed by a flame atomic absorption spectroscopy were then used in establishing the content of provitamin A carotenoids (precursors of vitamin A) and iron content respectively. All the extractions and analysis were carried out in triplicate.

Results: Findings indicated that the six most common foods were maize-base porridge, steamed-mashed banana served with beans, boiled banana served with beans; boiled banana served with groundnut sauce, stiff porridge (Ugali) served with beans and boiled cassava served with beans.Analysis showed no trace of ei-

ther vitamin A or iron was observed in the maize-based porridge. Some iron 2.28mg/100gfw and 1.18mg/100gfw were observed in the stiff-porridge served with beans and small fish and boiled banana served with red kidney beans respectively. The banana-based foods showed some content of vitamin A ranging from 23 to 43 RAE ug/100gfw.

Conclusions: Considering the estimated average requirements of iron and vitamin A for children being 4.1mg/d and 210-275 RAE ug/day respectively, these foods are poor sources of these nutrients in their current form. There is therefore need to explore opportunities of either modifying the preparation methods and incorporating more nutritious and diverse ingredients for better nutrition content.

Keywords: Vitamin A, Iron, Complementary foods, Weaning foods

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144/1151

NUTRITIONAL QUALITY OF DRIED VEGETABLES AND VEGETABLE SOUPS

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Background and objectives: Dehydration of food has been used for centuries as a technique to increase shelf life and preserve nutrient quality during storage. However, degradation or loss of nutrients may occur during the drying process, either due to applied heat or leaching due to water removal. Therefore, we investigated nutrient retention during pre-processing and drying of vegetables used to prepare dry vegetable soups in 2 studies.

Methods: First, nutrient levels were determined in fresh industrial tomato, onion, and lentil produces, as well as in the industrially dried products obtained from the same batches. Vitamin C and lycopene were selected as representatives for heat- and storage-labile nutrients in tomato. For onion, vitamin C and flavonols were taken, whereas folates were chosen as nutrient markers for lentils. Potassium contents were determined for all vegetables. Second, the overall nutritional quality of dry vegetable soups was assessed and compared with recommended dietary allowances (RDAs) and nutrition databases. Nutrients, including dietary fiber, minerals, vitamins, and carotenoids were determined in ten commercial dry vegetable soup varieties.

Results: During the pre-processing and dehydration of tomato, lycopene remained stable, whereas 70% of vitamin C was retained. With regard to onions, 29% of vitamin C and 51% of flavonols were retained. Losses of folates during processing of lentils was between 10-25%, depending on the process applied. Potassium levels remained largely unaltered for all vegetables, indicating limited losses attributable to leaching. The nutritional profile of dry vegetable soups aligned well with nutritional databases and

the profile of nutrient contribution from dry soups was consistent with the expected RDAs contribution from vegetables.

Conclusions: A notable amount of nutrients are retained in vegetables after pre-processing and dehydrating and dry vegetable soups can therefore be considered a relevant source of vegetables and nutrients.

Keywords: Vegetables, nutrient composition, dehydration, nutrient retention.

Conflict of Interest Disclosure: All authors are employees of Unilever, a manufacturer of Food and Beverages products (including soups)

Further collaborators: Karin H. van het Hof. PhD. Unilever R&D Vlaardingen. Vlaardingen. The Netherlands

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144/1228

ANEMIA AND USE OF IRON SUPPLEMENTATION IN CHILDREN LIVING IN SOCIAL VULNERABLE CITIES IN THE SOUTH REGION OF BRAZIL

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Background and objectives: Anemia is one of the major nutritional deficiencies in children under five years old, with consequences for growth and development. In Brazil, the National Iron Supplementation Program (PNSF) was introduced in 2005, aiming at controlling and preventing anemia in children by administering prophylactic doses of sulfate ferrous to those of 6-24 months. The objective of this study was to evaluate the prevalence of anemia and its association with the of iron supplementation among children aged 12-59 months residing in cities that are part of Brazilian plan without extreme poverty from South of Brazil.

Methods: The study comprised children from 48 municipalities. Blood sampling was collected by peripheral venous puncture, followed by measurement of hemoglobin (Hb) using HemoCue®. Weight and length/height measurements were measured and face-to-face interviews were performed, using a structured questionnaire to obtain complementary information (e.g., socioeconomic, demographic and supplement use). Anemia was diagnosed when levels of Hb<11g/dL. Children were grouped according to the administration of sulfate ferrous: "using/used" (n=688) and "never used" (n=708). Double data entry and validation was done using

Epi-Data®. To evaluate the statistical association, chi-square test was performed in SPSS version 22, considering p<0,05.

Results: A total of 1511 children participated in the study with levels of Hb. The mean Hb was 12.8±1.13 g/dL. The majority of the children were male (51.5%), aged ≥24 months (71.4%), had a monthly family income of ≤1 minimum wages (32.7%) and were being monitored in health services since birth (93.1%). From the total sample, 49.3% were never supplemented and the prevalence of anemia was 4.9% (n=74). While the prevalence for children aged 12-24 months was 9.9% (n=43), for those with more than 24 months was 2.9% (n=31). When we compared the prevalence of anemia between those that were supplemented and those who were not, the prevalence were 4,2% (n=30) and 5.5% (n=38), respectively, with no statistical difference (p=0.26).

Conclusions: We conclude that the prevalence of anemia is considered acceptable, according to the World Health Organization. Furthermore, the determinants that are associated to this prevalence deserves further investigation, which seems not to be related to iron supplementation.

Keywords: Anemia; Children; Brazil, Iron Supplementation, Healthy Policy.

Further collaborators: We aknowledge the contribution of Dr. Daniela Cardozo Tietzmann and David Gonzalez to this study.

144/1371
DIET QUALITY INDEX ASSOCIATED WITH DIGITAL FOOD GUIDE – 2017: UPDATE AND VALIDATION

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Background and objectives: Background. Inadequate eating habits represent one of the main factors associated with chronic non-communicable diseases and nutritional deficiencies; food guides provide guidelines aiming to contribute to the promotion of health. The Diet Quality Index associated with the Digital Food Guide (DQI-DFG) was developed in 2011 from guidelines of School of Public Health at Harvard University, with adjustments for the Brazilian food habits. Objective. Analyze, improve and validate the Diet Quality Index associated with the Digital Food Guide, as a tool for food intake and diet quality assessment.

Methods: Method. The following psychometric properties were used: (a) content validation by building a consensus on healthy eating and diet quality index among experts; (b) construct validation through enhancement of a reference diet to determine recommended serving sizes and consumption ranges; correlation between each food group score and energy value; comparative analyses between menu assessment by experts and DQI-DGF application results to confirm the score criterion; (c) reliability from agreement analyses between the result shown by the evaluators and result presented by DQI-DFG; correlation between each food group score and total score Index to understand the relationship among this variables.

Results: The Index score is not dependent on energetic value (r=0.24). There is a high correlation between the score assigned by experts and the DQI-DFG result (r=0.78 until r=0.97).

Conclusions: Consensus result performed among experts legitimates the concepts that justify DQI-DFG; there was an agreement between menu quality evaluation by experts and the results shown by DQI-DFG; the correlation between food groups scores were weak and Index application result by evaluators agreed with the final DQI-DFG. The DQI-DFG update satisfied validation and reliability criteria.

Keywords: Healthy eating. Index. Diet Quality Index. Food and Nutrition Education.

144/1416
PREVALENCE OF IRON DEFICIENCY ANEMIA IN NON-PREGNANT WOMEN OF REPRODUCTIVE AGE LIVING IN KUALA LUMPUR, MALAYSIA

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Background and objectives: Anemia affects 1.65 billion individuals worldwide, especially young children and women of reproductive age. Anemia prevalence in pregnant women (hemoglobin <110 g/L) in Malaysia is estimated to be 38%. However, there is limited evidence on the prevalence of anemia and iron deficiency anemia (IDA) in non-pregnant Malaysian women and no studies have adjusted ferritin values for inflammation. This cross-sectional study aims to determine the prevalence of anemia and IDA in a sample of healthy non-pregnant Malay and Chinese women (19-45 years) living in Kuala Lumpur, Malaysia.

Methods: Fasting blood samples were collected from women living in Kuala Lumpur, Malaysia (n=210) and, for comparison purposes, from women living in Vancouver, Canada (n=206). Malaysian participants were of Malay (n=105) and Chinese (n=105) descent; Canadian participants were of European (n=110) and Chinese (n=96) descent. Samples were analyzed for hemoglobin, plasma vitamin B12, serum retinol binding protein (RBP), serum iron biomarkers (soluble transferrin receptor [sTfR] and ferritin),

and acute and chronic inflammation biomarkers (C-reactive protein [CRP] and α-1 acid glycoprotein [AGP]).

Results: Anemia (hemoglobin <120 g/L) prevalence was higher in Malaysian women compared to Canadian women (18% and 7%, respectively; p=0.001). In Malaysia, 11% (n=24) of women had IDA (based on hemoglobin <120 g/L and either inflammation-adjusted ferritin <15 µg/L or sTfR >8.3 mg/L), compared to 3% (n=6) of Canadian women. No significant ethnic differences were found among women in anemia or IDA prevalence. Depleted iron stores (inflammation-adjusted ferritin <15 µg/L) were found in 21% of Malaysian women and in 15% of Canadian women. The prevalence of acute (CRP >5 mg/L) and chronic (AGP >1 g/L) inflammation was 7% and <1%, respectively, in Malaysian participants, compared to 4% and <1% in Canadian participants. Adjustment for inflammation (using AGP and CRP biomarkers) did not change the prevalence of IDA in Malaysian or Canadian women. There was no biochemical evidence of vitamin A deficiency (RBP <0.7 µmol/L) and <1% of women had vitamin B12 deficiency (B12 <148 pmol/L) in both populations.

Conclusions: These findings suggest that over half the anemia in Malaysian non-pregnant women is attributed to iron deficiency. Further research is required to investigate the prevalence of IDA in a nationally representative sample.

Keywords: anemia, hemoglobin, iron, Malaysia, women

144/1520

NEW MIDDLE EUROPEAN REFERENCE VALUES FOR DIETARY PROTEIN INTAKE IN THE ELDERLY

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Background and objectives: Physiological aging is characterized by a steadily reduced protein synthesis capacity, a decreased postprandial amino acid availability and a diminished peripheral blood flow. We hypothesize that these age-dependent impairments in protein/amino acid metabolism can be slowed down by a nutritive protein intake >0.8 g/kg bw.d as recommended for younger adults.

Methods: In the obligatory updating of the D-A-CH Reference Values (RDAs) for Nutrient Intake we conducted a systematic literature review (PubMed, Embase; last entry: December 2016) identifying observational and clinical studies. The selection of and data extraction from studies included in the review were performed by two independent reviewers. The Working Group Of the German, Austrian and Swiss Societies evaluated the results obtained and draw conclusions with respect to the revision of RDAs for older adults.

Results: In several prospective cohort studies and a single cross-sectional trial, a positive correlation between protein intake and functionality was observed in older adults. In women aged 60 to 72 y, a protein intake of at least 1.2 g/kg bw.d showed an improved muscle strength and better mobility compared with participants consuming not more than 0.8 g/kg bw.d. A protein consumption of 1.2-1.6 g/kg bw.d was associated with an increased lean body mass compared with 0.8-1.0 g/kg bw.d in women aged 68 y (median). In postmenopausal women (75 y, median), a protein intake of 81 g/d was associated with a higher bone-free lean body mass and body cell mass than in those participants only consuming <66 g/d. Two recent prospective cohort studies showed within the 3y observational period a lower incidence of frailty in the quartile withthe highest protein intake (1.27 g/kg bw.d and 1.2 g/kg bw.d, respectively) compared to the quintile with lowest intake (<1.0 g/kg bw.d)

Conclusions: The results of our systematic evaluation of actual research work confirms our working hypothesis that a protein intake >0.8 g/kg bw.d can slow down impairments in protein/amino acid metabolism during aging. The working group, thus, recommend to increase the RDA for older adults (>65 y) for protein up to 1.0 g/kg bw.d.

Keywords: Protein intake, dietary allowances, elderly, systematic review.

Further collaborators.

Working group of the German, Austrian and Swiss Nutrition Societies (D-A-CH)

144/1563

IMPACT OF MICRONUTRIENT POWDERS COMBINED WITH MALARIA CHEMOPREVENTION ON ANEMIA, MALARIA AND COGNITIVE DEVELOPMENT: A CLUSTER-RANDOMIZED STUDY IN MALIAN CHILDREN

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Background and objectives: Anaemia is common in preschool African children, and is mostly due to iron deficiency and Plasmodium infection. Combining iron interventions with interventions against malaria may be more efficacious and safer than

iron interventions alone. We examined the impact of home fortification with micronutrient powders, delivered alongside seasonal malaria chemoprevention, parenting education and community based preschools in rural communities in Southern Mali over a two year period.

Methods: Sixty communities with community preschools were randomly allocated to the intervention and control group. All 60 study communities received two rounds of seasonal malaria chemoprevention during the peak malaria season (Oct-Dec), targeting all children aged 3-59 months. The 30 intervention communities then received daily home fortification with micronutrient powders containing 12,5 mg of elemental iron for four months (Jan-April) targeting all children aged 6-59 months. Two cross sectional surveys were conducted at baseline (May-June 2014) and endline (May-June 2016) to compare Plasmodium infection, nutritional indices and cognitive performance in children aged 3 and 5 years (N=1,105 and N=1,033 respectively).

Results: At baseline in 2014, 63% and 53% of children aged 3y and 5y were anaemic, 49% and 60% had Plasmodium infection and 43% and 34% were stunted. Despite high reported coverage for both chemoprevention and home fortification, the preliminary results from June 2016 found that after three years of intervention there was little discernible difference in anaemia (<110g/L) between the two intervention groups; 51.8% vs 48.9% in children aged 3 years, and 46.6% vs 40.6% in children aged 5 years; and negligible effects for stunting . The full results of the 2016 survey will be presented at ICN meeting.

Conclusions: Home fortification with iron-containing micronutrient powders is recommended by WHO where the prevalence of anaemia is over 20%.. This study found that micronutrient supplementation, when combined with seasonal chemoprevention against malaria, had limited impact on childhood anaemia in an area of high prevalence, despite good uptake of both interventions.

Keywords: Micronutrient, anaemia, malaria, home fortification, iron.

Further collaborators.

Seybou Diarra, Philippe Thera, Kalifa Sidibe, Modibo Bamadio, Yvonne Griffiths, Mouctar Coulibaly, Fatoumata Dougnon, Bore Saran Diakité, Bonaventure Maiga

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A NOVEL 129I TRACER METHOD FOR THE ASSESSMENT OF IODINE FRACTIONAL ABSORPTION AND THYROIDAL UPTAKE IN HUMANS

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Background and objectives: Thyroidal iodine uptake and turnover has been measured in adults using radioactive iodine tracers, but these cannot be used safely in women of reproductive age, pregnant women or children. Iodine 129 (129I) is a semi-stable isotope that is considered safe for use in human trials. Our objective was to assess 129I as a novel tracer for the assessment of fractional absorption (129IFA) and thyroidal uptake (129ITU).

Methods: We administered an oral physiological dose of 129I (129I Dose) to euthyroid young adults with adequate iodine intake. We collected baseline complete urines, complete feces and spot plasma samples. After tracer consumption, we collected complete urines (over seven days), complete feces (three days), and spot plasma (five days, with eight withdrawals on first day). The subjects followed an iodine-standardized diet from three days before until three days after tracer consumption. We measured 129I in alkaline-extracted plasma (129IP), urine (129IU) and feces (129IF) samples by a multicollector ICP-MS by use of isotope dilution analysis with 127I. 129IFA is evaluated as 129I Dose minus 129IF; 129ITU is evaluated as 129IFA minus 129IU; 129IP kinetics allows the evaluation of thyroid uptake patterns.

Results: Four male and four female euthyroid (mean±SD TSH 1.3±0.5 mU/L; T4 110.0±19.7 nmol/L) participants with a median (IQR) urinary iodine concentration of 118 (101-140) µg/L consumed 12.42±0.05 µg 129I. 129IU was first detected ≈1 hour after administration and a median cumulative 129IU of 6.9 (6.4-7.4) µg was excreted within 48 hours; this corresponds to 54.8±10.6 % of the 129I Dose. Results: **Conclusions:** A novel 129I-tracer based method successfully quantified 129I renal excretion patterns, showing that ≈55% of ingested oral iodine is excreted in the subsequent 48 hours. Quantification of 129IFA and 129ITU thyroidal uptake patterns are pending. This promising and safe tracer methodology can safely be used in all age groups to investigate a variety of research questions on thyroid health and iodine nutrition, including iodine requirements in pregnancy, lactation and infancy.

Keywords: 129I, mass-spectroscopy, dietary iodine, thyroid uptake, iodine kinetic.

144/1660

INTERRELATIONSHIPS BETWEEN FATTY ACID COMPOSITION IN PLASMA CHOLESTEROL ESTERS AND PHOSPHOLIPIDS IN MEN AND WOMEN - A POOLED ANALYSIS

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Background and objectives: Fatty acid (FA) proportions in cholesterol esters (CE) and phospholipids (PL) are widely used as biomarkers of dietary fat quality. Information on how proportions in these fractions correlate could have implications for interpretation and use of FA biomarkers in observational and interventional studies. The objectives of this study were to investigate correlations between FA proportions in CE and PL among free-living individuals and to assess how diet-induced alterations of FA proportions correlate between fractions.

Methods: Spearman's rank correlation coefficients (rs) between FA proportions (% of total FA) in circulating CE and PL were calculated separately in 8 individual study populations (total n=2052) and pooled by inverse-variance weighted meta-analysis. Additionally, each study population was stratified by age, sex, BMI, and type 2 diabetes status and strata-specific rs were pooled by meta-analysis. Furthermore, rs between FA changes in CE and PL during isocaloric dietary interventions were calculated separately per treatment in two randomized controlled trials (total n=79).

Results: Overall, FA proportions in CE and PL ranked individuals similarly. Polyunsaturated FA proportions correlated especially strongly between fractions, with pooled rs (95% CI) ranging from 0.74 (0.72; 0.76) for α-linolenic acid to 0.92 (0.91; 0.93) for eicosapentaenoic acid. Weak correlations (pooled rs< 0.4) were only observed for, palmitic acid and stearic acid, with pooled rs (95% CI): 0.29 (0.24; 0.33) and 0.30 (0.26; 0.34), respectively. Correlations were not evidently affected by age, sex, BMI, or type 2 diabetes. Strong correlations (rs≥ 0.6) between diet-induced FA changes in CE and PL were observed for most PUFA and especially eicosapentaenoic acid , where rs ranged 0.85-0.94 after different treatments.

Conclusions: Correlations between FA proportions in CE and PL were generally strong, suggesting that FA proportions in these fractions can be used interchangeably in diverse populations.

However, caution is advised when comparing results from studies assessing palmitic acid or stearic acid in different lipid fractions.

Keywords: Biomarker; Fatty acid; Cholesterol ester; Phospholipid; Meta-analysis.

144/1735

ZINC INTAKES AND DIETARY SOURCES IN AN IRISH ADULT POPULATION

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Background and objectives: Adequate zinc intakes are important for growth, immune function and cognitive health. Zinc deficiency affects approximately 17% of the global population, with young children and older adults at increased risk. There is currently limited data on zinc intakes in the Irish population. Therefore the aim of this analysis is to determine zinc intakes and sources in Irish adults using data from the cross-sectional National Adult Nutrition Survey (NANS).

Methods: The NANS assessed habitual food and beverage intake between 2008 and 2010 for 1500 Irish adults (18-90 years) using a 4-day semi-weighed food diary. 2552 food codes were aggregated into 33 food groups, representative of the overall diet. Differences in zinc intakes were assessed using one-way ANOVA and independent t-tests.

Results: Mean daily zinc intakes were 10.3mg in the total population. Males (11.6mg) presented greater intakes than females (9.0mg) (P<0.001). In comparison to the younger males (12.4mg), intakes of zinc were significantly lower in older males (10.2mg) (P=0.004). Smokers presented significantly lower zinc intakes than non-smokers in the total population, while intakes were significantly greater in supplement users than non-supplement users (P<0.05). Similar differences were observed when the population was split by gender (P<0.05). The Institute of Medicine recommend daily zinc intakes of 11mg and 8mg in males and females, respectively. These intakes were achieved by the current population. The dominant food groups contributing to zinc intakes were unprocessed red meat (22.3%), wholemeal/brown bread and rolls (10.1%), processed red meat (7.5%), white meat (5.7%) and white bread, rolls, scones and croissants (5.1%).

Conclusions: In summary, zinc intakes are adequate in this Irish population; however, they should be monitored continuous-

ly, particularly in older men as they presented significantly lower intakes.

Keywords: Zinc, dietary intakes, dietary sources.

144/1740

PHYTIC ACID CONTENT DETERMINES THE IRON BIOAVAILABILITY FROM WHEAT GENOTYPES

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Background and objectives: Biofortification envisages identification, selection and stabilization of genotypes with higher nutrient contents. However ensuring bioavailability of nutrients is required for the intended beneficial outcome in target population. The objective of the present study is to understand the relationships amongst iron content, iron bioavailability and phytic acid content among wheat genotypes.

Methods: Iron and phytic acid content in 22 different wheat genotypes were estimated using standard methods. The iron dialyzability after simulated digestion of wheat flour was performed in a 6-well plate format. The iron content in the digesta and dialysable fraction were estimated by atomic absorption spectrometry.

Results: The iron and phytic acid content of wheat genotypes varied from 3.3 to 4.9mg/100g and 2.2 to 8.9mg/100g dry weight, respectively. The dialyzable iron and percent dialyzability are in the range 0.24 to 0.72mg/100g and 7.4 to 16%, respectively among the 22 wheat genotypes tested. There was no significant correlation amongst iron content with that of either iron dialyzability or phytic acid content. However, phytic acid content negatively correlated with that of dialyzable iron content (correlation coefficient-0.0641 p=0.0013)

Conclusions: The above results suggest significant variability in iron, phytic acid content and bioavailable iron among wheat genotypes. The phytic acid but not total iron appears to determine the extent of iron dialyzability. These results suggest that iron and phytic acid content alone appear to provide the key selection marker for breeding wheat to improve iron status

Keywords: Biofortification, bioavailability, in vitro digestion, phytic acid.

144/1755

MEASUREMENT OF HUMAN MILK INTAKE USING STABLE ISOTOPE IN INDIAN RURAL INFANTS FROM BIRTH TO 24 MONTHS: A LONGITUDINAL STUDY

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Background and objectives: Exclusive breastfeeding for first six months of life, followed by complementary feeding and continuation of breastfeeding is advocated by international health agencies. In this study, human milk intake from birth to 24 months was measured, and its associations with maternal and infant factors were studied.

Methods: In this community based, longitudinal study data collected were: Socio-demographics, anthropometry (weight, length and skin-folds of mother and offspring), morbidity and diet recall. Using deuterium oxide (30g) dose-to-mother technique, saliva samples of mother and infant were collected (on day 0, 1, 2, 3, 4, 13, and 14) at 1, 3, 6, 12, 18 and 24 months post-partum, and were analyzed by Fourier transform infrared spectroscopy. The human milk intake and non-milk oral water intake were estimated using a standardized method. Associations between human milk intake and maternal and infant factors were studied using correlations and linear mixed models. Approval from the Institutional Ethics Committee was obtained.

Results: Thirty rural mother-offspring pairs (age 29±3y and 30±7d, respectively) were enrolled. The mean human milk intake increased from 1st to 6 months from 686 ±162 to 844 ±117 g/d (p<0.001), and then decreased to 534 ±239 and 380 ±239 g/d at 18 and 24 months respectively. Rate of breastfeeding fell from 100% at one month to 97% at 6, 78% at 12 and 52% at 24 months. The human milk intake in first six months was positively associated with maternal fat mass, infant weight, length, sum of skin-folds and anthropometric z scores. After controlling for parity, birth weight, age and gender, human milk intake was associated with only infant's weight (p<0.001).

Conclusions: The HMI increased from first to sixth month, and then decreased significantly after 12 months till 24 months of age in infants who continued to be breastfed. High rate of breastfeeding beyond six months underpins need to assure adequacy of maternal nutrient stores, in this population.

Funding agency: The International Atomic Energy Agency, Vienna, Austria.

Keywords: Human milk intake, breastfeeding, infants, India.

144/1785

VALIDATION OF THE DIETARY REFERENCE INTAKES FOR PREDICTING ENERGY REQUIREMENTS IN ELEMENTARY SCHOOL-AGE CHILDREN

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Background and objectives: Accurate assessment of children energy requirements is important for the prevention of pediatric obesity, which has been a big public health challenge in recent years. The purpose of the present study was to examine the accuracy of Dietary Reference Intakes for predicting energy requirements in elementary school-age children, by using the doubly labeled water as a reference method.

Methods: The doubly labeled water (DLW) method was used to measure total energy expenditure (TEE) in 25 elementary school children aged 9-11 years. The accuracy of DRI predictive equations for TEE was assessed by comparing the predicted TEE (TEE_{DRI}) to the measured TEE (TEE_{DLW}), based on the mean percentage error (bias), the Root Mean Squared prediction Error (RMSE) and the percentage subjects predicted within 10% of TEE_{DLW}. The Bland-Altman plot was used to assess agreement between the two methods.

Results: The DRI predictive equation overestimated TEE by 242.7 kcal/ day (12.6%) in boys, and underestimated TEE by 31.2 kcal/ day (-1.6%) in girls, with the RMSE of 376.7 and 216.8 kcal/ day, respectively. The percentage of accurate predictions was 28.6% in boys and 63.6% in girls. The bland-Altman plot showed larger limits of agreement in boys compared to girls. In addition, there was a proportional bias in case of boys, with a tendency of underprediction in subjects with low TEE and overprediction in subjects with high TEE. On the contrary, no proportional bias was observed in case of girls.

Conclusions: These results suggest that in elementary school-age boys, the DRI predictive equation could be inaccurate in predicting energy requirements. In girls, the present study indicates that the DRI equation could be used accurately at the group level. However, caution should be taken when estimating energy requirements for individual girls as this equation may result in inaccurate estimation in a large percentage of subjects. More studies are required to confirm our findings, and to assess the accuracy of the DRI equations in other groups including obese children, younger children and adolescents.

Keywords: Children, energy metabolism, dietary recommended intake.

144/1790

ESTIMATION OF PROTEIN REQUIREMENTS IN INDIAN PREGNANT WOMEN USING A WHOLE BODY POTASSIUM COUNTER (WBPC)

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Background and objectives: The diets of Indian pregnant women do not often meet their increased gestational protein requirement, as defined by the WHO/FAO/UNU. Since the occurrence of low birth weight is high in India, it is critical to examine how the quantity/ quality of protein intake affects gestational body and fetal protein accretion. While body composition measurements during pregnancy are limited by hydration status and radiation exposure, measuring the naturally occurring radioactive isotope of potassium (40K) in the body, by a Whole Body Potassium Counter (WBPC), is independent of assumptions of the hydration status, and gives accurate estimates of Body Cell Mass (BCM) and further, the fat free mass (FFM). Accurate measurements of gestational BCM, as an indicator of protein accretion, will also define gestational protein requirements. The objective of the present study was to build a WBPC and use it to arrive at protein requirements for Indian pregnant women.

Methods: A state of the art WBPC was constructed in Bangalore, using a shadow shield, with alternate layers of steel and lead to shield four Sodium Iodide (NaI) crystal detectors from natural background radiation. Gamma spectra obtained were used to estimate total body potassium using phantoms of varying shapes/ sizes with known concentrations of potassium chloride and Monte Carlo simulations to adjust for body geometry. Fifty pregnant women were recruited in their first trimester and measurements of anthropometry, body composition and dietary intakes were performed at each trimester.

Results: The WBPC had an accuracy of 3%. Estimates of FFM from the WBPC correlated well with the FFM obtained by deuterium dilution and Dual Energy X-ray Absorptiometry (DEXA). The preliminary results suggest that the protein requirement is 14.2 ± 5.5 g/day in the 2nd trimester and 15.9 ± 7.0 g/day in the 3rd trimester, for a gestational weight gain of 12.5 kg in Indian women.

Conclusions: The results from this first facility in Asia will provide critical data with regard to protein requirement in pregnancy and will address several questions around pregnancy nutrition and birth outcomes in India.

144/2094

MATERNAL IRON ABSORPTION AND IRON TRANSFER TO THE FETUS DURING PREGNANCY IN NORMAL-WEIGHT AND OVERWEIGHT/OBESE WOMEN AND THE EFFECTS ON INFANT IRON STATUS

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Background and objectives: Overweight/obesity causes low-grad systemic inflammation and thereby an up-regulation of the iron regulator hepcidin and a reduction in fractional iron absorption (FIA) even when iron stores are low. Pregnancy increases iron needs because of the expansion of maternal blood volume and fetal needs. It is unclear whether and/or to what extent overweight/obese pregnancy influences FIA, iron supply of the fetus and risk of iron deficiency in mother and newborn. In this case-control study, we (1) determined the impact of maternal overweight/obesity on FIA in pregnancy and on the transfer of iron to the fetus and newborn iron status; (2) confirmed the relationship between BMI, hepcidin, plasma ferritin (PF) and inflammatory markers; and (3) determined differences in women's iron needs during the 2nd and 3rd trimester.

Methods: In this ongoing multicenter case-control study (normal-weight n=36; overweight/obese n=36) we have administered labeled [57Fe]- or [58Fe]-FeSO4 to women during the 2nd and 3rd trimester of pregnancy. We measured FIA determining erythrocyte incorporation of iron stable isotopes 14 days after administration. From pregnancy week (PW) 12 until PW 36 iron-, inflammation and hepcidin were monitored. Iron transfer to the fetus was determined as iron stable isotope concentration in cord blood.

Results: Subject characteristics (mean±SD) in PW 12 for the normal-weight/obese were: age: 32±6/33±5years, BMI: 20.8±2.5/41.0±7.4kg/m2, hemoglobin: 12.1±0.9/13.5±0.8g/dL and PF: 61±23/47±24μg/L. Preliminary data showed an 83% and 24% lower FIA in the 2nd trimester compared to the 3rd in nor-

mal-weight and overweight/obese pregnant women, respectively. Iron isotopes were highly detectable in cord blood. The [58Fe]/[57Fe]-ratio determined in cord blood corresponded to the [58Fe]/[57Fe]-ratio determined in the mother in the 3rd trimester.

Conclusions: In normal pregnancy, FIA increases over time to support increased iron needs of mother and fetus. This is consistent with decreasing hepcidin concentrations during pregnancy. Our preliminary data show a dramatically reduced increase in FIA in overweight/obese pregnant women indicating hepcidin may still play an important role in this group even in the 3rd trimester. Thus, even though iron demands are strongly increased, overweight/obesity may prohibit an adequate iron supply to the expecting mother and the fetus due to persistent subclinical inflammation.

Keywords: Overweight/obese pregnancy, hepcidin, subclinical inflammation, iron absorption, iron transfer to the fetus.

144/2501

RETENTION, IRON BIOAVAILABILITY AND SENSORY EVALUATION OF EXTRUDED RICE FORTIFIED WITH IRON, FOLIC ACID AND VITAMIN B12

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Background and objectives: Food fortification is considered a sustainable long term strategy for the prevention of micronutrient deficiencies in general population. Extrusion technologies enabled rice fortification with iron and other multiple nutrients. In the current study we have developed iron, folic acid and vitamin B12 fortified rice, and tested the retention, iron bioavailability and sensory properties compared to unfortified rice.

Methods: The rice flour is fortified with iron, folic acid and vitamin B12, and extruded rice kernels were prepared using a warm extrusion process. The iron, folic acid and vitamin B12 content were analyzed by HPLC methods before and after washing the fortified rice in water to test the retention. The iron dialyzability after simulated digestion of fortified rice was performed in a 6-well plate format. The iron content in rice, digesta and dialyzable fraction were estimated by atomic absorption spectrometry. The sensory evaluation was done in 84 adult human respondents using triangle test to evaluate if fortified rice was similar to unfortified rice both in the uncooked and cooked form.

Results: The iron (59.3mg±3.2/kg), folic acid (0.136±0.019mg/kg) and vitamin B12 (0.086±0.03 mcg/kg) of fortified rice, pre-

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pared by 1:100 dilution of extruded rice mix with normal rice, is in agreement with expected fortification levels. The retention of iron, folic acid and B12 after incubation of fortified rice with excess water for a period of 1h, is more than 90% for all nutrients. The percent dialyzable iron from fortified rice (1.39%±0.3) was much lower compared to unfortified rice (6.79%±0.54), but net dialyzable iron content was 14 times higher in fortified rice. Triangle test revealed that 95% and 78% of the respondents were not able to distinguish the fortified rice from unfortified rice in uncooked (P=0.85) and cooked form (P=0.15) respectively.

Conclusions: These results suggest that rice fortified with iron, folic acid and vitamin B12 has high retention of nutrients during washing procedures at household levels, and provides more bioavailable iron compared to unfortified rice. Further, sensory studies also demonstrated acceptable similarity between fortified and unfortified rice and therefore can be used interchangeably. Nevertheless, further studies in human subjects are required to validate these in vitro findings.

Keywords: Food fortification, extruded rice, iron, folic acid, vitamin B12, bioavailability, sensory properties.

144/2768

IS ENERGY EXPENDITURE CONSIDERED IN THE LITERATURE WHEN ENERGY INTAKE IS MEASURED? A NEED FOR A METHODOLOGICAL CONSENSUS

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Background and objectives: One of the health-transitions humans have passed during the XX Century related to nutrition is without doubt that from undernutrition to obesity, which persists in the ongoing years of the XXI Century. Energy intake (EI) is a contributing factor and therefore a "hot topic" in nutritional

sciences. The aim of this study was to review if studies including data on dietary intake, and specifically EI, also included data on energy expenditure (EE) and physical activity (PA).

Methods: A systematic search of PubMed from 1953 to December 2015 was conducted. Our systematic search consisted of keywords related to energy intake and nutrition ("nutritional requirements", "recommended dietary allowances" or "diet records"). We used MeSH and MaJR terms to build up a structured search and the final equation was: ("Recommended Dietary Allowances"[Majr] OR "Nutritional Requirements"[Majr] OR "Energy Intake"[Majr] OR "Diet Records"[Majr]) NOT ("Diseases Category"[Mesh] OR "Pregnancy"[Mesh] OR "Breast Feeding"[Mesh]). Filters were "Humans" and "Adults over >19 years".

Results: From 2229 identified articles, 933 articles were finally retained fulfilling inclusion and quality criteria. A total of 307543 adults were included, and most studies had been performed in EEUU, UK, Canada, Australia, Japan and Europe (mainly France, followed by Ireland and Denmark); only 9 studies were conducted in Spain. Few studies took place in Africa in comparison with other continents. Only 15% of the studies included both EI and EE. A great methodological variety was observed, with more than 14 different methods regarding EI, and more than 10 for EE. PA was only analysed in few studies, and mostly not considered for interpretation of data and conclusions. Moreover, PA was commonly measured by non- validated questionnaires.

Conclusions: A great diversity regarding the methodology was observed, which makes comparability among studies difficult. EE and PA are missing in around 80% of studies or not included in interpretation of results. Conclusions regarding EI in adults should not be taken without interpreting EE. We highlight the need for a methodological consensus and analyses standardization regarding dietary intake and energy expenditure in nutritional studies.

Keywords: Energy intake, energy expenditure, physical activity, energy balance.

Further collaborators: Spanish Nutrition Society

144/2887

THE PREVALENCE OF MALNUTRITION IN EN-RICH PROJECT SITES IN BANGLADESH, KENYA, MYANMAR, PAKISTAN AND TANZANIA

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Background and objectives: ENRICH is a Maternal Newborn and Child Health and Nutrition program funded by the Government of Canada and implemented in Bangladesh, Pakistan, Myanmar, Kenya and Tanzania. ENRICH will use nutrition pathway to reduce U5M by strengthening health systems and improving basic nutrition and nutrition sensitive services and addressing nutrition-related causes such as: poor breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (Lancet, 2013). One

of the strategies is promotion of production and consumption of biofortified micronutrient-rich crops which help to reduce vitamin A deficiency and improved iron status among CU5

Methods: The anthropometric assessment was done as part of the project baseline survey. Stratified multi-stage cluster sampling method was used to select households and respondents. ENA for SMART software was used to determine sample size and for data analysis. Children between 6-59 months were measured to determine their nutrition status. Mothers/caregiver's knowledge on Infant and Yong Child Feeding practices and status of household food security were also assessed using a structured questionnaire.

Results: The prevalence of stunting in ENRICH project sites in Bangladesh, Kenyan, Myanmar, Pakistan and Tanzania was 30.9%, 35.1% 39.0%, 33.8% 31.5% respectively. Prevalence of wasting was 6.5%, 5.3%, 7.0%, 10.2% and 4.9% in the same order. Undernutrition was also ranged from as low as 15.3% in Tanzania to 29.7% in Pakistan. The proportion of households with sever food insecurity in Bangladesh, Kenyan, Pakistan and Tanzania was 11.0% 23.0%, 15.5%, 32. 3% respectively. Food insecurity and poor infant and young child feeding practices are among the major underlying causes of malnutrition in the target communities.

Conclusions: Malnutrition is a major public health problem in implementing countries. Integrated nutrition specific and sensitive interventions are required to address the immediate and underlying causes of child malnutrition in the target communities. The project will implement food based interventions such as biofortification to improve availability of nutrient dense foods

Keywords: Stunting, Wasting, biofortification.

Further collaborators.

World Vision Implements ENRICH project in collaboration with Nutrition International and HarvestPlus.

144/2898

ADVERSE EFFECTS ON THYROID OF CHINESE CHILDREN EXPOSED TO LONG-TERM IODINE EXCESS: OPTIMAL AND SAFE UPPER INTAKE LEVEL OF IODINE FOR 7-14-YEAR-OLD CHILDREN

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Background and objectives: The adverse effects of iodine excess on thyroid in children were not well understood. This study aimed to assess the effects of iodine intake on thyroid and explore the safe iodine intake level (UL) for children.

Methods: A multi-stage cross-sectional study involved 2224 children from areas with high iodine content in drinking water.

Twice repeated samplings of 24-h urine and spot urine samples were collected to estimate habitual daily iodine intake of children. Thyroid volume of children was measured and blood samples were collected to determine thyroid function indicators.

Results: This study enrolled 2224 children including 1100 boys and 1114 girls. The median iodine content of water in this study was 181 (67.2-402) μg/L. In the first sampling, the median urinary iodine concentration (UIC) of spot urine and 24-h urine (24-h UIC) were 481 (218-818) μg/L and 380 (203-646) μg/L, while the spot UIC and 24-h UIC were 417 (195-753) μg/L and 397 (200-682) μg/L, respectively, indicating iodine status of children in this study was excessive. The habitual iodine intake (Best linear unbiased predicator, BLUP) of children was 298 (186-437) μg/d. The total goiter rate (TGR) was 9.7% and the incidence of subclinical hypothyroidism (SCH) was 237 (11.5%) in children. TSH of children increased as the increase of iodine intake (r=0.11, P<0.0001), while the incidence of SCH was 11.2% in children with iodine intake of 200-300μg/d and increased accordingly. Adjusted for age, sex, height, weight, logistical regression analysis shows that the risk of TGR significantly increased at iodine intake of 250-299μg/d in 7-10 year-old children and the risk of TGR increased at iodine intake of 300-399μg/d in 11-14 year-old children, and the risk increased as the increase of iodine intake. However, there were no differences in the risk of SCH among different iodine intake groups (P>0.05).

Conclusions: TGR may be a more sensitive indicator to reflect long-term iodine excess. We recommend the UL of iodine for 7-10 year-old children is 250μg/d and the UL of iodine for 11-14-year-old children was 300μg/d.

Keywords: Children, tolerable upper safe intake level, thyroid volume, subclinical hypothyroidism (SCH).

Further collaborators.

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Track 6: Functional Foods and Bioactive Compounds

144/267

BIOINFORMATIC AND CHEMINFORMATIC APPROACHES IN STUDYING BIOACTIVE PEPTIDES DERIVED FROM FOOD PROTEINS

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Background and objectives: There are few criteria to evaluate proteins originating from foods. One of them is resulted from the presence of peptide fragments generated upon the proteolytic enzymes action. These fragments are called bioactive peptides (biopeptides) because they can regulate body functions. Many peptides act as inhibitors of angiotensin converting enzyme (ACE inhibitors), antioxidant, antibacterial, antithrombotic etc. agents. as well as affect the quality of foods due to their taste properties.

The progress in the development of information technologies contributed to the massive growth of scientific interests in the application of computer methodologies in studying bioactive peptide sequences. These methodologies concerning the analysis of biopeptides include e.g.: elaboration of databases of information, development of criteria of evaluation of proteins as the potential source of bioactive peptides, and/or programs to simulate protein hydrolysis to generate biopeptides. This bioinformatic methods are suitable to study peptides especially when combined with the cheminformatic approach including the databases of chemical information about peptides as well as multivariate analyses like principal component analysis (PCA), partial least square methods (PLS) and artificial neural networks (ANN). Such approach is useful in prediction of relationship between the structure and bioactivity of peptides (QSAR approach).

Methods: The aim of the study was to present the methodology involving some examples of bioinformatic/cheminformatic analysis of peptides derived from food proteins. This approach includes the presentation of sources of information on peptides provided in bioinformatic/cheminformatic databases like BIOPEP, EropMoscow, ChemSpider or ChEMBL. Moreover, some examples of cheminformatics methods to study the properties of peptides in the context of their bioactivity will be presented.

Results: The results of such studies can be useful when combined with the research concerning generation of peptides with use of commercial enzymes or human digestive juices.

Conclusions: The approach presented above enables developing the knowledge on peptides derived from different foods.

Keywords: Bioactive peptides, proteins, bioinformatics, cheminformatics.

144/402

GINSENG OLIGOPEPTIDES PROTECT RATS AGAINST BINGE DRINKING–INDUCED LIVER INJURY

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Background and objectives: The present study aimed to investigate the effects and mechanism of ginseng oligopeptide (GOP) on acute alcohol poisoning in rats.

Methods: A total of 70 SD rats were randomly assigned to 7 groups, including a normal control group, a model group, a whey protein group (0.2500 g/kg) , and 4 GOP intervention groups (0.0625, 0.1250, 0.2500, 0.5000 g/kg). 7 g/kg/BW 50% v ethanol was given intragastriclly after the 30 days of rat stomach-gavaged continuously. The serum aminotransferase and inflammatory cytokine were assayed, the alcohol dehydrogenase (ADH) activity and oxidative stress and lipid peroxidation parameters in liver tissue were conducted.

Results: We found that the GOP treatment reduced the levels of TNF-α, IL-6,IL-1β in serum and MDA concentrations in liver ($p<0.05$), increased the levels of AST, ALT in serum and the contents of ADH, SOD, GSH and GSH-PX in liver tissue($p<0.05$).

Conclusions: These findings suggest that GOP have a significant protective effect on cute alcohol poisoning in rats and acute liver injury, and the underlying mechanism may be related to inhibit the inflammatory response and Lipid peroxidation reaction, and to improve the alcohol dehydrogenase activity and enhance anti-oxidative activities.

Keywords: Ginseng oligopeptide; Binge Drinking–Induced Liver Injury; Oxidative stress; Lipid peroxidation; Inflammatory response.

Further collaborators: Some issue about the peptide nutrition.

144/416

EICOSAPENTAENOIC ACID AND DOCOSAHEXAENOIC ACID HAVE ANTIDEPRESSANT EFFECTS WITH 17B-ESTRADIOL INJECTION VIA REGULATION OF A NEUROBIOLOGICAL SYSTEM IN OVARIECTOMIZED RATS

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Background and objectives: Our previous studies found that n-3 polyunsaturated fatty acids (PUFAs) and estrogen had

synergistic antidepressant-like effects. The purpose of the present study was to investigate the hypothesis that three major n-3 PUFAs, α-linolenic acid (ALA), eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), individually had antidepressant effects combined with 17β-estradiol-3-benzoate (E) through a neurobiological pathway in ovariectomized (OVX) rats.

Methods: The experimental protocol was approved by the Institutional Animal Care and Use Committee of Hanyang University (HY-IACUC-16-0044). Rats were fed a modified AIN-93G diet with 0% n-3 PUFAs, and 1% ALA, EPA and DHA relative to total energy intake for 12 weeks, and were injected with corn oil or E every 4 days during the last 3 weeks.

Results: Regardless of E injection and sham surgery, supplementation with ALA increased the brain phospholipid proportion of 18:3n3 as compared to the NC diet and supplementation with EPA and DHA. Supplementation with ALA, EPA and DHA increased the brain phospholipid proportions of 20:5n3, 22:5n3 and 22:6n3; this increase was greater with EPA and DHA than ALA supplementation. Supplementation of EPA, DHA and E increased serum concentrations of serotonin and climbing behavior, and decreased immobility during a forced swimming test. Supplementation with EPA, DHA and E also decreased hippocampal expressions of interleukin-6 and tumor necrosis factor-α, and increased cAMP response element binding protein, brain-derived neurotrophic factor (BDNF) and estrogen receptor-α. Immunofluorescence staining consistently showed elevated expressions of BDNF. Magnetic resonance spectroscopy showed that E increased glucose and decreased glutamate, glutamine and myo-inositol concentrations regardless of n-3 PUFA supplementation. In addition, supplementation with EPA, DHA and E decreased levels of nitric oxide metabolite. However, ALA had no antidepressant effect.

Conclusions: The present study suggested that the antidepressant-like effects of EPA and DHA supplementation and E injection could be due to the regulation of serotonergic neurotransmission and inflammatory cytokines, rather than due to the anti-oxidative system. Supplementation with n-3 PUFA and E had the additional function of modulating neurometabolites in the hippocampus.

Keywords: BDNF. Depression. Estrogen. Neurometabolite. N-3 polyunsaturated fatty acids.

1'-ACETOXYCHAVICOL ACETATE AMELIORATES AGE-RELATED SPATIAL MEMORY DETERIORATION BY INCREASING SERUM KETONE BODY PRODUCTION AS A COMPLEMENTARY ENERGY SOURCE FOR NEURONAL CELLS

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Background and objectives: Alzheimer's disease (AD) is the most common age-dependent neurodegenerative disorder and causes a progressive decline in cognitive function. Therefore, it has been highly desirable to find a method of preventing and treating AD. 1'-Acetoxychavicol acetate (ACA) is naturally obtained from the rhizomes and seeds of Alpinia galangal. The plants are used as a spice or Chinese medicine in Southeast Asia. ACA exhibits various biological activities. However, the effect of ACA on neuronal cells death remains unclear. Here, we examined the effect of ACA on learning and memory in senescence-accelerated mice prone 8 (SAMP8).

Methods: Eight age-matched SAM resistance/1 (SAMR1) mice and 24 SAMP8 mice (8 weeks old) were used. After the interval (2 weeks) of acclimation, SAMR1 mice were used as homologous controls and 24 SAMP8 mice were assigned randomly to the control group and the 0.02% ACA group and maintained for 25 weeks. After 25 weeks, the learning ability in the Morris water maze test and the Y-maze test were performed. Serum metabolite profiles were obtained by GC-MS analysis, and each metabolic profile was plotted on a 3D score plot.

Results: In mice that were fed a control diet containing 0.02% ACA, the learning ability in the Morris water maze test was significantly enhanced in comparison with mice that were fed the control diet alone. In the Y-maze test, SAMP8 mice showed decreased spontaneous alterations in comparison with senescence-accelerated resistant/1 (SAMR1) mice, a homologous control, which was improved by ACA pretreatment. Furthermore, the contents of betab-hydroxybutyric acid and palmitic acid in the serum of SAMP8-ACA mice were higher than those of SAMP8-control mice and SAMR1-control. We also found that SAMR1 mice did not show histological abnormalities, whereas histological damage in the CA1 region of the hippocampus in SAMP8-control mice was observed. However, SAMP8-ACA mice were observed in a similar manner as SAMR1 mice.

Conclusions: These findings confirm that ACA increases the serum concentrations of betab-hydroxybutyric acid and palmitic acid levels and thus these fuels might contribute to the maintenance of the cognitive performance of SAMP8 mice.

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BREAD FORTIFICATION WITH MICROENCAPSULATED VITAMIN D

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Background and objectives: Vitamin D plays an important role in the health of the population, regarding bone metabolism, cardiovascular system, insulin resistance, diabetes, neurological development, immunomodulation and regulation of cell growth. Active Vitamin D can be derived from the skin, where 7-dehydrocholesterol or diet is formed from its precursor by the action of solar radiation. The evidence reveals that at national and international level, there is a generalized deficiency of Vitamin D. An alternative to diminish this deficiency is to incorporate vitamin D in food of habitual consumption. In our country, fortified wheat flour proves to be a good vehicle since it is of regular consumption and is considered a food of first necessity by the school and adult population. However, the incorporation of vitamin D into food matrices presents a disadvantage, since the thermal treatments that undergo these matrices can limit its bioavailability and bioactivity. Because of the above, microencapsulation is a very good alternative to protect vitamin D for later use in food processing.

The objectives of this research were to evaluate the effect of concentration and degree of dispersion of vitamin D on the quality of the process of encapsulation by ionic gelation.

Methods: Emulsions were prepared from alginate solutions incorporating vitamin D in three concentrations (1, 2 and 3% v / v). Emulsions were prepared at three speeds and a dispersion time of 5 min. Emulsions were evaluated by image analysis. The drop size of the dispersed phase was determined as well as the polydispersity. To obtain the microcapsules, each emulsion was dripped into a solution of $CaCl_2$ (1.0% w / v). The microcapsules were oven dried at 35 ° C for 12 hours. The efficiency of encapsulation and load capacity by spectrophotometry was determined.

Results: The results indicated that EE% and CC% are dependent on the concentration and degree of dispersion of vitamin D. In addition, it was determined that vitamin D concentration affects the size and shape of the microcapsule.

Conclusions: Therefore microencapsulation is a viable alternative for vitamin D. Future studies will analyze the organoleptic quality of bread and the bioavailability of microencapsulated Vitamin D.

Keywords: Vitamin D, fortification.

144/686

STIGMASTEROL SERUM ELECTROLYTES ELEVATING POTENTIALS IN POLOXAMER-407 INDUCED HYPERLIPIDEMIC ALBINO RATS

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Background and objectives: Hyperlipidemia often occurs in conjunction with other metabolic risk factors including glucose intolerance, obesity, diabetes and metabolic syndromes. The study investigated effect of stigmasterol administration on serum calcium, potassium, sodium and phosphorus levels of poloxamer-407 induced hyperlipidemia in albino rats.

Methods: Thirty albino rats were divided into six groups of five rats viz: normal, poloxamer, atorvastatin and 50, 100 and 200 mg stigmasterol treated animals. Poloxamer-407 was dissolved in saline (1g/mL, 40C) and administered by intraperitoneal injection at a dose of 1g/kg body weight. Injections were given at days 1 and 3. Blood samples were obtained by cardiac puncture at baseline, day 4 and post-treatment.

Results: Induction of hyperlipidemia significant decreased serum calcium in positive control (4.52-4.41 mg/dl), atorvastatin (4.34-4.18 mg/dl), 50 mg (5.08-4.46 mg/dl), 100 mg (4.46-4.10 mg/dl) and 200 mg (4.83-4.35 mg/dl) stigmasterol treated rats. Induction serum potassium decreased from 0.69-0.65 mg/dl (positive control), 0.85-0.82 mg/dl (atorvastatin), 0.90-0.79 mg/dl (50 mg), 0.82-0.68 mg/dl (100 mg) and 0.87-0.72 mg/dl (200 mg) stigmasterol treated rats. Induction serum sodium decreased from 55.23-54.97 mg/dl (positive control), 67.13-66.97 mg/dl (atorvastatin), 74.09-65.39 mg/dl (50 mg), 74.28-66.16 mg/dl (100 mg) and 66.35-65.16 mg/dl (200 mg) stigmasterol treated rats. Induction serum phosphorus decreased from 3.38-3.27 mg/dl (positive control), 4.60-4.24 mg/dl (atorvastation), 4.44-4.20 mg/dl (50 mg), 3.81-3.36 mg/dl (100 mg) and 3.51-3.10 mg/dl (200 mg) stigmasterol treated rats. Post-treatment serum calcium increased from 4.18-5.39 mg/dl (atoevastatin), 4.46-5.68 mg/dl (50 mg), 4.10-5.24 mg/dl (100 mg) and 4.35-5.72 mg/dl (200 mg) stigmasterol treated rats. The serum potassium levels at post-treatment increased from 0.82-0.85 mg/dl (atorvastatin), 0.79-0.90 mg/dl (50 mg), 0.68-0.82 mg/dl (100 mg) and 0.72-0.87 mg/dl (200 mg) stigmasterol treated rats. Post-treatment serum sodium increased from 66.97-122.91 mg/dl (atorvastatin), 65.39-123.65 mg/dl (50 mg), 66.16-127.71 mg/dl (100 mg) and 65.16-122.42 mg/dl (200 mg) stigmasterol treated rats. Post-treatment serum phosphorus increased from 4.18-5.51 mg/dl (atorvastatin), 3.69-4.57 mg/dl (50 mg), 4.28-5 mg/dl (100 mg) and 3.52-5.18 mg/dl (200 mg) stigmasterol treated rats.

Conclusions: Stigmasterol has electrolytes elevating potential in a dose dependent manner.

Keywords: Electrolytes, Stigmasterol, Poloxamer-407, Hyperlipidemia, Atorvastatin.

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GLYCOGEN IMPROVES COGNITIVE FUNCTION IN HUMAN AND MICE

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Background and objectives: Recently, we have developed the method of synthesizing glycogen from corn starch by using 3 enzymes, isoamylase, branching enzyme and amylomaltase. We named the product enzymatically synthesized glycogen (ESG), which is equivalent in the physicochemical properties to natural-source glycogen. It is confirmed that ESG possess health-beneficial functions such as immunomodulating effect and dietary fiber like effect. In this study, the effects of ESG on brain function were investigated in human clinical study and animal study.

Methods: Human clinical study: The study was approved by the ethics committee of Ezaki Glico Co., Ltd. and carried out with a placebo-controlled, double-blind, randomized, cross-over design. Thirty-eight healthy adult subjects ingested 5 g/day of ESG or maltodextrin as a placebo for 4 weeks. Before and after 2 and 4 weeks of starting ingestion, cognitive performances were detected by using CogHealth battery. Subjective fatigue and stress markers in saliva were measured simultaneously.

Animal study: The study was approved by the Institutional Animal Care and Use Committee of Ezaki Glico Co., Ltd. and performed in accordance with the Guidelines for Proper Conduct of Animal Experiments (Science Council of Japan). Senescence-accelerated mouse prone 8 (SAMP8) were fed 6.0% ESG containing feed or AIN-93M as a control for 6 month. After that, memory function was evaluated by Morris water maze.

Results: In the human clinical study, supplementation of ESG significantly improved the visual discrimination at 2 week and the memory function at 4 week compared with placebo control. On the other hand, subjective fatigue and stress markers were not changed by ESG. In the study of SAMP8 mice, the better memory function was observed in ESG ingestion group.

Conclusions: In this study, we confirmed that ESG ingestion improves cognitive function in human and mice.

Keywords: Glycogen, brain, cognitive function, human, mice

144/875

SUPPRESSION OF POSTPRANDIAL HYPERGLYCEMIA BY BUCKWHEAT ALBUMIN

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Background and objectives: Diabetes mellitus is a disorder of blood glucose regulation. Most of the patients are categorized into type 2 that shows a symptom of insulin resistance and/or deficiency. For the prevention of type 2 diabetes, it is important to control the postprandial blood glucose level by an appropriate food intake. The retardation of starch hydrolysis by inhibiting the α-amylase activity is one of the effective ways to suppress the elevation in blood glucose level. Wheat α-amylase inhibitor possesses the inhibitory activity against α-amylase and suppresses postprandial hyperglycemia after starch administration. It has been used as a functional component in Food for Specified Health Uses (FoSHU) in Japan. We have already reported that rice albumin is indigestible and effectively suppresses the elevation in blood glucose level not only after starch administration but also after glucose administration. However, the effect of other cereal protein on hyperglycemia has not been fully examined yet. Therefore, the present study was conducted to examine if buckwheat protein could suppress postprandial hyperglycemia.

Methods: Albumin was purified from buckwheat by ammonium-sulfate precipitation and gel filtration. First, the inhibitory activity of buckwheat albumin against α-amylase from human saliva, porcine pancreas and mealworm was evaluated in vitro. Next, rats were administered starch with and without the addition of buckwheat albumin. After the administration, the blood was collected from the tail vein at certain intervals. Then, the blood glucose level and the plasma insulin level were measured.

Results: Buckwheat albumin inhibited the activity of α-amylase from porcine pancreas and mealworm, but did not inhibit that of α-amylase from human saliva. Although buckwheat albumin was hydrolyzed by digestive enzymes, it suppressed the elevation in blood glucose level after carbohydrate administration. The plasma insulin level was also suppressed by the administration of buckwheat albumin.

Conclusions: Buckwheat albumin suppressed postprandial hyperglycemia in vivo though it was digestible indicating that peptides in the hydrolysate maintained the inhibitory activity against α-amylase even after digestion.

Keywords: Inhibition of α-amylase activity, suppression of postprandial hyperglycemia, buckwheat albumin, diabetes mellitus.

144/910

ADDRESSING FOOD, NUTRITION AND ECONOMIC SECURITY THROUGH IRON FORTIFIED RICE TECHNOLOGY

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Background and objectives: The Philippine Food Fortification Law covers mandatory fortification of staples like rice with iron due to the alarmingly high prevalence of iron deficiency anemia (IDA) in 1998 (30.6%). Rice was used as a vehicle for fortification but was projected to be inadequate in 2025 to supply the growing population. During the milling process the recovery rate is estimated at 60% whole grain and 40% broken grain. Objective: This paper presents the results of the different studies of FNRI on iron-fortified rice addressing pronged issues: food, nutrition and economic insecurities besetting the Filipino population.

Methods: FNRI conducted Series of studies on rice fortification: (1) technology generation and product development of iron rice premix (IRP) and iron fortified rice (IFR); (2) efficacy trial; (3) pilot-scale field trials; (4) large-scale commercialization of IFR; and (5) scaling-up in Mindanao and national implementation.

Results: FNRI developed IRP from broken grains made into flour and blended with iron using hot extrusion technology which is stable for 24 months. The IRP is mixed with ordinary rice to produce IFR. An efficacy study among schoolchildren showed significant decline in anemia prevalence from 100% to 33%. The market trials studies in the municipality of Orion, Bataan and the province of Zambales showed that IFR is efficacious in reducing anemia and feasible to be sold in public markets. The FNRI has scaled-up the transfer of the IRP and IFR technologies to several private mills and investors. Currently, IFR is used in the Social Safety Net (SSN) programs of the government.

Conclusions: The technology of IRP addresses the 3 pronged issues: (1) food security by increasing rice supply because the broken rice which is usually used for animal feed is converted to whole grain rice for human consumption; and (2) nutrition security by increasing iron intake through fortification, and (3) economic security by converting broken rice which is a low priced rice (PhP 27.00) to high priced whole grain rice (Php 45.00). The proven significant benefits of fortifying rice merits to be scaled up to more millers and investors to make available ample supply of IFR for nationwide consumption.

Keywords: Food, nutrition, economic security, iron fortified rice.
Further collaborators: ILSI-CHP Japan.

144/958

ANTIOXIDANT ACTIVITY AND AVAILABILITY OF POLYPHENOLS IN FRUITS AND VEGETABLES OF MAJOR CONSUMPTION IN THE PERUVIAN POPULATION

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Background and objectives: In fact, a big variety of fruits and vegetables which differ in shape, color, taste and nutritional value are available in the market of the Peruvian population. In this study, the physicochemical characteristics (pH, °Brix and acidity), total phenol content and antioxidant activity of fruits (strawberry, grape, papaya, banana "seda", mango, apple "Israel", watermelon, orange, tangerine, lemon) and vegetables (celery, cabbage, pumpkin, tomato, garlic, onion, Peruvian yellow chili, carrot, baby corn, lettuce) were evaluated.

Methods: The fruits and vegetables were analyzed using physicochemical analysis (volumetric titrations, potentiometric and refractometry methods). The total polyphenol content by the Folin-Ciocalteu method and antioxidant activity by QUENCHER-CUPRAC method (visible molecular absorption spectroscopy).

Results: The strawberry and grape showed the highest total phenolic content in fruits while onion and Peruvian yellow chili showed higher content of polyphenols in vegetables. The highest antioxidant activity in the QUENCHER-CUPRAC assay was found for strawberry, grape, apple "Israel", orange and tangerine while the showed highest antioxidant activity in vegetables was for garlic, onion and Peruvian yellow chili. Additionally, the positive correlation between the phenolic compounds content and antioxidant activity of the studied samples has been noted. However, the linear correlation between the polyphenol content versus the antioxidant activity in fruits was higher than in the vegetables.

Conclusions: Our results revealed that the fruits presented highest availability of polyphenols and a great antioxidant activity in compared to vegetables.

Keywords: Fruits, vegetables, polyphenols, antioxidant activity, peruvian populations.
Conflict of Interest Disclosure: The authors have no conflicts of interest to declare. This study is the doctoral thesis of RFC that has been developed within the Doctoral Program in Biochemistry and Nutrition at the university San Martin de Porres, Lima, Peru

144/990

OXIDATION OF MAJOR CATECHINS IN GREEN, BLACK AND OOLONG TEAS AND THEIR CORRESPONDING BIOACTIVITIES

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Background and objectives: Tea (Camellia sinensis L.O. Kuntze) is the most popular flavored and healthy beverage beyond water in the world. Catechins are the most important compounds in tea due to their physiological activity and the important effect on tea brew color and taste. In different kinds of teas, catechins might be kept, or be oxidized into dimers and other polymers, and could exhibit different bioactivities. This paper will figure out the major catechins oxides, and their corresponding bioactivities.

Methods: In this paper, we compared the content and composition of catechins and their major dimers including theaflavins and theasinensins, in green, black and oolong teas, based on UHPLC and HPLC assisted with electrospray tandem MS. The bioactivities of catechin oxides and the related tea samples were also analyzed based on in-vitro studies.

Results: Besides green teas as non-fermented teas, catechins encounters different degrees of catechins oxidation, whilst different kinds of oxidation pathways to form some kinds of catechin oxides, in black teas or oolong teas respectively as full- or partial- fermented teas. Results: **Conclusions:** Their compositions might induce differential biological activities from those tea samples due to variant oxidation pathways of catechins.

Keywords: Tea, catechin dimers, theaflavins, theasinensins, bioactivities.

144/992

ACCURATE QUANTITATION OF PLASMALOGEN AND RELATED PHOSPHOLIPIDS BY USING HIGH PERFORMANCE LIQUID CHROMATOGRAPHY COUPLED WITH MASS SPECTROMETRY

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Background and objectives: Concentration of plasmalogen (Pls) in human plasma/serum have recently gained attention, since certain patients including those with neurodegenerative disorders have been reported to exhibit reduced levels of Pls. The possible cause of this reduction is the decline in synthesis activity and/or degradation of Pls, although it is still unknown due to the lack of a suitable analytical method. If we can characterize Pls together with its synthesis intermediates (Alkyl-phospholipid (Alkyl-PL), Lyso Alkyl-PL) and degradation products (Lyso Pls and Lyso Acyl-PL) in vivo, the cause of Pls reduction will be clarified. Therefore, in this study, we aimed to develop an accurate method to simultaneously quantitate Pls molecular species along with its synthesis intermediates and degradation products.

Methods: The standards (Pls, Diacyl-PL, Alkyl-PL, Lyso Alkyl-PL, Lyso Pls and Lyso Acyl-PL; Avanti Polar Lipid, Alabaster, AL, USA) were analyzed by mass spectrometry (MS/MS) in the presence of the sodium ion. The resultant product ion specific to each compound was used for the high performance liquid chromatography (LC-)MS/MS operated in multiple reaction monitoring mode. To quantitate the analytes in human plasma, analytical concerns including the extraction and matrix effect were evaluated.

Results: First, by the MS/MS analysis it was shown that Pls yielded a specific product ion in the presence of sodium ion. Similarly, each characteristic product ion from Diacyl-PL, Alkyl-PL, Lyso Alkyl-PL, Lyso Pls and Lyso Acyl-PL species was determined. Under the optimal LC-MS/MS conditions and with the use of the characteristic product ions, all analytes were detected with high sensitivity at femtomole levels. The extraction recoveries of all analytes from plasma were nearly 100%, and matrix effects were not observed. Moreover, as the intra-/inter-day precision and accuracy were sufficient (<20%), the present LC-MS/MS method enabled to accurately quantitate Pls, its synthesis intermediates and degradation products. We are currently applying the novel method to analyze clinical samples.

Conclusions: The herein developed method appears to be a powerful tool for analyzing Pls and may provide a better understanding of their physiological roles in vivo.

Keywords: Plasmalogen, Alkyl-acyl-phospholipid, Diacyl-phospholipid, Lyso phospholipid, LC-MS/MS.

144/1131

MATÉ TEA AND LIPID PROFILE IN OVERWEIGHT WOMEN UNDER CALORIC RESTRICTION

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Background and objectives: Maté tea is a traditional beverage consumed in South America, made from roasted leaves of Ilex paraguariensis. Several studies have shown its hipolipemic properties, due to the presence of polyphenols and saponins. The objective of this research was to analize the lipid profile in overweight women with or without maté consumption and or caloric restriction.

Methods: 119 overweight women between 25 and 50 years old were included into three groups: maté and diet (MD), maté and no diet (M), water and diet (WD). "Maté" groups drank that beverage prepared with 100 g of yerba maté on a daily basis during 12 weeks, while "diet" groups followed a low-calorie diet during that time. Anthropometric measurements and blood tests (including lipid profile: Total Cholesterol, LDL Cholesterol, HDL Cholesterol and Triglycerides) were performed at the beginning and after 12 weeks. Statistical analysis was performed by Student t-test or Wilcoxon test for paired samples and ANOVA ($p < 0,05$ in all cases).

Results: After 12 weeks of treatment, Total Cholesterol fell in all groups (10,21 mg/dl in MD, 18,29 mg/dl in M, 17,63 mg/dl in W, no differences between groups). LDL Cholesterol fell in both maté groups (8,07 mg/dl in MD, 16,04 mg/dl in M group, no difference between groups); HDL Cholesterol lowered in M group (2,09 mg/dl). On the other hand, Triglycerides fell 10,74 mg/dl only in MD group.

Conclusions: Daily maté tea intake helps lowering Total Cholesterol and LDL Cholesterol, and provides a Triglycerid reduction together with a low-calorie diet.

Keywords: Ilex paraguariensis, cholesterol, dyslipidemia.
Further collaborators.
Laboratorio de Enfermedades Metabólicas (Universidad Juan Agustín Maza) and Instituto Nacional de la Yerba Mate.

144/1259

IRON AND ZINC CONCENTRATION IN WHEAT CULTIVARS FROM THE SOUTH BRAZILIAN RECOMMENDED LIST

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Background and objectives: Iron and zinc are important to human nutrition and for human health. The FAO Harvest Plus program is working on biofortification of human food with the objective to obtain biofortified agricultural products. In Brazil, the Embrapa's wheat breeding program begun the research of wheat biofortification in 2009. Since this time many genotypes were characterized for iron and zinc concentration in the grains. The previously results showed that levels above 40 ppm of iron and zinc are high for the evaluated material. On the other side, it is also important to know what we are consuming in our meals. So, the main objective of this research is to evaluate iron and zinc concentration in cultivars from the South Brazilian wheat recommended list.

Methods: Twenty nine cultivars were sowed in the field, in 2015, at the Embrapa's experimental Station. At maturity, spikes of each cultivar were harvested and threshed manually, to avoid iron and zinc contamination. The iron and zinc quantification was performed in an inductively coupled plasma optical emission spectrometer.

Results: For zinc, the results showed an average of 31,04 ppm of zinc. Twelve cultivars with similar concentration formed the highest group, including Vaqueano (the highest with 36,64 ppm of iron), TBIO Tibagi, BRS Parrudo, BRS Guamirim, BRS 327, Marfim, Estrela Atria, Jadeíte, FCEP 50, CD 1440, BRS Marcante and FCEP Campo Real. The lowest group was formed by TEC 10, Ametista, TBIO Sintonia, ORS Vintecinco and LG Prisma (which was the lowest with 23,82 ppm of zinc). For iron, the results showed an average of 35,10 ppm. The cultivar BRS Parrudo was superior in iron to all other cultivars, with 44,01 ppm, confirming previous evaluation. A second group was formed, in which iron concentration varied from 38,91 to 34,49 ppm. The lower group included TEC 10, BRS Marcante, TEC Frontale, Celebra, Estrela Atria, Ametista and ORS Vintecinco (with only 28,91 ppm of Iron).

Conclusions: After this results, BRS Parrudo showed the highest level of iron concentration in the grains and will be the basic material for continuing the breeding research for wheat biofortification in South Brazilian Region.

Keywords: Triticum, biofortification, cereal, breeding.

144/1308

POTENTIAL OF THE POLYPHENOL, CYANIDIN 3-O-GLUCOSIDE, IN PREVENTING CARDIOVASCULAR DEFECTS IN AN ANIMAL MODEL OF HYPERTENSIVE HEART DISEASE

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Background and objectives: Polyphenols are a class of plant compounds which have gained interest in recent times due to reported health benefits. Cyanidin 3-O-glucoside (C3G) is a polyphenol found in abundance in certain dark fruits such as blackberries and black elderberries. Recent animal studies have reported that CG can prevent obesity and diabetes; however, its potential in preventing hypertension and heart disease, has not been studied. The in vitro cardiac effects of CG was studied using a cell culture model - cardiomyocytes exposed to endothelin 1 (ET1), a peptide which contributes to development of hypertension. The in vivo cardiovascular effects of C3G was examined using an animal model - the spontaneously hypertensive rat (SHR); the effects of CG was studied alone or in combination with a conventional blood pressure medication, hydrochlorothiazide (HCT).

Methods: For the in vitro studies, ET1 exposed cardiomyocytes and control cardiomyocytes were treated with and without CG, and cardiomyocyte hypertrophy and cell death were assessed. For the in vivo studies, five-week-old SHR and 5-week old normotensive controls [the Wistar-Kyoto rats (WKY)] were treated with and without C3G (10 mg/kg/day), HCT (10 mg/kg/day), and a combination of C3G+HCT for 15 weeks. Cardiovascular assessments included measurement of blood pressure by tail-cuff plethismography, and heart structure and function using echocardiography.

Results: Our in vitro studies showed that C3G prevented ET1-induced cardiomyocyte hypertrophy and cell death. Our in vivo studies showed that at 8-weeks blood pressure was lowered in SHRs treated with C3G, HCT, and C3G+HCT in comparison to SHRs. At 15 weeks SHRs treated with HCT and C3G+HCT showed lower blood pressure in comparison to SHRs, however, blood pressure was not lowered in SHRs treated with C3G alone. At 15 weeks, SHRs treated with C3G, HCT, and C3G+HCT showed a reduction in cardiac hypertrophy and improved diastolic heart function in comparison to SHRs.

Conclusions: The results of our study show that while CG was cardioprotective, the blood pressure lowering effect of CG was not sustained with increased severity of the disease. The results also suggest that consumption of CG rich dark berries may render cardiovascular benefits.

Keywords: Heart disease, polyphenol, cyanidin 3-O-glucoside, hydrochlorothiazide.

144/1327

IMPACT OF OMEGA-3 FATTY ACIDS IN QUANTITATIVE AND QUALITATIVE FEATURES OF LIPOPROTEIN OF BRAZILIAN SMOKERS AND NON-SMOKERS

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Background and objectives: Cigarette smoking is an independent risk factor for cardiovascular diseases. In addition, smokers have lower plasma omega-3, which contribute to increase the cardiovascular risk in these subjects. Objectives: To evaluate the impact of omega-3 supplementation on traditional lipid profile of smokers and its relation with qualitative features of lipoproteins.

Methods: Based in a randomized and parallel clinical study smokers and non-smokers subjects were enrolled. Omega-3 was administrated in capsules (3.0 g/day) and all subjects were monitored during 8 weeks. After complete demographic (sex, age), clinic (medication, actual disease, familial history of disease), diet (R24h), anthropometric (weight, waist circumference) and habitual physical activity evaluation, blood samples were collected after 12h of fasting. Lipid profile (total cholesterol, LDL-c, HDL-c, triglycerides, Apo AI and Apo B), glucose, insulin, non-esterified fatty acids, oxidized LDL and subfractions of HDL and LDL were analyzed.

Results: Both, smoker (n=17) and non-smoker (n=44) groups showed similar age, ethnicity, diet, physical activity, current medication and Framingham risk score, however smokers group had more male (p=0.039). After 8 weeks of intervention, total cholesterol and LDL-c were reduced in smokers. Triglyceride levels decreased in both groups (smoker= -15%; non-smoker = -17%, p= 0.536) during follow-up time. There was not significant changes in LDL subfraction, however, non-smokers showed higher large HDL (smoker= +5%; non-smoker = +14%, p= 0.010) and lower small HDL (smoker= -3%; non-smoker = -16%, p= 0.024). The omega-3 was associated with non-esterified fatty acids (r=-0.512; p=0.042) and electronegative LDL (r=0.793; p<0.001) in smoker group. Smoker showed 4.85 odds (CI=1.08-21.6; p=0.039) to have the sum EPA+ DHA lower than 8% - a cut off point for high cardiovascular risk.

Conclusions: Omega-3 promoted positive changes in lipid profile of smokers, but only in non-smokers the qualitative features of HDL were improved.

Keywords: Omega-3, lipoproteins, smoking.

144/1516

EFFECTS OF HONEY VARIETIES ON GLYCEMIC RESPONSES, SALIVARY GHRELIN, LEPTIN AND APPETITE RATINGS. A RANDOMIZED CLINICAL TRIAL IN HEALTHY HUMANS

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Background and objectives: Diets low in GI/GL have been associated with lower hunger, increased satiety and lower risk of chronic diseases. Glycemic index (GI) and glycemic load (GL) of honey varieties vary significantly worldwide; whereas GI/GL of Greek honey varieties is unknown. Therefore, the aims of two-studies were to: 1. determine the GI/GL of three honey varieties (fir, heather, pine) and 2. investigate their effects on salivary ghrelin, leptin, insulin and subjective appetite ratings.

Methods: Eleven healthy, normal-weight volunteers participated in GI investigation following International Standard Organization's protocol. Then, eleven healthy, normal-weight women consumed, cross-over, in random order, three-honey varieties, with 3-days wash-out period. Capillary blood glucose samples and salivary insulin were collected at baseline, 60 and 120min. Salivary ghrelin and leptin were collected at baseline and 120min. Subjective appetite (hunger, satiety, desire to eat) were rated on visual analogue scales (100mm, VAS) at baseline and 120min.

Results: Fir was medium GI (63 on glucose scale), low GL (8); heather was high GI (73), low GL (9); and pine high GI (100), medium GL (12). There was a significant main effect of time on blood glucose, salivary insulin, salivary ghrelin, subjective hunger and satiety (p for all<0.05). Peak rise in glucose was significantly higher after pine honey vs. fir and heather (p<0.001 for both). Salivary ghrelin concentrations decreased significantly after consumption of all honeys (p<0.001). Subjective hunger increased significantly after consuming fir (p=0.03) and pine (p=0.04), but not after heather (p=0.08); without significant differences between them. Subjective satiety decreased significantly after consuming fir (p=0.03) and pine (p=0.04), but not after heather; without significant differences between them. No differences were observed for fasting glucose, iAUC for blood glucose, fasting insulin, iAUC for insulin, fasting leptin, 120min-leptin and subjective desire to eat.

Conclusions: Honey varieties produced different GI/GL. All honeys, independently of their GI/GL, decreased salivary ghrelin concentrations, without affecting leptin or insulin, indicating decreased hunger. However, subjective hunger was increased and satiety decreased after consumption of all honey varieties. More studies are needed to investigate the effects of honey varieties on the complex issue of appetite.

Keywords: Honey, glycemic index, ghrelin, leptin.

144/2006

EVALUATING THE EFFECT OF DOUBLE FORTIFIED SALT ON MULTIPLE MARKERS OF IRON STATUS IN CHILDREN AND ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: Salt is one of few universally consumed food vehicles, making it a good candidate for fortification. Iodized salt has been highly effective in reducing iodine deficiency, thus further fortifying salt with iron could improve iron status within populations with poor access to iron supplements and widespread iron deficiency anemia. Intended to provide approximately 30% of one's daily dietary iron requirement, double fortified salt (DFS) has been developed.

Methods: To understand the effect of DFS compared to iodized salt (IS) on several markers of iron status, we conducted a systematic review of published and grey literature with no age restrictions. A total of 14 articles and reports were identified to meet the inclusion criteria. Meta-analyses were performed, and results were presented as mean differences (MD), standard mean differences (SMD), or risk ratios (RR) with 95% confidence intervals (CI).

Results: DFS was found to increase hemoglobin concentration in most studies, and the total MD in hemoglobin concentration was 3.4 g/dL (95% CI: 2.4 to 4.4; 12 trials; 39,682 individuals; I2: 95%). Anemia also significantly decreased among those provided with DFS compared to IS (RR: 0.79; 95% CI: 0.69 to 0.89; 9 trials; 36662 individuals; I2: 98%). However, no significant difference was observed between groups for serum ferritin (SMD: -0.08 μg/L; 95% CI: -1.06 to 0.91; 5 trials; 1775 individuals; I2: 99%) or transferrin receptor concentration (MD: -4.70 μg/L; 95% CI: -11.67 to 2.27; 5 trials; 1,261 individuals; I2: 98%). Notably, for all comparisons high heterogeneity was observed.

Conclusions: DFS could offer a modest increase in hemoglobin concentration, although its ability to improve the iron status of those at the greatest risk of poor iron-related health outcomes could be limited (i.e., pregnant women and young children). Furthermore, effective delivery of DFS could be limited by supply chain requirements.

Keywords: Salt, iron, iodine, food fortification.

EFFECTS OF CONJUGATED A-LINOLENIC ACIDS (CLNAS) FROM POMEGRANATE AND BITTER GOURD SEED OILS ON INFLAMMATORY PARAMETERS IN RAW 264.7 CELL CULTURES

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Background and objectives: Punicic acid (C18:3 – 9c11t13c) and α-eleostearic acid(C18:3 – 9c11t13t), two conjugated isomers of α-linolenic acid (C18:3 – 9c12c15c), are found at high concentrations in pomegranate seed oil (PSO) and bitter gourd seed oil (BSO), respectively. Both conjugated seed oils exert anti-inflammatory effects possibly through mechanisms involving alterations in eicosanoid synthesis, reduction in the levels of signaling proteins and NF-κB, activation of PPARɣ, and reduction in the levels of proinflammatory cytokines. This study aimed to investigate the anti-inflammatory effects of PSO and BSO, compared with those of linseed oil (LSO), on the activity of four cytokines, MCP-1, IL-6, IL-1β, and TNF-α, in RAW 264.7 cell cultures.

Methods: RAW 264.7 (monocyte/macrophage) cells were plated at a density of 5×10^5 cells/mL and treated with samples of PSO, BSO and LSO at 5, 25 and 50 μM for 24 hours before the assessment of activities of MCP-1, TNF-α, IL-6, and IL-1β.

Results: Treatment with PSO, BSO, and LSO resulted in lower activities of MCP-1 and IL-6 in cells compared with those in lipopolysaccharide-stimulated cells (LPS). The activity of IL-1β showed no significant difference among LPS-treated cells and non-treated cells. TNF-α activity dropped in cells treated with BSO, PSO, and LSO.

Conclusions: These results can help to better understand the physiological role of CLNAs in inflammatory processes and contribute to research into the development of nutraceuticals and functional foods rich in CLNAs.

Keywords: Conjugated fatty acids, punicic acid, alpha-eleostearic acid, inflammatory; seed oil.

DETERMINATION OF PARTIAL CONTENT OF PHENOLIC CONTENT AND ANTIOXIDANT ACTIVITY IN CHIA SEEDS (SALVIA HISPANICA L.)

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Background and objectives: Due to the growing interest for the world's public health, functional foods and nutraceutical demand has increase. Chia seeds (Salvia hispanica L.) are a popular food of Mexico since pre-Hispanic, it's considered as a functional food due to its bioactive compounds believed to have health benefits. It possesses a high content of phenolic compounds, which are important for the protection of the lipid oxidation that impact as much as the health of the users as food quality.

Objectives: Determine the content of phenolic compounds and antioxidant activity in methanolic extract of chia seeds.

Methods: The chia seeds used in this project were cultivated in Mexico. Extracts were made with 50g of chia in 250ml of methanol-maceration concentrated by rotavaporation.

Antioxidant capacity was determined using DPPH {2,2-diphenyl-1-picrylhydrazyl} (Bondet, 1997), FRAP {ferric reducing antioxidant power} (Benzie y Strain, 1996) and ABTS {2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) } (van den Berg, 2000) methods, expressing results as mM of TEAC g-1 {mmol Trolox equivalent antioxidant capacity/g}. Previous to the quantification of phenolic compounds by HPLC {High Performance Liquid Chromatography} an hydrolytic split off of the glycosides of polyphenols was performance following the methodology proposed by Taga et al., (1984) and Hempel and Bohm (1996) for the chromatographic technique, with modifications by analyzing the extracts before and after hydrolysis. Total polyphenol content was determined as mg GAE/g {milligrams equivalent of gallic acid per gram of extract} by the Folin-Ciocalteu method proposed by Singleton and Rossi 1965.

Results: The antioxidant activity of the extracts was 2.49±0.15, 8.32±0.91 and 4.77±0.38 mM TEAC g-1 for DPPH, FRAP and ABTS respectively. Total polyphenol content was 1.08 ± 0.03 mg GAE/g. In the chromatographic analysis, caffeic acid was found mainly in the non-hydrolyzed extract (3.47±0.59 mg/g) followed by chlorogenic acid (0.51±0.16 mg /g). In non-hydrolyzed extracts, after hydrolysis was found: myricetin 1.21±0.89 mg/g, quercetin 2.70±1.14 mg /g and kaempferol 0.27±0.12 mg/g.

Conclusions: Regarding the above, chia seeds can be considered as a good component of human diet, due to its high phenol-

ic compounds content (caffeic acid, chlorogenic acid, myricetin, kaempferol and quercetin) with antioxidant activity, which can lead to health benefits.

Keywords: Chia seeds, antioxidant activity, phenolic compounds.

144/2183

EFFECT OF THE STIMULATION WITH (-) EPICAT-ECHIN ON GENE EXPRESSION IN HUVEC CELLS

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Background and objectives: Epicatechin (EC) is the most abundant polyphenol in cocoa. Consumption of cocoa polyphenols has been related with cardiovascular benefits such as decrease in blood pressure and improvement of markers of glucose and lipid metabolism in human. These polyphenols have been shown to modulate gene expression and exert an anti-inflammatory effect. The present study analyzed the dose-response effect of EC stimulation on the expression of genes related with inflammation (NFkB) and endothelial cell function (eNOS) in primary culture of human umbilical vein endothelial cells (HUVEC). The tested doses included concentrations that are achievable by intake of EC containing food.

Methods: HUVEC cells were isolated from the umbilical cord of women with a history of healthy pregnancy who signed the informed consent. Endothelial cells were isolated and cultured using standard methods. Cells were stimulated with three different doses of EC (1, 0.1, 0.01 uM and untreated control) during 4 h. All experiments were conducted in triplicates. RNA was isolated from cells and eNOS and NFkB (p50) mRNA was measured using real time, quantitative RT-PCR by absolute quantitation. HUVEC cells were identified by immunoflorescence staining. Comparison of the mRNA abundance across treatments was conducted by a one-way ANOVA. Statistical analysis was conducted in SPSS v.20 software. This project was approved by the Ethics committee at INMEGEN.

Results: The immunoflorescence staining was positive for endothelial cells. Significant differences in mRNA abundance were found for the analyzed genes. Stimulation with EC at 0.01 uM decreased the expression of eNOS mRNA as compared with control ($p < 0.001$). The expression of NF kB significantly increased after the stimulation with 0.1 and 0.01 uM of EC as compared with control. No effect of the highest dose was observed on the analyzed transcripts.

Conclusions: These results suggest that treatments induced moderate pro-inflammatory changes in the analyzed genes. Further investigation is required to determine the effect of EC at different times and changes in the protein products of the analyzed genes.

Keywords: Epicatechin, eNOS, NFkB, endothelial cells, cocoa.

144/2201

EXPRESSION MODULATION OF AGTR1A AND BDKRB2 GENES IN HYPERTENSIVE RATS TREATED WITH EXTRACT OF CHIA SEEDS

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Background and objectives: High Blood Pressure (HBP) is the principal risk factor for cardiovascular disease. HBP is regulated by the renin-angiotensin system, particularly the angiotensin-converting enzyme (ACE). ACE inhibitors are used as first-line therapy, however, these produce secondary reactions. Searching of natural source is an alternative for HBP treatment and salvia species have shown a hypotensive effect. We analyzed the effect of an ethanolic extract of chia (Salvia hispanica L.) seeds (EESH) on the expression of Agtr1a and Bdkrb2 genes, involved in HBP regulation.

Methods: A hypertension rat model was generated by administration of a nitric oxide synthesis inhibitor: NG-nitro-L-arginine methyl ester (L-NAME). Hypertensive rats (12) were allocated to three different treatments; the first group received captopril, the second group received EESH and the last group remained with administration of L-NAME. Control group (healthy group, 4 rats) was treated with distilled water during the whole study. In the second phase, gene expression analysis was realized by RT-PCR in cardiac tissue samples, using specific oligonucleotides designed for Agtr1a, Bdkrb2 and Gapdh genes. Comparisons of level expression between groups was performed using statistical analyses with ANOVA test.

Results: Rats treated with L-NAME increased its blood pressure: between 310 to 328 mmHg, while the control group showed values of 100 mmHg. After, the administration of the different treatments, rats that was receiving L-NAME showed an increment on blood pressure levels (31.2%), and the administration of captopril and EESH decreased 0.2% of blood pressure levels. Gene expression analysis showed that the administration of L-NAME incremented significantly the expression of Agtr1a gene, in comparison to basal levels (healthy rats). In the hypertensive rats treated with captopril there were no changes in the expression of Agtr1a. The administration of EESH produced a similar effect as captopril in Agtr1a expression levels. The Bdkrb2 gene expression did not show significative changes in the different treatment groups.

Conclusions: The EESH shown to have a similar effect to the captopril on the blood pressure of hypertensive rats. Besides, a regulatory effect of the expression of the genes involved on the modulation of blood pressure was observed.

Keywords: High Blood Pressure, Salvia hispanica L, expression genes.

144/2264

PHYSICOCHEMICAL, FUNCTIONAL AND NUTRITIONAL CHARACTERIZATION OF RAW FLOUR OBTAINED FROM DIFFERENT SWEET POTATO (IPOMOEA BATATAS) AND ÑAMPI (DIOSCOREA TRIFIDA)

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Background and objectives: The main objective in food processing is the use of inexpensive raw materials, high durability and high amount of compounds with nutritional value, in order to reduce the potential costs and prevent deterioration, establishing as a priority the search for new alternatives to increase its conservation.

The use of technological purpose flour in bread and pastry requires knowledge of the characteristics regarding the ability to develop along with the other ingredients that make up the mass. These characteristics of the flour contemplated parameters humidity, water absorption, and enzyme activity bread making quality. This paper aims to characterize two types of flour from artisanal mining, in order to determine their physical, nutritional, functional characteristics and potential uses in baking and pastry

Methods: For this performance from the fruit from a craft collection process it was determined by a proximal composition and activity antioxidants was determine by method DPPH and polyphenols totals. Also, determining the thermal qualities thermal analysis (DSC) and thermo gravimeter (TGA) was performed

Results: Statistically significant differences were found between the samples flour studied humidity (1.88 – 3.57%), ashes (3.51 – 4.42%), protein (5.74 ± 1.36 %), crude fat (0.262 - 1.52%), total carbohydrate (4.48 – 9.02%) and polyphenols (200.8 ± 50.67 mg GAE/100 g dry mass)

The swelling and solubility of both flours showed similar changing patterns as the temperature increased.

Conclusions: The flour obtained show physicochemical characteristic and chemical composition desirable mainly by high protein contain, total carbohydrates. Also, presented high capacity water absorption and swelling power. On the other hand, the phenol content and antioxidant capacity were

All the flour has excellent potential as ingredients for new baking product development

Keywords: Flour, sweet potato, ñampi, tropical roots, functional properties.

Further collaborators.
Dr. Abel Guarda Moraga

144/2330

CONSUMPTION OF MILK PRODUCTS WITH 100% B-CASEIN A2 IMPROVES OVERALL GASTROINTESTINAL TOLERANCE BUT HAD NO EFFECT ON BEHAVIOR OF MEXICAN CHILDREN WITH AUTISM SPECTRUM DISORDER

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Background and objectives: Autism spectrum disorders (ASD) affect two areas of development, the first comprises restricted, repetitive and stereotyped behaviors, second refers to alterations in social communication. There is evidence of behavioral improvement of children with ASD following casein free diets because digestion of β-casein A1, but not β-casein A2, produce an opioid peptide called β-casomofphin 7 which has been associated with behavioral disturbances and gastrointestinal problems. The aim of the study was to compare the effect of milk and cheese ingestion with either a combination of A1/A2 or only A2 β-casein on ASD children's behavior, milk tolerance and intestinal permeability.

Methods: A double-blind, randomized 16-week crossover study was conducted. 22 ASD children and adolescents participated. Subjects underwent 2-week dairy washout followed by 6 weeks of dairy products with β-casein A2 or A1/A2 and a further 2-weeks dairy washout followed by final 6 weeks of dairy products with β-casein A2 or A1/A2. Child Behavior Checklist (CBCL) and Repetitive Behavior Scale-Revised (RBS-R) were applied to measure behavioral changes in internalized and externalized behaviors and repetitive behaviors. Intestinal permeability was evaluated by a lactulose/mannitol test in urine by HPLC. Gastrointestinal tolerance was measured by questionnaire in which the number of bowel movements, consistency, diarrhea, constipation, or loss of appetite were recorded.

Results: No changes were observed in the psychometric questionnaires RBS-R (0.6±8.7 vs. -5.6±9.3, p=0.06) and CBCL (12.8±2.7 vs.13.6±2.7, p=0.16) between treatments which could be a reflection of the integrity of the intestinal permeability, average L/M was 0.01 ± 0.02. Gastrointestinal tolerance was consisitently improved during the intake of products with β-casein A2 than β-casein A1/A2.

Conclusions: In this initial study we conclude that the intake of milk and milk products with 100% of β-casein A2 have benefits in gastrointestinal tolerance but not beneficial effects in overall behaviour of children with ASD. Since mucosal permeability was not affected in our children, we cannot rule out the possibility that milk with 100% of β-casein A2 has a positive effect on the behavior of children with ASD who have increased intestinal permeability or frequent gastrointestinal problems.

Keywords: Autism spectrum disorder, behavior, β-casein A2, intestinal permeability, milk tolerance.

144/2476

TOTAL POLYPHENOL CONTENT AND ANTIOXIDANT CAPACITY IN JUICE AND PEEL OF BLUEBERRIES (VACCINIUM CORYMBOSUM) GROWN IN CAÑETE VALLEY, PERU

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Background and objectives: Blueberries are considered as the king of antioxidant foods, due its high content that protects our bodies from damage by free radicals, unstable molecules that can damage cellular structures and contribute to aging and diseases like cancer. The aim of the present study was to determinate the total polyphenol content and antioxidant capacity of juice and peel from blueberries (Vaccinium corymbosum) grown in Cañete Valley, Peru.

Methods: Folin-Ciocalteu and DPPH methods were used to determinate the concentration of total polyphenol content and antioxidant activity, respectively. Extracts were obtained from juice and peel in four study parameters. At first, solvents with different polarities were tried (water, methanol, ethanol 80% and acetone-water 75%); second, ratio fruit/solvent; thirth, extraction-time and fourth, temperature.

Results: Results in juice: total polyphenol content 3,474 mg Gallic acid/ml juice and antioxidant capacity 12,131 Trolox mg/ml juice. Results in peel: showed solvent acetone/water 75% > ethanol/agua 80% > methanol > distilled water. The ratio 1/10 was greater ratio 1/12. 4 hours-time exhibed the higher values in total polyphenol content 16.40 mg Gallic acid/ml extract and antioxidant capacity 8,90 mg Trolox/g blueberries. The effect of temperatures were studied between 40 to 80 °C. At 60, 70 and 80 °C showed higher total polyphenol content values: 19,213; 26,522; 32,830 mg Gallic acid/ml extract, respectively; however the stability and antioxidant capacity were reduced when increased the temperature: 13,500; 13,675 and 12.525 mg Trolox/g peel, respectively; and at temperatures below about 40-50 °C the total polyphenol content and the antioxidant capacity showed higher stability. It is concluded that the peel has higher total polyphenol content and antioxidant capacity than the juice and fresh whole fruit.

Conclusions: The stability and antioxidant capacity were reduced when increased the temperature (13,500; 13,675 and 12.525 mg Trolox/g peel, respectively).

At temperatures below about 40-50 °C the total polyphenol content and the antioxidant capacity showed higher stability.

It is concluded that the peel has higher total polyphenol content and antioxidant capacity than the juice and fresh whole fruit.

Keywords: Blueberries, polyphenol content, antioxidants capacity.

144/2487

EFFECT OF DEEP FRYING ON BIOACTIVE COMPONENTS OF WHEAT FLOUR PRODUCTS

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Background and objectives: Deep frying is one of the most common cooking methods used for many products, and in particular for cereal based snacks and dishes. Frying uses high temperature and could lead to partial destruction of bioactive components. Frying also changes the microstructure of foods altering the bioavailability of its constituents.

Objective; Hence the present investigation was undertaken to determine the effect of deep frying wheat flour based products on their bioactive components namely, total phenols and flavonoids.

Methods: The flours used were whole wheat (WWF) and refined flour (RWF) as these are commonly used for preparation of staple products. Mineral fortification of flour was one of the variation chosen as many times staple flours are fortified with minerals in developing countries. Whole and refined wheat flour fortified either with iron or zinc (each with 10 & 20mg) were used for preparing 'Chapathis' (Indian unleavened pan-roasted flat bread), and 'Poories' (deep fried flat bread) and analyzed for total and in vitro bioavailable total phenols and flavonoids.

Results: Results showed that the total phenol content in chapathi was higher in WWF products (83.25-93.74 mg/100g) and much lesser in RWF products (19.82-25.96 mg/100g). Similar trend was seen in bioavailability pattern (60-77% for WWF and 36-40% in RWF). Wheat had a small flavonoid content which was higher in WWF products than RWF products. However bioavailability was slimier in WWF and RWF. On deep frying, there was a visible decline in the bioactive constituents, both total phenols and flavonoids reduced in fried products. The bioavailability was also much lesser in comparison with pan-roasted products. In WWF poories, 43-58% of total phenols were bioavailable whereas similar range for RWF poories were 17-21%. Again the RWF products had much lesser availability than WWF products indicating that both refining and deep frying were detrimental to content and availability of bioactive components in wheat flour.

Conclusions: Hence, limiting the use of refined flour as well as deep frying is beneficial to retain maximum bioactive components.

Keywords: Total phenols, flavonoids, bioavailability, roasting, frying.

144/2678

RECOMMENDATION VS. REALITY: A GLOBAL ASSESSMENT OF FRUIT AND VEGETABLE INTAKE AND VARIETY

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Background and objectives: In 2004 the World Health Organization (WHO) and Food and Agricultural Organization (FAO)

established minimum fruit and vegetable intake recommendations for adults at 400 g or 5 servings per day. The basis for this recommendation was epidemiological data that showed a strong inverse relative risk for chronic disease morbidity with fruit and vegetable intakes up to this level. Despite this recommendation, there has not subsequently been a global assessment of fruit and vegetable intake.

Methods: Utilizing WHO World Health Survey data (2002) and FAO food supply utilization data (2012), we evaluated fruit and vegetable intake, fruit and vegetable variety, and intakes of selected phytonutrients in different regions globally.

Results: The results show a striking shortfall globally in fruit and vegetable intake relative to the WHO minimum recommendation, and relatively narrow range of variety. According to this assessment, approximately 75% of individuals worldwide fail to meet WHO minimum intake levels.

Conclusions: These data strongly support the need to better educate consumers regarding the health promoting and risk reducing effects of fruit and vegetable dietary patterns.

Keywords: Fruit and vegetable intake, dietary pattern.
Further collaborators.
Alli Klosner

144/2691

EFFECT OF AQUEOUS LEAVES EXTRACT FROM PASSIFLORA ALATA CURTIS AND VITEXIN, ISO-ORIENTIN IN CO-CULTURE OF MIN6/LYMPHOCYTES FROM NOD MICE IN OXIDATIVE STRESS AND CELL DEATH

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Background and objectives: Type 1 Diabetes mellitus can be associated with increase of oxidative stress and infiltration of cells of immune system, such as lymphocytes CD4+ and CD8+. The P.alata is considered by the Brazilian Pharmacopoeia as a medicinal plant that plays important role decreasing inflammation. The aim was to evaluate the effect of P.alata aqueous leaves extract and vitexin and isoorientin in cell inhibition and free radicals production.

Methods: NOD mice spleen lymphocytes were isolated through the wool column/2,5x105 and cultured with min6 cells/8x104.The co-cultures were treated with different concentrations of P.alata and vitexin and issorientin and analyzed in proliferation of CD4+ and CD8+ lymphocytes to evaluate the concentration of inhibition dose (ID50). The ID50 were used to analysis of Apoptosis, Mitochondria Depolarization, CellRox oxidative stress reagentes, MitoSOX red mitochondrial superoxide indicator and Glutathione ThiolTracker Violet. All analyses were done by flow cytometry. The supernatants were used to evaluate insulin production by ELISA in min6 cells.

Results: The concentration of inhibition proliferation of P.alata was 500μg/mL, Vitexin 200μM and Isoorientin 5μM. The apoptosis demonstrated most of cells in late apoptosis/necrosis and the mitochondrial depolarization was higher in P.alata and Vitexin when compared with Isoorientin. CellRox showed higher in all treatment and Glutathione decrease in all treatment, but in P.alata showed greater decrease of this antioxidant. The production of superoxide treated with Vitexin and P.alata was higher in CD4+. Insulin analysis showed high production of hormone in all treatment. The CD4+/CD8+ lymphocytes are the main type of cells involved in destruction of β cells during type 1 Diabetes Mellitus. The results showed that CD4+ and CD8+,when treated with P.alata or Vitexin and Isoorientin, can inhibits cell prolifera-

tion through mitochondrial depolarization increase the oxidative stress and consequently cell death. Besides that, the high production of insulin demonstrated that β cell in min6 continued to produce this hormone,maintaining viability cellular.

Conclusions: In conclusion, the treatment with P.alata or vitexin and Isoorientin leads to lymphocytes death triggered by increased oxidative stress without causing damage to β cells, therefore these treatments can aid in decreasing cell infiltration in β cells.

Keywords: Passiflora alata curtis, vitexin and isoorientin, antioxidant activity, decrease inflammation.

144/2695

EFFECT OF AQUEOUS EXTRACT OF PASSIFLORA ALATA CURTIS, CATECHIN AND RUTIN IN PROLIFERATION, APOPTOSIS, ERK PHOSPHORYLATION AND AKT SIGNALING PATHWAY OF LYMPHOCYTES (NOD MICE) FROM CO-CULTURE WITH MIN6

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Background and objectives: Passiflora alata Curtis leaves (passion fruit) contains phenolic compounds in its composition with anti-inflammatory and antioxidant properties. This study aimed to investigate the effects of aqueous leaf extract of P. alata, catechin and rutin, compounds presents in the leaves, in lymphocytes submitted to co-culture with MIN6 cells.

Methods: Different concentrations of P. alata (50, 200 and 500μg/mL), catechin (25, 50 and 75μM) and rutin (50, 150 and 300μM) were added separately to cell culture containing lymphocytes (2.5×105) from diabetic NOD mice and MIN6 cells (8×104) and it was maintained in culture for 96 hours (CO2 5% at 37°C)

for analysis of proliferation, apoptosis, ERK phosphorylation cascade's and AKT signaling pathway in TCD4+ and TCD8+ populations. The presence of inflammatory cytokines and insulin in culture supernatant was also analyzed. All analyses were done by flow cytometer (Guava easycyte, Millipore®, Bellirica, USA).

Results: It was observed a decrease in the percentage of CD4+ and CD8+ T cells proliferation after each treatment. The concentrations of P. alata (500μg/mL), catechin (50μM) and rutin (300μM) to be used in apoptosis, ERK, AKT and supernatant analysis were determined calculating 50% of inhibition of lymphocytes proliferation (ID50). Increase in the percentage of lymphocytes in apoptosis and late apoptosis/necrosis was observed when submitted to P. alata. AKT analysis showed lower expression in lymphocytes submitted to P. alata and catechin while lymphocytes in the presence of P. alata and both compounds presented lower percentage of ERK phosphorylation. Decrease in TNFα and IFNλ cytokines was observed in supernatants of P. alata and rutin treatment while the expression of insulin was preserved after all treatments.

Conclusions: TCD4+ and TCD8+ cells develops an important role in triggering type 1 diabetes whereas these cell types attack the pancreatic islets destroying beta cells. In addition, inflammatory cytokines such as TNFα and IFNγ are important mediators of beta-cell death induced by CD4+ T cells. The decrease in the levels of these cytokines after treatment associated with preservation of insulin, inhibition of proliferative T cells, induction of apoptosis and decrease in the expression of AKT/ERK may provide useful information for the treatment of autoimmune diabetes with natural products.

Keywords: Passiflora alata, rutin, catechin, anti-inflammatory effect, NOD mice.

144/2890

EFFECTS OF GENETIC AND ENVIRONMENTAL FACTORS ON PROANTHOCYANIDINS IN SEA BUCKTHORN (HIPPOPHAË RHAMNOIDES)

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Background and objectives: Sea buckthorn (Hippophaë rhamnoides) berries are rich sources of flavonoids and other polyphenols. Proanthocyanidins (PAs) in sea buckthorn have biological activity and may be effective in maintaining health.

Methods: Sea buckthorn berries of three subspecies (H. rhamnoides ssp. rhamnoides, ssp. mongolica and ssp. sinensis) including nine varieties grown in Finland, Canada and China were

collected and the contents of PA oligomers and total PAs were detected using HILIC-ESI-MS-SIR method and BL-DMAC method, respectively.

Results: The three subspecies were separated by three validated factors in the partial least squares discriminant analysis model (PLS-DA). The content of total PAs in ssp. rhamnoides was significant higher than that in ssp. mongolica (p < 0.05). Five varieties 'Prevoshodnaya', 'Prozcharachnaya', 'Chuiskaya', 'Oranzhevaya' and 'Vitaminaya' of ssp. mongolica were separated in principal-component analysis (PCA) model. Sea buckthorn berries of ssp. rhamnoides ('Tytti', 'Terhi' and one of wild origin) harvested during 2007–2013 in Finland and of ssp. sinensis (wild) harvested in 2008 in China were investigated by the contents of PAs based on growth environments. In ssp. rhamnoides, the levels of total PAs in the northern samples were significantly higher than that in the southern samples (p < 0.05). The three varieties ('Tytti', 'Terhi' and one of wild origin) were all well discriminated by latitude in the PLS-DA model. Negative correlation was found between total PAs and most of the temperature and radiation-related variables (p < 0.01), and positive correlation with most of precipitation and humidity variables. In the northern ssp. rhamnoides samples, clearly decreasing trends were found in the contents of total PAs during the growth season until harvest when length of the growth season, temperature sum, and total radiation were increasing. No significant correlation was found in southern samples. Within ssp. sinensis, latitude correlated negatively to total PAs and positively to PA oligomers. In comparison to the latitude, altitude showed less impact on PAs.

Conclusions: Genetic backgrounds and growth environments showed significant influence on the content and composition of PAs in sea buckthorn.

Keywords: Sea buckthorn, proanthocyanidins,subspecies, latitude, weather conditions.

144/3016

EVALUATION OF THE EFFECT OF PARTIAL SUBSTITUTION OF TREATED VETCH SEEDS FLOUR (VICIA SATIVA) BY WHEAT FLOUR (TRITICUM SPP) IN FUNCTIONAL AND SENSORY PROPERTIES OF BREAD

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Background and objectives: Common vetch (Vicia sativa), leguminous used for cattle feed and agricultural land repositioning, have high nutritional composition but contain cyanogenic compounds that not allow human consumption. Vetch could be used for human alimentation if cyanogenic compounds are reduced.

The aim of this work was to study the effect of partial substitution of treated vetch (Vicia sativa) seeds flour, by wheat flour (Triticum Spp) in functional and sensory properties of bread.

Methods: Soaking in water for 24 hours, followed by oven drying at 40 °C (6 or 12 hours) were used in vetch seeds to diminish the cyanogenic compounds, the same which were determined by Spectrophotometry Uv-vis after a Grignard's reaction between the samples and Sodium Picrate. A milling of treated and untreated seeds was carried out to obtain flours, a proximal characterization of those were performed. The levels of partial substitution evaluated in functional and sensorial properties were: 0, 5, 10, 15, 20 y 25%. Volume, weight, loaf volume and height of breads were determined. Brabender Faringraph and extensogramme parameters as well as the moisture absorption and the tolerance indices were evaluated. CO_2 production of the doughs were measured by a fermentogramme essay (60, 52.5, 42, 38 and 42 min). Sensory bread tests were performed to determine bakery aptitude and acceptability.

Results: The cyanogenic glycosides content of the untreated vetch was 0.44 µg/g. After the treatments, these decreased to 0.30 and 0.27 µg/g, respectively, resulting not dangerous for human consumption. In general, these treatments did no change proximal characterization of the untreated seeds flour. CO_2 production were between 820-1000 cc during fermentation. Extensibility (145 mm), tenacity to 5 cm (460 UB) and energy (103 cm2) of dough did not change between 0 and 5 % of substitution. Loaf volumes were from 3.30 to 1.80 cm3/g and correlated with bread heights (8.54-4.65 cm) and arrival time (1.5-4.2 min). Samples supplemented with vetch flour up to 15% and 10% of substitution had acceptability and baking aptitude, respectively.

Conclusions: Functional and sensory properties diminished from 10% of level substitution. Vetch substitution in dough contributes with proteins, fiber, fatty acids, turning bread into a functional food.

Keywords: Vetch, wheat, partial substitution, bread making, functional food.

Further collaborators.
Rosario Barrera

Track 7: Food Culture Practices and Nutritional Education

144/295

LOCAL INSIGHTS INTO THE NUTRITION OF HILL TRIBE CHILDREN UNDER FIVE YEARS IN NORTHERN THAILAND: BEFORE AND AFTER AN AGRICULTURE INTERVENTION

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Background and objectives: Approximately one third of Northern Thai hill tribe children under five years are stunted. Food insecurity and poor nutrition knowledge have been recognized as causes. A nutrition-sensitive agricultural intervention was implemented to address these causes. The aim of this research is to gain an in-depth understanding of local infant and young child feeding (IYCF) beliefs and practices before and after implementation of the intervention.

Methods: A two-day workshop and 30 in-depth interviews were undertaken in June 2014 with health officers, nurses, village health volunteers and carers of children under five years from four ethnic hill tribe villages. An agricultural intervention was implemented involving the provision of hens, vegetable seeds and nutrition education to families with children under age five years, followed by monthly check-ups for six months. One year after implementation, 20 in-depth interviews were conducted with intervention participants. All interviews and the workshop were transcribed and translated from Thai to English and thematically analyzed.

Results: Prior to the intervention, predominant breastfeeding occurred for one to three months and a variety of nutritious complementary foods were delayed in their introduction. Breastfeeding was impeded by the need for mothers to return to work. Infants were usually cared for by older family members and fed water and rice mixtures. Following the intervention some carers delayed the introduction of rice and introduced a variety of nutritious complementary foods, however, the majority of carers continued with previous practices.

Conclusions: The formal intervention trial showed it had benefits in the short term and this research shows that further work would be required for the benefits to be sustained, including cultural change broader structural support in addition to the nutrition sensitive agricultural intervention.

Keywords: Food, nutrition; Indigenous, Child Nutrition and Food Security.

Further collaborators.

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144/906

"DORM FOODS": A WEB-BASED NUTRITION INTERVENTION WITH BRAZILIAN COLLEGE STUDENTS

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Background and objectives: Young adults, especially in college, may be more vulnerable to unhealthy eating. Our objective is to report the experience of a web-based nutrition education program for students focusing on social-environmental factors and food-related behaviors.

Methods: An online course was developed for dormitory-resident college students as part of a student affairs policy at the Federal University of Sao Paulo, Brazil. Two seasons of a 2-months intervention were conducted (100 vacancies/version), aimed to share food-related experiences, creating an atmosphere of consciousness about food production and society. It presented four topics: "Food: memory, affection, identity, citizenship, and nutrients?"; "Eating habits and university dorms"; "Capitalism and food policy: a critical view of the food on your plate"; "Gastro-anomy", and components included messages, videos, readings, discussion forums, and wikis. Initial and final questionnaires were applied to evaluate participant's characteristics, perceptions and behaviors.

Results: There were 167 registrations in overall, and 19% of applicants completed the entire course. Half of the students were from the health sciences campus, 43% referred living in dorms, and 81% reported the need to improve their food habits. Before the course, 51% of students classified their eating behavior as regular. At the end, 77% reported changes, and 72% classified their eating behavior as good or very good. The main positive behavior changes reported were: be more critical and concerned about food and sustainability, preparing own meals, eating out less often, decreasing in consumption of ultra-processed, increasing in consumption of fresh produce, and trying new foods. Participants mentioned some barriers, such as lack of information to make more ethical and sustainable food choices, time constraints, lack of money, organization or motivation. The course components were considered facilitators to behavior change, as well as social support and food accessibility. Although, 95% of participants reported being able to cook, the course did not show impact to develop new culinary skills.

Conclusions: This experience showed potential in increasing knowledge, modifying perceptions and food-related behaviors in academic contexts. Future studies should examine the role of university cafeterias and address online access difficulties to improve adherence to distance education.

Keywords: Food and nutrition education, web-based distance education course, university dorms foods, university.

Further collaborators.

144/1095

THERAPEUTIC PATIENT EDUCATION IN TYPE 2 DIABETES: IMPACT ON HEALTHY NUTRITION HABITS, EMPOWERMENT AND GLYCEMIC CONTROL

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Background and objectives: Background: The education of people with diabetes mellitus (DM) is an essential tool to empower on healthy nutrition habits and optimize treatment.

Objectives: to evaluate acquired healthy nutrition habits, empowerment and glycemic control after a therapeutic patient education intervention in people with DM2.

Methods: a cohort study in people with DM2, carried out by certified SAD/IDF educators who were trained to replicate a structured therapeutic education program focused on motivating on healthy nutrition habits, 5 interactive workshop sessions (groups up to 15 people) of 120 Min of duration, once per week in a row. We used the same educational material in all the Centers and we evaluated changes in habits, weight and knowledge (multiple-choice questions) and test DES-SF 8 before and at the end. Laboratory at de beggining and tree month later. Descriptive statistics and paired Wilcoxon test were performed. (84% who completed the program)

Results: 150 people were evaluated, Age: 57.1 ± 12.1 years, fem. 58.7%, age DM2: 7.7 ± 7.6 years, glycemia fasting 140.1 mg / dl, initial weight 84.3 ± 19.4 kg, treatment with oral drugs 84.7%, insulin 30%, BMI : 32.5 k / m2, smoking 12%, schooling less than 7 years 22.8% and ≥7 years 77.2%. Glycemic control: before A1C: 7.8 ± 2.1% tree month 7.1 ± 2.8%(p<0.002).

Changes in habits (previous and post): intake of 2 or more servings per day of vegetables before 54% and later 72.6% (p<0.0001), 2 or more portions per day of fruit previous 60.6% and later 71.3% (p<0.001), 4 or more intakes /day prior 74% and later 83.3% (p<0.001). Weight loss 1.9 ± 1.36 kg (p<0.04), previous physical activity 52.8% and later 60.5% (p<0.001)

Test of Knowledge: previous 63% and posterior 88% (p<0.0001). The greater knowledge correlated with higher level of education, with males and with greater weight loss.

Empowerment (DES-SF8) before 3.8 and later 4.2 points (p<0.007) The sub-item with the greatest change was goal setting.

Conclusions: Education program focused on motivating had an impact on changes habits and weight loss. We found a significant increase in knowledge, with impact on empowerment and glycemic control.

Keywords: Education, healthy habits, motivation, type 2 diabetes, glycemic control.

Further collaborators.

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144/1115

TRANSLATING FOCUSED ETHNOGRAPHIC STUDY FINDINGS INTO DESIGN AND IMPLEMENTATION OF BEHAVIOR CHANGE COMMUNICATION INTERVENTION IN KENYA

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Background and objectives: The Focused Ethnographic Study (FES) methodology is used to answer a set of program relevant questions that are important for making decisions about future actions for a social, public health or nutrition intervention. We used FES to examine household perspectives on infant and young child feeding (IYCF) practices and beliefs in the Turkana, Marsabit, Isiolo, Wajir and Garissa counties of Kenya. The transitional period from exclusive breastfeeding to complementary feeding, is a period when infants are most vulnerable to the deleterious effects of inadequate nutrient intakes. Based on FES findings, Global Alliance for Improved Nutrition designed a social behavior change communication (SBCC) intervention targeting improved IYCF practices of children 6-23 months in the five Counties.

To design a package of interventions aimed at supporting individuals, households and groups to adopt and sustain high impact

nutrition behaviors specifically IYCF practices based on FES findings within a resilience program in the five counties.

Methods: Based on FES findings, we designed a SBCC intervention focusing on behavior change, social mobilization and advocacy around IYCF including inadequate micronutrient intake, cooking practices and food security. Target was self-help group members including fathers and grandmothers that were also receiving a package of other interventions from consortium partners. The community was reached through care groups and radio listener groups. Talking books were used in areas where there was no local radio frequency.

Results: The FES identified zinc and iron to be the most critical problem nutrients. We reached 5163 households with 6443 children 0-5 years of whom 46% were under 2 years through 230 care-groups and over 100,000 through mass communication on IYCF messages. 170 health workers and 86 CHVs trained on care-group model. Over 20 model vegetable gardens were established. The FES was adopted by MOH as a methodology for identifying IYCF interventions and BCC strategy adopted by Turkana County.

Conclusions: FES provides empirical support for evidence based programming of nutrition interventions in resource-constrained populations. Care-groups and radio listener groups were an innovative model through which community members can discuss nutrition related issues. Engagement with government provides for sustained efforts of promoting IYCF behavior change in the region.

Keywords: FES, Infant and Young Child Feeding, Behavior Change Communication.

144/1242

TYPE OF NUTRITION FACTS PANEL (NFPS) ON PACKAGED FOOD PRODUCTS AND THEIR COMPREHENSIBILITY BY THE CONSUMERS

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Background and objectives: Nutrition information on the packaged foods aids healthy food choices. However, absence of a uniform style of Nutrition Facts Panel (NFP) on the packaged food leads to lack of comprehensibility of NFPs by the consumers. Therefore, the present study aimed at assessing the comprehensibility of commonly found NFPs on packaged foods.

Methods: The study was carried out on 807 consumers aged ≥15 years in Vadodara, Gujarat, India. Each consumer was shown four NFPs, varying in terms of the format and the amount of nutrition information, and their responses were recorded on a pre-tested semi-structured questionnaire. NFP-1 presented nutrients as "per 100g" of the product with fractions of total-fats and

total-carbohydrates. NFP-2 presented nutrients in two tabular formats. One table detailed micronutrients with their significance and second table listed four mandatory nutrients "per 100g" of the product. NFP-3 reported five mandatory nutrients as "per 100g" and "per serving". NFP-4 listed nutrients in two tables. One of the tables had nutrients as "per serving" and "%DV" with five mandatory plus other essential nutrients while the other table presented nutrients as "per 100g." All the NFPs were as per Food Safety Standards Act guidelines (2006).

Results: Comprehensibility of four different NFPs commonly found on packaged foods revealed that the best comprehended NFP was NFP-2(82%) followed by NFP-1(67%), NFP-4(55%) and NFP-3(52%). Percent scores on understanding of NFPs were higher among adolescent girls (53%) and adult females (53%) than their male counterparts, 50% and 45% respectively. Fat was considered by most of the consumers (27%) for evaluating NFPs, followed by energy (23%), protein (17%), vitamins (14%) and carbohydrates (13%). "Nutrients of concern" namely, cholesterol, sugar, TFA and sodium were considered by less than 10% of the consumers. Terminologies that were reported difficult to understand on NFPs were units for expression of nutrients, serving size, nutrients like MUFA (24%), TFA (18%) PUFA (24%),etc.

Conclusions: With the increase in complexity or the amount of information on NFPs, the difficulty in comprehension also increases. Therefore, there is a need to present NFPs in uniform and simplified format so as to make them easy to understand by the consumers.

Keywords: Nutrition facts panel, consumer awareness, packaged foods.

Further collaborators.
Meenu Singh and Suneeta Chandorkar.

144/1334

BREAKING FRESH GROUND ON ADOPTING SUSTAINABLE DIETS: ASSESSMENT OF USING CONSUMER PARTICIPATION TO DEVELOP TOOLS FOR BRIDGING THE INTENTION-BEHAVIOUR GAP

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Background and objectives: When trying to adopt sustainable diets, people often deal with the gap between their good intentions and their actual behaviour. Tools are needed which support people´s needs during the process of diet adoption. To meet those needs, it might be useful to involve people in the developmental process. Therefore, we conducted six workshops in different cities in Germany from September to December 2016. Our workshop

design provided a combination of creativity supporting techniques. The purpose was to enable all participants to develop ideas contributing to the research question: How can we bridge the intention-behaviour gap regarding the adoption of sustainable diets? Besides the workshop results, it is important to explore the potential of our innovative approach by examining the participants' experience with it. The aim of the subsequent survey among the participants was to examine their assessment of the workshop design in combination with the research question, the applied methods and the suitability for active participation.

Methods: We collected the data using seven structured and closed ended questions with a verbalised response scale as one part of an anonymous feedback tool we distributed always after the end of the six workshops. Participants were men and women between the age of 16 and 70 years.

Results: The sampling comprised 82 participants of which 63 (76,8%) completed the feedback questionnaires and 19 (23,2%) didn't fill in the questionnaire. Evaluation shows that 61 participants (96,8%) agree that the research question is suitable for exploration within an idea generation workshop and 58 (92,1%) say that therefore a series of local workshops is sensible. Concerning the applied methods, 62 (98,4%) say that they were suitable for the workshop. Only 2 people (3,2%) claimed that the methods were not supporting the creativity for generating ideas. All participants (100%) grant that involving people in this research is reasonable and 58 (92,1%) say that the participation in the developmental process searching for tools can contribute to their successful application later on.

Conclusions: Our conclusion from the results is that our methodological approach corresponds to the concept of citizen science. Here we see potential for further contributions to this latest research development.

Keywords: Citizen science, consumer input, diet adoption, intention-behaviour gap, sustainable consumption.

144/1348

ASSESSING THE VALUE OF EATING PATTERNS AS MARKERS OF DIET QUALITY IN A RESOURCE-CONSTRAINED SETTING

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Background and objectives: Decades of research have shown that empirically derived eating patterns have substantial power to predict risk for health outcomes, including cardiovascular disease, diabetes, metabolic syndrome, cancers, and a range of plasma biomarkers (Hu 2002; Newby and Tucker 2004; Barbaresko et al. 2013). Rising rates of overweight and obesity in low-income countries have more recently led to use of eating pattern assessment in these contexts, but the approach has been virtually unused in relation to undernutrition. The purpose of this study is to determine the value of this methodology in predicting risk of child malnutrition associated with undernutrition.

Methods: Household eating patterns are identified using exploratory factor analysis with 24-hour, 12-food-group dietary recall data from a clustered survey of 740 households in the Far-West region of Nepal. Survey-adjusted OLS and logistic regression is used to assess the relationship of these patterns to anthropometry of an index child in these households, while controlling for food environment and household characteristics. Similar analysis is performed regressing anthropometric indicators on the household dietary diversity score (HDDS), which is associated with daily per capita caloric availability and is commonly used as a proxy for food security in monitoring impact of development programs.

Results: Three consistent patterns emerged: a "diverse," "energy-dense," and "typical." All else equal, the energy-dense pattern (dairy, sugar/sweets, and oils/fats) was positively associated with WAZ ($p<.01$), WHZ ($p<.001$), BMIZ ($p<.01$), and overweight ($p<.05$) and negatively associated with underweight ($p<.01$) and wasting ($p<.01$). The diverse pattern was positively associated with overweight ($p<.05$), and there was no significant association between anthropometry and the typical pattern. HDDS was moderately correlated with the diverse pattern ($r=.56$, $p<.001$) but not the energy-dense ($r=.14$, $p<.05$) and typical patterns ($r=.13$, $p<.05$). All else equal, HDDS was not significantly associated with any anthropometric measures.

Conclusions: Eating patterns derived from limited dietary data may be sufficient to predict child nutritional status, and eating patterns may offer value beyond simple dietary diversity scores—constructed using the same data—in helping to understand context-specific dietary factors influencing growth. In a resource-constrained setting, understanding the relationship between how people eat and nutritional status may be useful in determining areas for programmatic intervention.

Keywords: Nepal, diet quality, malnutrition, dietary diversity, eating patterns.

144/1564

DOES PEER COUNSELING PROMOTE APPROPRIATE INFANT FEEDING AND BETTER GROWTH IN INFANTS IN URBAN SLUMS IN BANGLADESH?

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Background and objectives: Adequate and age-appropriate nutrition during infancy and early childhood is fundamental for attaining and maintaining the growth and health of children. The objectives of this study is to investigate the association between infant feeding practices, and growth and compared data between control and intervention groups to measure the impact of peer counseling.

Methods: A community-based randomized controlled trial was conducted in selected slums of Dhaka, Bangladesh in which 350 mother-infant pairs were randomized to either receive infant feeding counseling (n = 175) or a control group (n = 175) between September 2014 and July 2016. The outcome data were collected at enrollment, following childbirth, and every two months interval up to 12 months. We have created scales to measure infant feeding practices (IFPs) and anthropometry from birth to 12 mo of age to assess the main outcomes of weight and length. Moreover, we created infant feeding scales based on infant feeding recommendations and run linear regression models to determine the effect of intervention.

Results: Higher proportion of intervention mothers (89%) reported first hour initiation of breast feeding than control mothers (78%). More than 95% of the neonates in both groups received colostrum. More mothers in the intervention group (n = 136, 73%) were exclusively breastfeeding at 5 months compared to mothers in the control group (n = 124, 27%). Better feeding scale scores were associated (p<0.001) with better weight and length gains during infancy. Infants who were in the 75th percentile of the infant feeding scales found to be significantly less stunted (P<0.05) compared with infants who were in the 25th percentile of these scales at intervention group as well as control group at different follow up period (1, 3, 5, 7, 9 and 12 months).

Conclusions: Our results provide the evidence for the effects of peer support on increasing rates and duration of exclusive breastfeeding. Similarly, this study also give a positive support of adhering to current infant feeding recommendations on better nutritional status of infants. Further studies are needed to follow the linear growth of these children during the second year of their life.

Keywords: Infant feeding scale, peer counseling, randomized control trial.

144/1598

DEVELOPING A VOICE MESSAGING INTERVENTION TO IMPROVE NUTRITION IN A LARGE-SCALE HORTICULTURE INTENSIFICATION PROJECT IN SENEGAL

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Background and objectives: Irrigated horticultural production at scale can be a powerful vehicle for income generation in Sub-Saharan Africa; however, there is a need for evidence about how best to integrate nutrition in a scaleable way. This project is unique for two key reasons: 1) it is injecting nutrition (via behavior change communication strategies) into an existing agriculture development project and 2) it is using voice messaging as a delivery mode for nutrition education.

Methods: We will leverage a large, funded, cluster-randomized controlled trial (RCT) that evaluates the impact of the PAPSEN-TIPA development project, which disseminates drip-irrigation and improved horticultural technologies to groups of smallholder farmers in Senegal. One hundred and twenty-four villages in three regions of Senegal are participating in the study (~1275 households). In order to develop the voice messaging intervention we first conducted formative research by conducting focus groups (n=6) with men and women to identify barriers and facilitators to improving infant and young child feeding practices. We combined these findings with baseline results from the larger RCT as well as market surveys.

Results: The focus groups found that men were making food purchasing decisions within households, horticulture crops produced were being sold rather than being consumed within the household and that there was an avoidance of feeding infants and young children "heavy" foods (e.g., animal sourced foods). These findings were complemented with the baseline survey data that indicated that 63% of children consumed a minimally diverse diet and consumption of nutrient-rich food groups was generally low. Moreover, 64% of children 6-59 months surveyed were anemic. These findings were subsequently combined to identify the key messages for the intervention, including: consumption of locally available and affordable animal sourced foods, dark leafy greens and vitamin A rich fruits and vegetables along with messaging around consumption of horticulture within the household. Voice messages will be sent to both mothers and fathers in the study in order to ensure buy-in for purchasing nutrient-rich foods.

Conclusions: This study has the potential to provide important insight into the effectiveness of using mobile technology to inject nutrition into large-scale agriculture development projects.

Keywords: Behavior change communication, infant and young child feeding, nutrition-sensitive interventions.

144/1764

PROMOTING FOOD LABEL INFORMATION READING SKILLS AMONG URBAN ADOLESCENTS IN INDIA - 'READ-B4-U-EAT' STUDY

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Background and objectives: India is home to ~20% of world's adolescents but of whom ≈19.3% are overweight/obese. This in part is attributed to increasing trend of shift from at-home meals to away-from-home meals. Lack of skills to interpret food label information, which can serve as point-of-purchase guideline for healthy food choice can add to the woes. The present study describes an educational intervention that aimed at improving the food label information skills among urban adolescents (13-15y) in a south Indian City.

Methods: Firstly, a KAP questionnaire was developed & its content-validity was assessed by a panel of 3 experts. Test-retest reliability was assessed by administering it among 114 participants within a gap of 7-days. Spearman Correlation co-efficient, difficulty and discrimination indices were calculated to accept/reject questions. The questionnaire thus validated was administered among 170 participants to assess the determinants of food label usage by co-relating label use with demographic details, nutrition awareness and perceptions. 'Read-B4-U-Eat' a multi-component education module comprising 3 interactive sessions, animated film, booklet and 9 posters was developed and tested on 116 participants. The impact of educational intervention was assessed by administering KAP questionnaire pre- and post-intervention and observing food choices of 60 participants in a simulated shopping environment. Retention was assessed by interviewing participants' parents (n=30).

Results: For validating the questionnaire, Spearman-Correlation was calculated for internal consistency. Following this, patterns and words in the questionnaire were changed to finalize using Difficulty index (range: 0.2-8) and discrimination index (≥0.20). General nutrition awareness, specific health claims and perceived weight status were identified as major determinants of food label use. Read-B4-U-Eat module significantly (p<0.05) increased knowledge on manufacturing-date, ingredients, nutrient-panel and quality-symbols & checking of sodium declaration in snacks. After the intervention, use of label information to read fat-content (100%), ingredients, calorie, sugar and protein was increased. Reading date-of-manufacture and best-before-date, quality-symbols also improved notably. Parents (24 of 30) informed that their children's label reading skills retained after 3 months.

Conclusions:

This study was one of the first attempts to equip adolescents to use food label information in India. This can be scaled up for integration in school curricula.

Keywords: Food label, adolescents, educational intervention.

titude of non-Igbo bank workers to local dishes in Abia State and influencing factors.

Methods: Validated and pretested questionnaire was used to obtain data on the demographics, dietary adaptation and attitude to local dishes and influencing factors from 236 non-Igbo indigenes working in various banks and residing in two commercial cities in Abia State. Dietary adaptation was assessed using a Likert scale rating of 10 different local dishes ranging from "Being aware of the dishes" to "Ability to prepare, consume and enjoy the dishes frequently". Attitude was assessed using 12 questions on a 5 point scale rating ranging from "Strongly agree" to "Strongly disagree". Factors influencing dietary adaptation were assessed using 5 point scale rating of 11 questions ranging from "Affected much" to "Never affected". Pearson's correlation was used to determine the relationship between respondents' demographics, dietary adaptation and attitude to local dishes. IBM SPSS Statistics (version 20) was used to analyze the data and significance judged at P<0.05.

Results: Demographic result showed that 18% of the bankers have Igbo mothers, 52% have resided in the State for less than 2 years while 38% have lived in another Igbo speaking State but for less than 2 years (58%). Majority (79%) of the bankers moderately adapted to the local dishes while 35% showed positive attitude to local dishes. Dietary adaptation score positively correlated with having Igbo mother, duration of residence in Abia (P<0.01) and in another Igbo speaking State (P<0.05). Only duration of residence in the State positively (P<0.01) correlated with attitude. Dietary adaptation also positively (P<0.01) correlated with attitude to local dishes. Preconceived myths and fallacies were factors that most affected the level of dietary adaption.

Conclusions: Dietary adaptation and attitude towards local dishes among non-Igbo indigenes working and residing in Abia State improved with duration of residence in the State but were limited by preconceived myths and fallacies.

Keywords: Dietary adaptation, Attitude, Local dishes, Non-Igbo indigenes, Bank.

144/1793

DIETARY ADAPTATION AND ATTITUDE TO LOCAL DISHES AMONG NON-IGBO INDIGENES WORKING IN BANKS AND RESIDING IN TWO COMMERCIAL CITIES IN ABIA STATE. NIGERIA

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Background and objectives: Adapting to local dishes by non-indigenes may be influenced by demographics, education and income as well as exposure and access to host culture and cultural norms. This study aims to determine the dietary adaption and at-

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144/1855

NUTRITION EDUCATION PRACTICES IN HEALTH TEACHERS FROM SHANGHAI K-12 SCHOOLS: THE CURRENT SITUATION, BARRIERS AND WILLINGNESS

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Background and objectives: To investigate the current situation of health teachers performing nutrition education in Shanghai K-12 schools, and to determine the barriers and willingness of teaching nutrition in the classroom.

Methods: A total of 904 health teachers from Shanghai K-12 schools was invited to fill out a Wechat-based questionnaire by

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investigating the current situation of teaching nutrition in the classroom, the barriers and resources of performing nutrition education, and the wiliness of performing future education on nutrition. The questionnaire were self-designed and validated. Logistic analysis was used to identify the factors influencing the education practices and willingness.

Results: There are 722 (84.29%) health teachers currently teaching nutrition in the classroom. Among them, 532 (73.68%) teachers spent less than 1 hour to teach the class. Among the 182 teachers who did not teaching nutrition, 57 (31.32%) reporting that nutrition was not a required course by the school, 69 (37.91) reporting of willing to teach but lack of knowledge, and 17 (9.34) reporting of willing to teach but lack of support. There are 735 teachers willing to develop a future nutrition course, and 762 teachers willing to teach nutrition in other ways. Using the logistic models to identify the factors influencing whether or not teachers were currently teaching nutrition in the classroom, gender, age, school type, level of concerning about nutrition, and the level of received background on nutrition background were identified as significant factors. Using the logistic models to identify the factors influencing whether or not teachers were willing the teach future lessons on nutrition, location, school type, level of concerning about nutrition, and currently teaching nutrition lessons were identified as significant factors.

Conclusions: Nutrition education in Shanghai K-12 schools is not sufficient.

Keywords: Nutrition education, K-12 schools, teachers, barriers, willingness.

144/2014

NUTRITION STATUS AND FEEDING PRACTICES AMONG ORPHANED CHILDREN IN MEXICO

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Background and objectives: Children in abandonment have become an increasing problem in Mexico. According to the National Institute of Statistics and Geography (INEGI) there are 30 thousand children living in orphanages. Children and adolescents institutionalized in orphanages are exposed to greater risks of poor nutrition and health. The aim of this study was to explore the nutrition status and feeding practices among this vulnerable population.

Methods: Quantative: This is a mixed methods study. Quantitative data was taken from (n=24) institutionalized children (<9 years old). Trained personnel measured the children using standardized procedures. Nutrition status of children were categorized according to the World Health Organization criteria. Qualitative: Fieldworkers (n=20) who worked at the orphanage and collected the data, were interviewed to explore their perceived barriers to better food prac-

tices. The interviews were read line by line and then coded. Transcriptions were analyzed using the MAXQDA software.

Results: Quantative: Stunting was prevalent among children (n=11, 45.8%), whereas overweight and obesity had a lower prevalence (n= 2, 8.3%). Qualitative: Three main themes arose from the analysis: 1) Poor hygiene methods: participants reported lack of hygiene in the kitchen and food wasting. "It is quite hard to manage that amount of food with reduced space and hardly any kitchen staff to help out..." 2) Caregiver's attitude/situation: most of the caregivers felt observed; therefore, they might not have acted as usual. "We had everything, from very willing nurses to others very conservative with their methods" and 3) Perceived need for a multidisciplinary approach: Most of the participants reported that there was a generalized need for nutritionist and psychologist to be involved in the caring of the children. "Most of the children need psychological support due to their vulnerable situation".

Conclusions: Results showed that most of the institutionalized children are stunted (this situation might come from previous abandonment situation); furthermore, feeding practices and hygiene methods could be improved. Data showed that there is generalized call for a multidisciplinary approach. Government should be encouraged to improve the nutrition of orphan children around the country.

Keywords: Nutrition status, feeding practices, orphaned children.

144/2159

STRESSORS AND COPING STRATEGIES OF INFANT AND YOUNG CHILD FEEDING PRACTICES IN RWANDA: PERCEPTIONS OF MOTHERS, FATHERS, GRANDMOTHERS AND COMMUNITY HEALTH WORKERS

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Background and objectives: Background: Chronic malnutrition is an unabated public health priority in Rwanda with an unacceptable high stunting prevalence of 38% among under-five year olds. Although exclusive breastfeeding is a social norm and widely practiced, only 18% of children aged 6-23 months are fed in accordance with the recommendation for infant and young children feeding practices, contributing to these high rates.

Aim: This study investigated the everyday challenges towards appropriate infant and young child feeding practices (IYCFP) experienced by community members in poor resource, rural setting of the Muhanga District in Rwanda and how they engage resourc-

es and strategies to deal with these challenges by use of a salutogenic, solution-oriented approach.

Methods: 16 Focus group discussions were held with mothers, fathers, grandmothers and community health workers (CHWs) in Muhanga district (144 participants in total). The discussions were recorded, transcribed verbatim and thematically analyzed using Atlas.ti software.

Results: Two main themes emerged from the data. Firstly, a discourse on optimal practices that reflects the knowledge about and efforts to align with recommendations on proper IYCFP. Second, a discourse on impeded mother-child interaction involved challenges hindering optimal practices and the applied resources and strategies. A number of challenges emerged as impeding appropriate IYCFP being mainly poverty, gender imbalance (laborious women's work and limited support from partner) and seasonal fluctuations. Required resources included time-availability, attentiveness, responsiveness and resources specific to optimal complementary feeding such as availability of proper foods, money, and home-grown food. Strategies to cope with the challenges involved family and social support from CHWs and health facility staff, financial support through casual labor, mothers saving and lending groups and kitchen gardens.

Conclusions: Conclusion: Determinants of IYCFP are beyond food practices and embedded in everyday-life situations (mother's workload, social support at family and community levels, financial resources available at family level, mothers' knowledge about appropriate IYCFP). Hence, strategies to improve child nutrition should also go beyond food related practices and consider the multidimensional nature of IYCF in the everyday reality of those living in impoverished situations.

Keywords: Infant and young child feeding practices, breastfeeding, stressors, salutogenesis, coping strategies

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COMMUNITY VIDEO: AN ADAPTABLE AND EFFECTIVE TOOL FOR NUTRITION SOCIAL AND BEHAVIOR CHANGE

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Background and objectives: Community video is an innovative social and behavior change communication (SBCC) tool that can be harnessed to promote maternal, infant, and young child nutrition (MIYCN), hygiene, and nutrition-sensitive agriculture practices. The USAID-funded Strengthening Partnerships, Results: **Methods:** Formative research is crucial for adapting this community-centered model, allowing implementers to better understand the nutrition context, as well as influencers and determinants of key behaviors, and to prioritize behaviors for video top-

ics. Local extension agents or community volunteers are trained on MIYCN, hygiene, and nutrition-sensitive agriculture (in some contexts) as well as on video production for select team members. SPRING works with local partners and teams to create videos addressing priority behaviors and determinants featuring "early adopters" of improved practices. After production teams pretest and finalize videos, they are shown in community peer groups using portable pico projectors, followed by facilitated discussions.

Results: A feasibility study conducted in India in 2013 found the approach to be promising, with good community engagement and interest as well as anecdotal evidence of behavior change. Evaluations in Niger and Burkina Faso found the approach to be an effective and cost-effective SBCC approach. An evaluation of the pilot program in Niger found that households that have handwashing stations with water and soap increased from 73.8% at baseline to 96.2% only 3-4 months after exposure to videos on handwashing. The program's cost per beneficiary reached was approximately US$16.19 per person, projected to be US$3.73 once the program is taken to scale. The approach has been successfully adapted for a number of contexts and local partnership models, and a focus on capacity-building for local production teams has strengthened the sustainability of the approach.

Conclusions: Community video is a promising SBCC approach for promoting nutrition-specific MIYCN and hygiene as well as nutrition-sensitive agriculture practices. The approach provides implementers and communities with a flexible tool to create participatory, context-specific, and sustainable nutrition-related SBCC programs.

Keywords: SBCC, nutrition, MIYCN, nutrition-sensitive agriculture, ICT.

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ASSESSMENT OF A CASCADE TRAINING APPROACH FOR NUTRITION: LESSONS LEARNT FOR E-LEARNING IN GUATEMALA

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Background and objectives: The Diplomado course, developed in 2014, focused on training on maternal infant and young

child nutrition for various cadres of health providers, including auxiliary nurses and nurses. In 2015, ~ 600 health providers were trained in eight modules related to Essential Nutrition Actions. Central and district levels viewed the course as a core training tool for nutrition. To date, no assessment of training methodologies for nutrition have been conducted in the country – which can inform on training strategies needed at the national and subnational levels. The key objectives of this assessment are to ascertain the strengths and areas of improvement of the Diplomado course, as well as examine the value added of the cascade training as a training methodology and the potential to adapt the course for e-learning to other health content, beyond nutrition.

Methods: This mixed methods assessment included 8 focus group discussions (FGDs) with health providers, 32 in-depth interviews (IDIs) with health providers and 8 FGDs with facilitators which were carried out in three areas of western Guatemala. In addition, 15 IDIs with key stakeholders involved in the design and/or implementation of the course were conducted. Following transcriptions of recordings for FGDs and IDIs, key emergent themes and sub-themes were coded. Quantitative post-tests were analyzed by topic. A review of key official documents and supporting materials was also carried out.

Results: The course demonstrated improved health providers' knowledge in key nutrition areas. Areas of improvement identified by health providers and facilitators included greater time allotment for content learning, and real-time learning at health facilities, in areas such as growth monitoring and interpretation. Implementing routine supportive supervision and mentoring were recognized needs for translation of skills to achieve improvements in quality of health services. Adaptation of the course through the development of additional health modules, on topics such as family planning and greater awareness of stunting at community level were cited as important.

Conclusions: The Diplomado course has potential for further expansion and adaptation to other areas, through an e-learning platform.

Keywords: Capacity building, nutrition, e-learning, health providers, health.

Conflict of Interest Disclosure: One of the authors, M. Fischer, aided in supporting the implementation of the DIplomado course. The author aided in providing input to the recommendations, though did not partake in collection of data, analyses or design of the assessment.

FEASIBILITY STUDY OF AN INTERVENTION OF GIFTING CHICKENS FOR YOUNG CHILDREN IN ETHIOPIA FOR PROVISION OF EGG AND EGG-SHELL

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Background and objectives: Malnutrition in young children of Ethiopia is mainly related to poor quality and quantity of complementary foods, which are thin cereal gruels lacking in animal-sources. One egg a day is recommended but accessibility is low. By age of 12 months, need for calcium (Ca) goes up dramatically. An eggshell contains ~2 grams Ca. The objective was to evaluate effects of promoting egg and eggshell powder (ESP) consumption on nutritional status of children of 6-24 months.

Methods: A cluster, randomized,controlled trial was conducted in Halaba in 2016 for 6 months, following Intervention (127) and Control (128) children, 6-12 months old. Caregivers were counselled on feeding children with egg and ESP and on safe homestead poultry husbandry. Chicken gift ceremony was conducted in intervention kebeles. Children received two egg-laying local chickens; caretakers promised not to sell or share eggs nor chickens, and to maintain two or more chickens.

Results: Within one month, 83% of children had ≥3 hens; this increased to 93% by endline. Average egg consumption by children increased from ≤2 to 17 eggs/month; control children remained at 2 eggs/month. Eggshell use was accepted. Most children in the intervention group consumed ESP mixed in hardboiled egg. There were more underweight (-2SD WAZ) and stunted (-2SD HAZ) children in the Control group with 28% and 36% than in the intervention group with 20% and 25%, respectively. Underweight was reduced by 15% in the Intervention arm while a slightly increasing pattern was observed in the control group. Stunting increased in both groups with similar trend; however severe stunting rate (-3SD HAZ) was increased at a slower rate in the Intervention group. Hemoglobin <11.0 g/dl was more prevalent in the Control group (22%) than in the Intervention (16.5%) but decreased in both groups at the same rate.

Conclusions: The effect of increased egg and ESP consumption was seen as reduction of underweight but not stunting. Benefits of increased egg and eggshell consumption on intake, however, may have been offset by having free-range chickens corralled in homes each night, with potential to negatively affect children's health.

Keywords: Malnutrition, hemoglobin, stunting, poultry, calcium.

Conflict of Interest Disclosure: Funding from One Health, University of Saskatchewan

PROCESS EVALUATION OF THE CLUSTER RANDOMIZED CONTROLLED TRIAL ACTIVITAL- A SCHOOL-BASED HEALTH PROMOTION INTERVENTION

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Background and objectives: Process evaluations (PE) of behavioral interventions can help to understand pathways of change and assess the opportunities to implement the intervention in real practice. In Ecuador, the school-based health intervention ACTIVITAL was effective in decreasing adolescents intake of added sugar and unhealthy competitive food items as well as in decreasing waist circumference. We report the PE of the ACTIVITAL.

Methods: The trial involved 10 intervention and 10 control schools and was conducted among 1430 adolescents (12-14 years old). Interventions strategies involved the implementation of interactive healthy eating classes with adolescents, healthy eating workshops with parents and canteen staff, and social events A full pre-specified PE was performed to document the implementation of the ACTIVITAL intervention. Reach, dose, fidelity and barriers of the intervention were evaluated. Data collection comprised observations, face-to-face interviews and questionnaires, applied to adolescents, parents, teachers and school staff.

Results: ACTIVITAL was implemented in all the schools, 46% of the school teachers delivered the classes themselves (the remaining classes were implemented by external teachers). Students received 94% of the planned classes, and, teachers were motivated in 89% of them. The teachers demonstrated sufficient knowledge in 88% of the classes and their students enjoyed 93% of the delivered classes. All the parental workshops were implemented and all but one school participated in the school canteens workshops. All the parental and canteen workshops were delivered by experienced staff and the attendants showed a positive attitude, but parental reach was low (15%). Most of the adolescents enjoyed the social events. The main barriers were the difficulty to include the program in the school curriculum, the voluntary participation of the school teachers, lack of time to perform the classes, poor parental reach, difficulties to change the food and portion sizes served by the canteens staff and persistence of an adverse nutritional environment outside the school.

Conclusions: In general, the ACTIVITAL intervention was well implemented and its content was well received by the included audiences. Future programs should: incorporate the activities in the school curriculum, deal with poor parental participation and promote changes in the canteens by means of new formative research.

Keywords: RCT, diet, school, Ecuador, process evaluation.

ANTENATAL NUTRITION BEHAVIOUR CHANGE COMMUNICATION: CHANGE IN BIRTHWEIGHT IN RURAL BANGLADESH

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Background and objectives: Historically Bangladeshi diet lacks diversity, heavily dependent on carbohydrates, mostly rice, contributing up to 86% of the total energy intake. Bangladesh observed a sluggish improvement in the nutritional status of women over the last decade. Almost a quarter (24.75%) of pregnant women are moderately malnourished and more than half of them (59.50%) are anemic. Rural pregnant women consume 1464 ($\pm$416) kcal energy per day, which is far below the recommended daily allowance. As a result, mothers deliver babies whose birthweight falls below the normal cut off level.

Methods: We conducted a cluster randomised controlled trial in one rural district of Bangladesh, where treatment was randomly allocated among 900 pregnant women selected from 36 clusters in equal proportion. Community health workers visited all pregnant women in both groups once in every month from conception till delivery and provided 'balanced plate nutrition education' to intervention group only. The outcome was difference in mean birthweight & low birthweight (LBW) rate. Socio-demographic data was collected on enrolment and outcome was measured within 72 hours after birth.

Results: The mean birthweight in the intervention group was 124g greater than that in the comparison group (2.86kg vs 2.74kg; P<0.001). The prevalence of LBW babies was 9.4% in the intervention group and 22.1% in the comparison group (P<0.001). Multivariate analysis revealed that the risk of LBW was 2.78 times lower in the intervention group than in the comparison group (P< 0.001) when adjusted for other variables in the model taking cluster effect into account.

Conclusions: Balanced plate nutrition education targeted to bring about changes in dietary behaviour with focus to meal balanced in energy and quality can improve birthweight of infants in situation where LBW is a major problem.

Keywords: Birthweight, nutrition education, pregnant woman.

144/2398

DESIGNING AN INTEGRATED AGRICULTURE AND NUTRITION INTERVENTION TO IMPROVE MATERNAL AND CHILD NUTRITION IN RURAL BANGLADESH: A FORMATIVE RESEARCH

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Background and objectives: Despite remarkable progress in agriculture over the past three decades in Bangladesh, food and nutrition insecurity among the poor is common. Several parallel interventions in agriculture and nutrition exist that lack integration. This paper presents the formative research findings of a study that assesses the feasibility of an intervention that integrates agriculture and nutrition behavior change with financial incentives, to improve maternal and child nutrition among disadvantaged families.

Methods: We conducted qualitative exploration and stakeholder consultation. i) In-depth interviews with mothers of <5 children in very poor households, and their husbands; ii) Key-informant interviews with agriculture extension workers, local shop keepers and mobile banking operators; 3) Focus Groups with opinion leaders and elderly women. We also organized stakeholder meetings that was attended by nutrition researchers, activists and program managers from the government and non-governmental organizations. We finalized the intervention design, including the sites, based on the feedback from the formative research findings and the stakeholders.

Results: The families widely practiced home gardening irrelevant of land ownership. Seasonal vegetables are the dominant foods produced in the homestead. Some families raised hens and ducks. The households produced these foods for their own consumption. Gardening and poultry raising were found to be solely women's activities. Respondents reported small size of the homestead and seasonal flooding for home gardening, and lack of medical care for poultry as the main barriers. Respondents knew about mobile banking ('BKash'), although none of them experienced using it. The women received gardening information from their neighbors and relatives. Seeds were provided by the neighbors, NGOs, and often purchased from local agro-dealers. The stakeholders suggested that the Agriculture Extension Workers might only be involved as trainers of counselors because their current job description does not include home visits. They identified voice message as more suitable than text message, and stressed on weekly reminders.

Conclusions: This formative research informed the design of a feasibility study that will guide the design of an integrated agriculture-nutrition intervention, which will be implemented and evaluated at a larger scale in the future.

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DETERMINANTS OF ADHERENCE TO MICRONUTRIENT POWDERS AMONG CHILDREN 6-11 MONTHS OF AGE IN RURAL ETHIOPIA

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Background and objectives: Micronutrient powders (MNPs) is a promising approach to improve micronutrients intakes of children in Ethiopia where malnutrition remains a public health concern. Adherence is a key element to reach successful implementation of delivering micronutrients to children. Identifying adherence and factors associated with adherence is essential to evaluate the effectiveness of MNPs and to provide necessary information for future MNP program implementation in Ethiopia.

Methods: A total of 1193 children aged 6-11 months were provided with MNPs during a seven-month intervention. Adherence and determinants of adherence were assessed monthly through the mothers. Adherence was measured by counting the number of MNPs sachets used, and determinants were assessed using a Knowledge, Attitude, and Practice (KAP) questionnaire. Adherence was defined in two ways: adherence based on distribution scheme and adherence based on instructions. Generalized Estimating Equation (GEE) analysis was performed to examine factors that determine adherence.

Results: Adherence fluctuated over time, with an average of 58% for adherence to distribution and 28% for adherence to instruction. On average, children consumed 95 out of total 120 sachets provided during the study. Each month, >80% of mothers reported that the child liked MNPs and > 90% responded that MNPs were easy to use. The factors of MNPs found easy to use, child liked MNPs, support from surrounding people and mother's age>25 years were positively associated with adherence of mothers to give MNPs to their children. Meanwhile, a far distance from home to the health post, knowledge of MNP correct use, perceiving negative effects and living in South Nation, Nationalities and People Region (SNNPR) had negative associations with adherence.

Conclusions: Despite an overall low adherence, the average 95 sachets of MNPs consumed over the study were reasonably good. MNPs were also well accepted by both mothers and children. It suggests that the MNP program has potential to be expanded, by taking into account the factors that positively and negatively determine adherence.

Keywords: Micronutrient powders, adherence, young children, Ethiopia.

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FOOD AND NUTRITION LITERACY (FNLIT) IS ASSOCIATED WITH DIETARY HABITS IN CHILDREN

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Background and objectives: Food and nutrition literacy may be the underlying factor that protects nutritional quality during transitions. This study evaluates the association between Food and Nutrition Literacy (FNLIT) and dietary habits of elementary school children in Tehran, Iran.

Methods: This cross-sectional study was undertaken on 803 students (419 boys and 384 girls) aged 10–12 years from 44 elementary schools in Tehran city. Demographic and socio-economic characteristics were collected through interviewing students and their mothers and/or caregivers. Food and nutrition literacy (FNLIT) was measured by a locally designed and validated self-administered questionnaire consisted of 46 items in 7 subscales. Dietary habits over the last 7 days were assessed by a questionnaire. The multinomial adjusted Odds ratios of food and nutrition literacy for dietary habits were analysed.

Results: High level of FNLIT cognitive domain were negatively associated with breakfast skipping (1-2 times a week; OR= 0.32, CI=0.17-0.60), eating lunch less than 7 days a week (nev-

er/1-2 times a week; OR= 0.40, CI=0.17-0.93, 3-6 times a week; OR= 0.45, CI=0.25-0.80) and eating dinner less than 7 days a week (never/1-2 times a week; OR= 0.32, CI=0.17-0.68). Also, negative relation between high FNLIT scores in skill domain and breakfast skipping was observed (3-6 times a week; OR= 0.33, CI=0.13-0.78). FNLIT skill domain had an evident positive relation with frequency of eating honey/jam (never eating; OR=0.44, CI=0.21-0.92; eating 1-2 times a week; OR=0.33, CI=0.14-0.76) and never eating sweet snacks (OR=2.84, CI=1.07-7.49). High FNLIT cognitive domain was contributed to never eating sausage/hamburger (OR=2.20, CI=1.01-4.83) and never eating salty snacks, (OR=2.82, CI=1.21-6.54).

Conclusions: Our findings highlighted the association between food and nutrition knowledge, skills and capacities and dietary behaviors. This evidence suggests that food and nutrition literacy can play an important role to facilitate healthy dietary behaviors of children. In addition, more emphasis in the development of skills in food and nutrition literacy is essential.

Keywords: Nutrition literacy, dietary habits, school age children, Iran.

144/2524

COMMON MATERNAL FEEDING BEHAVIORS IN INFANT FEEDING DIFFICULTIES – RESPONSIVE OR COERCIVE?

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Background and objectives: Given the positive influence of responsive caregiving on dietary habits in childhood, to raise awareness of caregivers regarding their feeding behaviors is crucial in multiprofessional care on infant feeding. Objectives: Identification of most common responsive and nonresponsive feeding

practices in mothers of children with feeding complaints, as well as to seek associations between practices and caregivers' profile.

Methods: Cross-sectional study with 77 children under 18 years old, with complaints of feeding difficulties. Data were collected during interviews with mothers: children's age, gender, duration of exclusive breastfeeding, presence of organic disease, dynamics of bottle use (normal/prolonged bottle feeding), self-feeding practices and posture at meals (adequate / inadequate), use of appropriate feeding equipment; basic maternal demographic information (parity and level of education), feeding style (according to Hughes et al 2005), presence of coercive feeding, frequency and characteristics of family meals. ANOVA test, Chi-Squared test and binary logistic regression were used, with significance level at 5%.

Results: Results a: The nonresponsive profile predominated among mothers (76.2%, with the Authoritarian style being the most prevalent - 39.7%). The responsive profile ('authoritative' style) was characterized by absence of coercive feeding, stimulation of self-feeding practices, use of appropriate feeding equipment and meal environment, with interaction at meals. Nonresponsive profile ('authoritarian', 'indulgent' and 'negligent' styles combined) consisted of both inadequate environment and posture at meals, use of distraction and coercive feeding, lack of shared meals, and disregard for children's hunger signals. The habit of sharing meals with children was associated with mothers' profile, and considered a protection factor against nonresponsive care (OR 0.23; 95% CI 0.06-0.88). Both Authoritarian (p = 0.000) and indulgent mothers (p = 0.007) breastfed exclusively for longer periods of time when compared to negligent ones. There was a higher level of interaction with children in "responsive" parental style (OR 0.056; p = 0.01) compared to non-responsive styles combined.

Conclusions: Results highlight the need for educational interventions focused on caregivers' behaviors in families with feeding complaints.

Keywords: Responsive caregiving, motherhood, feeding practices, feeding difficulties, feeding complaints.

Conflict of Interest Disclosure:

• The PI of the project (Mauro Fisberg) conferences in events such as – Abbott, CPW, EMS, Danone, Nestlé, Nutrociencia, PIC-ME, Sanofi, Wyeth; scientific board member of Danone Institute International, Danone Research, Mondelez. Supports research projects at Abbott, CNPq, Coca-Cola, CPW, Danone Institute International, Danone Research, Fapesp, Fap Unifesp, Nestlé.

• Authors have no participation in food, nutrition or pharmaceutical companies, and there is no influence of any company in any of the projects, conferences or publications conducted.

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FOOD AND NUTRITION LITERACY (FNLIT) AND ITS PREDICTORS IN ELEMENTARY SCHOOL CHILDREN IN IRAN

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Background and objectives: One of the most important personal skills to enable individuals to control the predictors of their health is food and nutrition literacy. Food and nutrition literacy like health literacy should be conceptualized as an asset and a protective factor. This study aimed to measure food and nutrition literacy and its predictive factors among urban 10-12 year-old children in Iran.

Methods: This cross-sectional study was undertaken on 803 students (419 boys and 384 girls) aged 10–12 years from 44 elementary schools in Tehran city, Iran. Food and nutrition literacy (FNLIT) was measured by a locally designed and validated questionnaire consisted of 46 items in 7 subscales. Adjusted binary regression logistic was used to assess the extent to which various independent covariates may predict low food and nutrition literacy as dichotomized outcome variables.

Results: Approximately 11.6% of students had low total food and nutrition literacy score. The majority (68.8%) of students had high scores in cognitive domain but was poor in skill domain (%2.6). The most important predictive factor of low total food and nutrition literacy was lower level of maternal education (OR=0.29, CI=0.09-0.87). The most important predictive factor of low nutritional health knowledge were father age in 30-40 year-

old compared with younger fathers (OR=0.12, CI=0.02-0.57) and Azeri ethnicity (OR=3.4, CI=1.35-8.71). Girls compared to boys (OR=0.30, CI=0.15-0.59) and students in 6th grade compared with those in 5th grade (OR=0.51, CI=0.28-0.93) had higher level of food choice literacy. Other predictive factors of low food choice literacy were lower mother education level (OR=0.16, CI=0.04-0.56) and younger age of mothers (OR=0.45, CI=0.21-0.96). Girls had lower level of critical food and nutrition literacy than boys (OR=1.57, CI=1.14-2.15). Probability of low critical literacy in later-birth children was higher than first-birth children (OR=1.50, CI=1.00-2.25). The students whose fathers' were older (≥ 46 years old) had better level of critical literacy (OR=0.56, CI=0.33-0.94).

Conclusions: Findings showed that despite desirable scores in cognitive domain, different aspects of food and nutrition literacy skills in primary school students are quite low. In planning future programs to promote food and nutrition literacy, more emphasis on skill development, considering socio-demographic predictors is recommended.

Keywords: Food and nutrition literacy, socio-demographic predictors, elementary school children, Iran

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144/2541

EASIER TO CHANGE ENVIRONMENTS THAN TO CHANGE BEHAVIOR? RETHINKING FOOD CHOICE DYNAMICS INCREASE SALES OF HEALTHY SNACKS AMONG YOUNG PEOPLE IN VOCATIONAL SCHOOL CANTEENS

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Background and objectives: Improving the dietary patterns of young people in a healthier direction is of considerable societal concern. Traditional approaches rest on the assumption that information an education can facilitate such change. However, studies have shown that such approaches tends to benefit those already complying with official nutritional advice whereas the socially less advantaged tends to benefit less. As a result, there is an increasing interest in interventions targeting the environment. According to dual process behavioral psychology changes in the environmental design – often referred to as nudgings - holds the potential to influence the consumer to make healthier decisions. The aim of this study was to examine if influencing food choice dynamics by slightly altering the choice architecture by relocating and re-exposing the healthy option could increase sales of healthy snacks among young people in vocational school canteens.

Methods: A healthy eating intervention was developed for young people in canteens of 13 vocational schools. The subjects attending is mainly young men between 16 and 19 years of age. A healthy snack pack not previously offered was developed. The intervention targeted the access to healthy snacks using 2 environmental change strategies. Salience of the healthy snack pack was

increased and customers were re-exposed to the healthy option more places. Sales data were collected pre/post test by canteen staff according to a protocol agreed with management canteens.

Results: The results showed that significantly more students chose the healthy snacks when measured follow up after the intervention compared to baseline before. Sales of the unhealthy snacks did not change significantly.

Conclusions: If students at vocational schools are to opt out unhealthy snacks and replace them with healthy alternatives, consideration should be given both to increase the exposure of healthy snacks and simultaneously undertake similar actions in the unhealthy snacks, for example by removing them or placing them less visibly in the canteen. Rethinking choice dynamics in self service food lay-outs through easy to implement minor changes seems to be able to change uptake of healthy options. More research is needed to explore effects and potentials of changing food choice architectures.

Keywords: Nudging, healthy eating, choice architecture, food environment, self service catering.

144/2562

ILLEGAL COMMERCIAL SALES OF INFANT FORMULA AND INFANT PRODUCTS IN RIO DE JANEIRO CITY, BRAZIL

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Background and objectives: The International Code of Marketing of Breast-milk Substitutes was decreed in 1981 by WHO in response to general breastfeeding decline observed trough the World. The aim of this document was to incentivize countries to introduce advertisement codes and legislation in order to protecting breastfeeding against predatory industry marketing strategies. In Brazil, the "International Code" was implemented as national regulation in 1988 and became a national law in 2006, named "Norma Brasileira de Comercialização de Alimentos para Lactentes e Crianças de Primeira Infância, Bicos, Chupetas e Mamadeiras" (NBCAL), in which, among other measures, infant formula, baby bottles and pacifiers cannot have special sales when commercialized. However, a NGO named International Baby Food Action Network has been reporting several marketing violations all over Brazil. The aim of this study was to evaluate commercial sale of infant formula and products related to baby feeding.

Methods: Cross-sectional study representative of Rio de Janeiro city's South-Zone, Brazil, a region with population from all

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social classes, where a sample of 60% of stores that commercialize products in the scope of NBCAL were evaluated between March and April, 2017 (n=195). All commercialized products not allowed to have special sales were considered: Infant Formulas (IFO), Infant Formulas for Special Needs (IFO_SN) and baby bottles, pacifiers and nipple protection shells (BBPN).

Results: Among 195 stores evaluated, 68.4% were pharmacies, 23.7% supermarkets and 7.9% department stores. Among those, 83.6% commercialized IFO, 63.6% IFO_SN and 74.3% BBPN, and 22.3% had illegal commercial sales. Considering stores that commercialized IFO's (n=163), 14.7% had illegal sales; among those commercializing IFO_SN's (n=124), 11.3% violated the NBCAL law; and considering BBPN's commercialization (n=145), 11.7% stores had illegal sales.

Conclusions: The high prevalence of illegal commercial sales of infant formulas, baby bottles, pacifiers and nipple protection shells, with violations ranging from special exposition to individual discounts, suggests the need of reinforced vigilance by the governmental agencies. The disrespect of stores and infant food companies with the NBCAL law may be jeopardizing the family ability to choose the best way to feed their babies.

Keywords: Marketing. Breastfeeding. Infant Formula. Pacifier

144/2593

FREE TIME, RECREATION AND ITS RELATIONSHIP WITH THE NUTRITIONAL STATE BY BODY MASS INDEX, IN UNIVERSITY POPULATION

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Background and objectives: Free time is not currently used for activities that fully benefit the health of the individual. Health involves working productively and actively in social life. The objective of the research was to determine the habitual activities in leisure time and recreation, relating it to the nutritional state of the UNICACH University population.

Methods: The main activities performed in the free time were classified, and a diagnosis was made regarding gender, age, occupation, and body mass index (BMI), applied through a sample of 20% (905 individuals), random sampling Stratified: CU-UNICACH teachers, administrators and students, men and women 18 years and older, with letter of informed consent. Application of questionnaire "Use of free time" (reliability of 0.84 Cronbach Alpha). Equipment: mechanical scale model 761, (150 kg), portable stadiometer (120 cm), brand SECA. BMI assessed with Quetelet cohort points, expressed as percentage and ANOVA.

Results: The university community devotes its free time: to use electrical appliances (internet of 1 to 3 hours / day), to social networks, to eat and to sleep (5 to 8 hours); Teachers and students report that they generally nap, do not attend cultural events organized by the university and do not use sports facilities; 27.2% were overweight, 7% some degree of obesity, with a higher prevalence in the age group of 20-29 years; In the category student predominated male sex and 1.8% underweight in the female

Conclusions: The University population does not have a healthy lifestyle, not making good use of their free time, with important percentage of high weight.

Keywords: Free time, university, usual activities.

Further collaborators.

Nayhelli Gutiérrez Castañón

144/2605

PROMOTION OF LOCAL AGROBIODIVERSITY IMPROVES DIETS OF WOMEN AND CHILDREN IN NORTH WEST VIETNAM: A CLUSTER RCT

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Background and objectives: Local agrobiodiversity has the potential to improve diet quality. Ethnic minority groups in NorthWest Vietnam have poor nutrition despite the region being an agrobiodiversity hotspot. A cluster randomized control trial was conducted in NorthWest Vietnam.

Methods: Four communes were randomly selected and allocated to control and intervention groups. From each, 85 women with at least one child aged 12-24 months were randomly selected. The one-year intervention was community-based farmer field school-like model (clubs). These promoted increased diversity of target food groups (FGs) produced and consumed based on identified low consumption in the baseline: pulses and vitamin A-rich vegetables and fruits. From these, neglected crops (produced by <40% of households) were selected by communities as 'target crops'. Clubs delivered training on two components: 1) Nutrition education and cooking demonstrations and 2) Agricultural capacity building in home gardens. Dietary intake was assessed using an administered quantitative 24-hour recall.

Results: After controlling for pre-intervention values, child sex and age, mother age and education and household income, 37% more women and 18% more children met Minimum Dietary Diversity Score (MDDS) compared to the control group. MDDS

increased significantly in the intervention group by 0.4 (p<0.01) and 1.4 (p<0.08) in children and women respectively. The number of species consumed increased more in the intervention than control, by 1 species in women and 4 in children (P<0.001 for both). The mean quantity of target FGs consumed per day also increased more in the intervention group. For women, pulses increased by an average of 47g/day (p<0.05); vitamin A-rich vegetables by 47g (p<0.001) and for vitamin A-rich fruits by 11g (p<0.001). For children, consumption of pulses, vitamin A-rich vegetables and vitamin-A rich fruits increased by 40, 26 and 3 grams, respectively (p<0.05, p<0.001, and p<0.01 respectively). Mean micronutrient intakes also increased more in the intervention group, especially for Vitamin A (RE), Vitamin C, B2, Folate, Calcium, Iron and Zinc.

Conclusions: Diet diversity and quality increased significantly after the intervention. This is consistent with previous global research demonstrating links between agrobiodiversity and food and nutrition security. We recommend replication of the study in different farming and agroecological systems.

Keywords: Diet diversity, Home gardening, Vietnam, Agrobiodiversity, Nutrition Education.

Further collaborators: Nga Le Thi

144/2613

FOOD SUPPLY AT CHILDREN SCHOOL CENTERS, AND PRESCHOOLARS' NUTRITIONAL STATE BEFORE AND AFTER FOOD NUTRITION ORIENTATION

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Background and objectives: The 21% of the caloric intake in kids comes from sugary drinks. In Mexico, over-weight and obesity has increased by a 26%, mainly due to preschoolers' sedentary lifestyle; The objective of this research was to gather data regarding the food offer at children school centers in Tuxtla Gutiérrez, Chiapas, México, and to offer food orientation in order to see changes in preschoolers' nutritional state

Methods: Investigation at the convenience of the researcher, with the authorization of parents and managers of the institution through personalized service, applied in 62 preschoolers, aged between 3 to 6 years, applied to children's school. The study variables were: weight / age (P / E), weight / height (P / T), height /

age (T / E). The equipment used was: mechanical scale model 761, (150 kg), portable meter (120 cm), brand SECA. The observation of foods available in and out of school was done through a tracking log. In educational guidance, didactic games and images were used, aimed at mothers and children, with two times of anthropometric assessments for preschoolers

Results: Food availability was 59% high energy density, low in fiber, with higher consumption of fried preparations, sweetened waters and sweet. Size for age improved 7.7%, from Normal: 58.1% to 65.8%; On the other hand the low cut went from 25.8% to 20.9%. In the case of weight for height improved 3.2%, from the Normal status figure: 56.4% to 59.6%, as well as the Low weight step from 30.8% to 12.9%; Although in a negative way, the results show a weight increase of 2.9 to 27.5%, predominantly in children. With regard to weight for age improved 19.3%, from Normal: 42% to 61.3%; In the case of the deficit, malnutrition increased from 46.9 to 16.1%, but, with an increase in overweight or obesity of 11.4% (11.2 to 22.6%, higher in children

Conclusions: Obesogenic atmosphere at children school centers. The orientation towards mothers and children turned out beneficial to increase normality rates in nutritional state. A considerable number of mothers over-concerned about increasing their children's weight; by not improving the food offer availability this phenomena will grow

Keywords: Food, preschool, orientation.

144/2696

PROCEDURAL ASSESSMENT IN FOOD AND NUTRITION EDUCATION GROUPS FOCUSING ON AUTONOMY FOR FOOD CHOICES

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Background and objectives: The assessment of food and nutrition education (FNE) actions can be considered a big challenge to the nutritionist, with the tendency to reduce it to quantitative indicators. Given that, this article describes the use of field diary as a procedural evaluation technique for FNE groups with focus on the autonomy for food choices.

Methods: Twelve reports from field diaries produced by two facilitators of the FNE groups (G1 and G2) and also, following the operating group benchmarks, were used. The groups presented 6 weekly meetings (1h30). In total, participated 10 people from G1 and 15 from G2, in addition to the facilitator and one observer. After each meeting, these steps were followed: (1) preliminary discussion immediately after the meeting, (2) field diary writing and (3) evaluation of the previous meeting and planning of the next one. There were successive diaries readings and plannings,

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allowing the identification of evaluation vectors proposed by Pichon-Rivière: communication, belonging, learning, tele, cooperation and relevance.

Results: Initially, it was delegated to the facilitator the leadership on knowledge proposition, however, it was provided a collective construction of different aspects related to health and nutrition, resulting in learning with greater significance among participants. The communication process has been developed during the weeks, both related to the facilitator, as well as among participants. In the G2, it was noted an initial difficulty in people's interaction, which was eventually overcome as participants began to feel as a part of the group (belonging). Cooperation was explicit in G1, noted by how participants felt responsible for each other. As the meetings were occuring, more intense affinities (G1) and rejections (G2) could also be observed (tele). The tasks proposed in the meetings were eventually questioned both by G1 as G2, in addition, in face of participants' demands, adjustments were made for greater relevance.

Conclusions: Field diary consisted in an accessible and distinguished technique not only to guide the assessment of the meeting but also the planning for the next one, enabling a better understanding of each participant profile, mainly of the group's movements as a whole, contributing to the improvement of the facilitator 's performance.

Keywords: Food and Nutrition Education. Nutritionist. Health Education. Human Resources Training.

144/2714

MEXICAN FOOD BANKS: FROM ALLEVIATING FOOD INSECURITY TO PROMOTING HEALTHY EATING HABITS

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Background and objectives: Mexico, as many other countries, is currently facing both sides of malnutrition. This problem goes beyond food availability and involves food quality. We are facing a diet transition that includes more processed food and inadequate vegetable intake. Food banks alleviate immediate food insecurity, and recently their ability to promote healthy nutrition has been recognised to play a central role.

In a descriptive study, previous to an educational program that aims to educate, train, and empower food bank recipients with the information and skills they need to improve eating patterns and preserve their health and the family's well-being: "Comer en Familia", a situational study was conducted.

Methods: 755 women/caregivers recipients of a food bank in San Cristobal de las Casas, Chiapas were surveyed about cooking knowledge, attitudes and behaviors.

Results: When asked about cooking tools and appliances 91% refer to own a blender, 61% a refrigerator, 34% a stove and 20% a microwave. Only 25% own a traditional "molcajete" (wrinding stone), 31% a Corn mill and 7% a metate (traditional flat stone used for grinding corn). Most of them own a pewter (62%) or aluminum (44%) pot, while 12% own a clay pot. Most participants (92%) cook at home and enjoy cooking for their family. 70% spend around 30 minutes to 1 hour cooking per day. Also, most of them eat at home (90%) together with their families (76%). However, 61% find it difficult to have access to fruits and vegetables at their communities, and 56% considered that eating healthy is expensive.

Conclusions: Food banks are potential sites for effective nutrition promotion programs by improving access to healthy and affordable food together with nutrition education such as cooking from scratch and getting the most from their food. Preliminary findings also suggest that women play an important role in the family's health. They are the caretakers of household food and nutrition security. Therefore, educating, training, and empowering women with the information and resources they need to improve eating patterns and preserve their health and the family's well-being is key to achieving food security in Mexico and deserves further study.

Keywords: Malnutrition, food security, nutrition education, cooking skills, food banks.

144/2770

INFLUENCE OF MEAL CULTURES ON FOOD AND NUTRITION SECURITY: A CASE OF AFRICAN INDIGENOUS VEGETABLES IN KENYA

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Background and objectives: As Kenya focuses on achieving the sustainable development goals (SDGs), persistent food insecu-

rity and high level of poverty in over 50% of the population are still prevalent in some parts of the country. Contrastingly, the prevalence of metabolic syndrome (MS) associated with excess intake of calories is 34.6%. Various micronutrient deficiencies are also prevalent. Intervention measures, therefore, have to address both excessive and inadequate intake of nutrients. The use of African Indigenous Vegetables (AIVs) to alleviate hunger and malnutrition in Africa is under study. African Indigenous Vegetables are nutritionally superior to their exotic counterparts in some respects, have several agronomic advantages and some are also reported to have medicinal value. This notwithstanding, consumption of AIVs has been decreasing in some parts of Kenya. This trend is accompanied by loss of diversity and indigenous knowledge on preparation and cooking of AIVs. The objective of this research was to establish the preparation and cooking methods and consumption of AIVs in Kenya. The research questions were: which factors determine AIV consumption and how do meal cultures affect consumption patterns of AIVs?

Methods: The research design was a qualitative approach involving focus group discussions, cooking-along interviews and participatory observation as well as expert interviews. Research areas were Nairobi (urban), Nakuru (peri-urban), Kakamega (rural). The sample size was 50 (expert interviews, FGD, cooking along interviews), which were conducted between March 2015 and October 2016. Findings showed that eight varieties of AIVs were commonly consumed in various parts of Kenya.

Results: Findings showed that eight varieties of AIVs were commonly consumed in various parts of Kenya. More varieties were consumed in rural than urban areas. Indigenous knowledge, time for preparation and cooking, gender relations, price and perception were among factors that influenced consumption of AIVs. Further, consumption largely depended on ethnicity and the cultural practices influencing choice of food in various ethnic groups.

Conclusions: The study concluded that for optimal utilization of AIVs for food and nutrition security, there is need for interventions to promote acceptability of foods across different ethnic groups in Kenya and to overcome obstacles to preparation, cooking and consumption of AIVs.

Keywords: African Indigenous Vegetables, meal cultures, food and nutrition security.

Conflict of Interest Disclosure: This is part of my PhD work registered at Jomo Kenyatta University of Agriculture and Technology, Kenya

Further collaborators.

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Track 8: Agriculture, Food Science and Safety

144/391

WHAT IS THE QUALITY OF SCHOOL MEALS IN BRAZIL?

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Background and objectives: Brazilian is recognized internationally through the National School Meal Program (PNAE). PNAE, created in 1954, is reference for other countries in view of their universal coverage, perenniality, specific regulatory legislation, articulation with other policies and advances in relation to family agriculture.

Despite the importance of monitoring the policy for Food and Nutrition Security, there is still a lack of information about the quality of Brazilian school menus. Objective this study is to assess the quality of Brazilian school meals.

Methods: This cross-sectional study analyzed 2500 menus from 500 Brazilian municipalities. Menus were assessed by the Quality Index for School Meal Menus. This method proposes the evaluation of the weekly menu according to the following criteria: a) daily supply of cereals and tubers, legumes, vegetables, fruits, meat and eggs, dairy products, sweets as substitutes for meal, cured meats and sausages; B) weekly frequency of the sweets as dessert and ultra-processed foods; C) eventual offer of a second meal and meal timing adequacy. Data were analyzed by descriptive statistical analysis.

Results: A total of 29.4%, 50.6%, and 20% of the study menus presented high, intermediate, and low quality, respectively. Grains and tubers (86%) and meats and eggs (67%) groups presented the highest frequencies in the menus, followed by legumes (42.16%), vegetables (40%), fruits (35.56%), and dairy products (18.6%). Cured meats and sausages (8.68%) and sweets in place of meals (3.64%) were less frequent. Of the other components, 84.6% of the menus did not include sweets for dessert or included them only once a week. Ultra-processed foods appear in 65.6% of the menus at least once a week. Meal time was compatible with meal type in 22% of the sample.

Conclusions: Important foods for healthy and adequate diet, such as dairy products, vegetables, and fruits, are not provided regularly by Brazilian school meals. Despite the advances in policy management, the use of ultra-processed foods is still frequent in the menus.

Keywords: School feeding, menu planning, quality index.

ASSESSMENT OF NUTRITIONAL QUALITY AND SAFETY OF WINGED TERMITES (MACROTERMES BELLICOSUS) ENRICHED LOCALLY FORMULATED COMPLEMENTARY FOODS FROM SOUTH-WEST, NIGERIA

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Background and objectives: Adequate nutrition during first 1000 days of life is crucial to child's healthy growth. Blending of local staple foods with edible insects which are nutrient dense can improve nutrient intake and prevent early childhood malnutrition. Nutritional quality and safety of Macrotermes bellicosus enriched locally formulated complementary foods (CFs) was assessed using rats

Methods: Macrotermes bellicosus (MB) were collected during their swarming, roasted for 10 minutes, and refrigerated at -4oC. Ground MB was added to boiled rice (BR) and boiled yam (BY) in ratio 10.0%, 15.0% and 20.0% (w/w) levels to give BR1 and BY1; BR2 and BY2, and BR3 and BY3 respectively. Nutrient and anti-nutrient composition of MB, BY, BR and the MB-enriched CFs were determined using standard AOAC methods. Nutritional quality of two best MB-enriched CFs were assessed using Wistar strain rats (six per group) fed adlibitum for 28 days. Serum trace minerals in MB-enriched CFs, control and basal diets were assessed using standard methods, and histopathological effects of CFs on rats' kidney, liver and spleen were determined. Data were analysed using descriptive statistics and ANOVA at α 0.05.

Results: Roasted MB contained 31.8g protein, 16.4g fat, 3.8g ash, 227.5mg calcium, 2.1mg iron, 15.0mg zinc, 330.4µg retinol equivalent (RE), 6.7µg vitamin D, 0.1mg trypsin-inhibitor, and yielded 529.0kcal energy/100g sample; while 100g of BR and BY contained between 3.7-5.9g protein, 2.4-2.7g fat, 2.6-2.7g ash, 70.0-120mg calcium, 4.2-5.6mg iron, 1.2-1.5mg zinc and yielded 380-386kcal energy. Enriched CFs contained 7.9-15.3g protein, 2.9-4.1g fat, 4.1-4.5g ash, 242.2-264mg calcium, 2.4-4.4mg iron, 15.1-19.8mg zinc and yielded 357-372kcal energy/100g sample. Enriched CFs showed significant increase in nutrient content compared with BR and BY ($p<0.05$). Serum trace minerals in rats fed with two best MB-enriched diets ranged between 3.4-4.3mg zinc, 23.4-27.9mg calcium, 30.6-37.0mg iron and 52.5-56.9µg RE, which were significantly higher than control (3.2, 22.2, 34.1, 48.2) and basal (2.2, 21.1, 24.0 mg, 32.3 µg) diets respectively. No pathological lesions were observed in the internal organs of rats fed CFs diets.

Conclusions: Adding Macrotermes bellicosus to local complementary foods improved their nutrient and gross energy content, hence its use should be encouraged among mothers

Keywords: Macrotermes bellicosus, complementary foods, nutritional quality, trace elements, minerals.

GREATER IMPROVEMENTS IN CHILD GROWTH AND DIET QUALITY AFTER A HOLISTIC COMMUNITY DEVELOPMENT INTERVENTION THAN AFTER NUTRITION TRAINING ALONE

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Background and objectives: Linkages between nutrition-sensitive agriculture interventions and direct improvements in child nutritional status have been difficult to demonstrate. Likewise, household-level nutrition training has had variable results. Few organizations provide such training in the context of multi-sectoral community-based activities emphasizing livestock management practices and social capital development. The importance of this holistic approach to child outcomes has not been systematically studied. Therefore, we investigated the impact of a comprehensive community development intervention on child growth and diet, compared to training alone.

Methods: 3 matched communities (Banke, Nepal, 974 households) were randomly assigned to receive either Intervention ("full package" community development provided by Heifer Nepal, including social capital promotion, livestock/ nutrition training), Partial Intervention (livestock/ nutrition training alone), or Control (no interventions). Child growth monitoring plus comprehensive household surveys were completed at 5 household visits over 33 months.

Results: Wealth, hygiene practices, dietary diversity, and food security increased more in Intervention households ($p<.0001$, $p<.001$, $p<.0001$, $p<.0001$) than Partial or Control households. In addition, child diet diversity and WAZ, WHZ, HCZ, and MUACZ scores all improved significantly more in Intervention households than the other two groups ($p<.0001$, $p=.006$, $p<.0001$, $p<.0001$, $p<.0001$). In regression analysis, group assignment predicted child anthropometry (HAZ, WAZ, WHZ) and diet quality (diversity and animal source food consumption), after adjusting for child age/ gender as well as multiple household factors (caste, animals, wealth, women's empowerment and education).

Conclusions: In this longitudinal study, a comprehensive multi-sectoral intervention encompassing social and economic capital development and active nutrition messages more successfully improved key nutrition indicators and diet quality in young children. Livestock and nutrition training activities alone had little effect on

these outcomes. Household SES and hygiene practices also improved more in "full package" communities, even though these were not directly addressed by the intervention. Though more time-consuming and costly to administer, holistic community development was associated with better child growth and nutrition outcomes than isolated training programs alone. Organizations seeking measurable and sustainable improvements in these important child outcomes over time must consider the benefits of this more intensive strategy.

Keywords: Child nutrition, child growth, diet quality, community development, livestock.

144/1322

PRESENCE OF PHYTOSTEROLS IN BEE POLLEN FROM EUCALYPTUS SP.: IDENTIFICATION AND EVALUATION OF THE IMPACT OF THE COLLECTION PERIOD AND GEOLOCATION

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Background and objectives: Bee pollen is one of the products of the beehive that has been studied regarding the benefits associated with its consumption, which are due to the presence of bioactive compounds like vitamins, phenolics, flavonoids and phytosterols. Phytosterols are associated with the prevention and treatment of cardiovascular diseases when they are included in the diet. However, there are few studies regarding the presence and quantification of PS in bee pollen. The objective of this study was to evaluate the presence of phytosterols, and the influence of the period of collection and geolocation, on the profile of bee pollen samples from Eucalyptus sp., which were collected in the Brazilian state of Rio Grande do Sul.

Methods: 24 samples were collected from six apiaries in a micro region of Southern Brazil at five different periods. The extractions were performed in two steps: firstly hot saponification, and then extraction of the unsaponifiable matter. The conditions used were 30% KOH in a water bath at 80 °C under stirring for thirty minutes. A gas chromatograph system was used for the phytosterol profile. The analytical standards 5-alfa-colestane, sitosterol, campesterol and stigmasterol were used to compare the analyzed samples.

Results: The results showed that bee pollen from Eucalyptus sp. presented a large amount of total phytosterols, ranging from 0.89 ± 0.2 to 5.56 ± 0.85 milligrams per gram of sample (mean =

2.26 mg/g). Most of the samples contained beta-sitosterol as the main component, with a mean of 40.33 % of the total phytosterols. Both the collection period and geolocation significantly influenced the phytosterol content of the samples.

Conclusions: The results suggest that bee pollen can be used as an important dietary source of beta-sitosterol, adding value to products by increasing potential health benefits. The differences in results may indicate that the contents of these molecules are mainly determined by the plant genotype of Eucalyptus sp. In addition, environmental conditions may influence this composition.

Keywords: Bee products. Phytosterols, Bioactive compounds, Gas chromatography, Bee pollen.

144/1367

EMPOWERMENT IN PASTORALIST WOMEN, AND THE ASSOCIATION WITH MATERNAL AND CHILD DIETS AND HOUSEHOLD FOOD SECURITY

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Background and objectives: Studies have found that when women earn an income, child and household nutrition are more likely to improve compared to when men earn it. Sedentarization in East African pastoral communities might affect gendered control of food, milk and incomes. This paper investigates the relationship between women's empowerment (WE), household food insecurity and maternal and child diets in rapidly transforming pastoral communities in rural Tanzania.

Methods: From July to September 2015, we conducted a cross-sectional survey in two regions, among 373 livestock-owner households participating in a dairy-for-development project implemented by the International Livestock Research Institute. Eligible households had a child 6-24 months and/or a woman of reproductive age. Diet diversity scores (DDS) and diet diversity adequacy (DDA) were calculated for women (n=300) and children (n=95) according to Food and Agriculture Organization and World Health Organization guidelines. FANTA household food insecurity access scale (n=372) measured household food insecurity. The Women's Empowerment in Livestock Index (WELI) questionnaire

measures WE domains: time use, livestock/livestock-product-related decision-making, nutrition decision-making, and access to and control over assets, opportunities, and own-income.

Results: Women's mean WELI was 0.4±0.2 and DDS was 4.1±1.5; children's mean DDA was 2.8±1.2; 47.4% of households were food insecure, of which 20.4% were severely food insecure. One percentage point higher WELI score was associated with higher diversity of women (2.02 ± 0.36, P<0.001) and children (2.23±0.74, P<0.003). WELI scores were inversely associated with milk intake in the prior 24 hours in women (-7.31±1.15mL, P <0.01) and children (-1.23±0.38mL, P< 0.01) and the number of days milk was consumed in the previous 7 days (women: -0.07±0.02 days, P <0.01; children: -0.04± 0.01 days, P<0.01). WELI was not associated with household food insecurity.

Conclusions: Int these pastoral communities, WE was associated with more varied diets but not with household food security. With greater control over assets and products, more empowered women might procure a wider range of quality foods for themselves and their children. Further research is needed to understand the inverse association of WE on milk consumption and the lack of association with household food security, although this has also been found in other studies.

Keywords: Pastoralists, Tanzania, Women Empowerment, Diet, Milk.

144/1391

SENSORY ACCEPTABILITY OF IRON BIOFORTIFIED BEANS AND ORANGE FLESHED SWEET POTATO IN MALAWI

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Background and objectives: Over one-third of women and children under 5 in Malawi are suffering from micronutrient deficiencies. Research has shown the efficacy of biofortified crops, such as beta-carotene rich orange-fleshed sweet potato (OFSP) and iron rich beans, to improve nutritional status of target populations. The extent of consumption of biofortified crops will depend on the acceptability by consumers. Such acceptability has not been extensively investigated in Malawi. Therefore, we investigated the sensory acceptability of OFSP and iron beans in households in rural Malawi.

Methods: Sensory acceptability of OFSP (n=270 subjects) and iron beans (n=320) was investigated in adults using a discrimination test (blinded), preference test, and an acceptance test for 7 attributes. Also 57 children (beans) and 60 children (OFSP) aged

4-5 years took part in the preference test. Three OFSP varieties and one biofortified iron bean variety were tested against a local control variety. A 5-point facial Likert scale was used and participants were randomly assigned to taste either sweet potato or beans.

Results: Participants were able to discriminate between the taste of OFSP and local sweet potato variety, whereas they could not discriminate between non-biofortified beans and biofortified beans (p<0.05). Adults preferred the local sweet potato variety (76%) over OFSP. Although more children did prefer the orange variety (58%) this was not significant. Iron beans were more (p<0.05) liked than the non-biofortified beans by both adults (82%) and children (67%). In the acceptance test, the control sweet potato variety scored highest (4.4), whereas the three OFSP varieties scored significantly lower (range scores 3.4-4.0, p<0.05). Important factors for acceptance are starchiness and sweetness of the different sweetpotato varieties. The iron beans were significantly preferred over the non-biofortified variety (overall liking 4.3 vs. 3.8). For beans, the largest differences in liking were found for the attributes texture and hardness of the skin.

Conclusions: Overall, from a sensory perspective, biofortified OFSP and beans are well accepted in Malawi. However, although both were liked, there is still a preference for the local variety of OFSP and more research is needed to determine the reasons for this, to be able to develop varieties that are more preferred.

Keywords: Biofortification, sensory acceptability, beans, OFSP, Malawi.

144/1487

RURAL-URBAN DYNAMICS IN NUTRIENT CONSUMPTION: EVIDENCES FROM INDIA

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Background and objectives: Economic development is associated with nutrition improvement. National food security notwithstanding, household nutritional security remains a problem, this paper explores into.

Methods: National Sample Survey data on consumption, expenditure and nutrition intake were analysed for instability (CV, Cuddy-Della Valle Index) and inequality (Gini, Lorenz Curve and Biplot).

Results: Monthly per capita expenditure on food declined from 72.90% in 1972-73 to 52.90% in 2011-12 in rural and from 64.50% to 42.60% in urban. The per capita monthly consumption of cereals declined from 15.26kg to 11.86kg in rural and from 11.24kg to 9.28kg in urban. The rural-urban differential has reduced despite a discernible shift in the consumption pattern noticed between them. The monthly per capita consumption of rice was 7kg in rural against 5kg in urban. Surplus production and availability of wheat increased its consumption from 25.43% (42.88%) to 39% (46.12%) in rural (urban). The rural coarse cereals consumption declined from

4.79 to 0.66kg due to its substitution by fine cereals, milk, fruits and vegetables with changing income, customs, habits and taste. High consumption of cereals in rural is due to the high energy required for physical work and payment of kind wages. The share of non-cereals increased in rural but declined in urban. However, the share of non-food items witnessed an increase across the country.

The per capita calorie intake declined by 1.46% in rural owing to reduced cereals consumption but increased by 4.70% in urban. Consumption of fat increased in both rural (92.08%) and urban (61.11%). Inequality in consumption of calories, protein and fat declined in rural, increased in urban but declined among expenditure classes. Instability in nutrient uptake was high and more pronounced in rural. State-wise correlation between calorie intake and per capita cereal production was positive and significant indicating that local production determined cereal consumption. Low prices enabled the poor consume enough calories in surplus states.

Conclusions: The rural per capita cereal consumption is a concern. Raising income increased the non-cereal and non-food consumption. Policy should focus on accelerating the supply of non-cereals and providing the poor access to right food-basket to reduce the gap and inequality in nutrition intake.

Keywords: Consumption pattern, Nutrient intake, Calorie consumption, GINI coefficient, NSSO

144/1582

CROP PRODUCTION AND LIVESTOCK PRODUCTION DIVERSITY ARE POSITIVELY ASSOCIATED WITH DIETARY DIVERSITY IN RURAL UGANDAN WOMEN AND CHILDREN AGED 6-59MONTHS

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Background and objectives: Household production diversity is a common strategy promoted to improve dietary diversity of vulnerable populations in developing countries. The objective of this analysis is to examine the association between crop and livestock production diversity in rural Ugandan households and women's and child's dietary diversity.

Methods: Data used are from two survey rounds (2012, 2014) on the same households from 3 North and 3 South West Ugandan districts (random self weighting sample, n=6377 households, 6369 women, 2463 children 6 to 59 months). Pooled mixed effects repeated measures linear regressions tested the association between crop or livestock production diversity, women's dietary diversity score (WDDS) or child's dietary diversity score (CDDS). WDDS and CDDS are a count of all food groups consumed in the past 24 hours, crop production and livestock production diversity scores (CPDS and LPDS respectively) a count of all crops and livestock respectively. Co-variates include year of survey, geographical location, woman's age (WDDS model), household head gender, household wealth index, child's age and gender (CDDS models).

Results: Mean WDDS was 4.27 ± 1.48 and Mean CDDS was 2.48 ± 1.57. Mean CPDS was 4.09 ± 1.23 and mean LPDS was 1.12 ± 1.11. WDDS was negatively associated with age ($\beta=-0.010,p<0.001$), while CDDS is positively associated with age ($\beta=0.067,p<0.001$). We find a significant positive association between WDDS and CPDS ($\beta=0.22,p<0.001$) and LPDS ($\beta=0.23,p<0.001$). Controlling for age, geographical location, year, household head, wealth index and correcting for sample dependency did not alter the association (CPDS $\beta=0.23,p<0.001$, LPDS, $\beta=0.13,p<0.001$). CDDS was significantly and positive associated with both crop production ($\beta=0.15,p<0.001$) and livestock production diversity ($\beta=0.13,p<0.001$). Controlling for child's age, gender, geographical location, survey year, household head gender, wealth index and correcting for sample dependency did not alter the association (CPDS $\beta=0.14,p<0.001$, LPDS $\beta=0.07,p=0.016$)

Conclusions: Dietary diversity in rural Ugandan women and children 6-59 months of age is significantly associated with crop and livestock production diversity. The strength of association is consistent for crop production on adjusting for co-variates decreasing for livestock production diversity. Further analysis to understand the role of market access is required.

Keywords: Production diversity, dietary diversity, women, children, rural Uganda.

144/1688

USE OF A SYSTEMS-BASED APPROACH TO IMPROVE DIETS AND SUSTAINABILITY OF FOOD PRODUCTION

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Background and objectives: Our current food system is damaging to both human health and nutrition and the environment. Poor diet quality is now the leading cause of morbidity and mortality worldwide while the way in which food is produced, distributed and consumed is causing extensive environmental damage. Using a systems-based approach we studied food production systems and dietary intakes in Kenya, Vietnam and Zambia to identify entry points for improving dietary diversity and improve sustainability of the food system through the inclusion of locally available nutrient-dense food by season.

Methods: Qualitative participatory methods were used to assess seasonal food availability and species diversity in Zambia. Quantitative household surveys of dietary intake and household level production were repeated across seasons in all sites. Kenya included two rounds of data collection and a total sample of 647 households, Vietnam included two rounds of data collection and a total sample of 416 households and Zambia included three rounds of data collection and a total sample of 1089 adults.

Results: Abundant food biodiversity was recorded for Kenya and Vietnam. In Kenya 67 edible plant species were recorded on-farm and households reported collection of 38 different wild edible plants. In Vietnam, 398 different species (292 species of plants and 106 animal/fish/insect species) were produced in the landscape. Dietary diversity scores for women in the lean season were 4.1(1.3), 4.8 (1.1) and 3.5 (1.0) and in the more abundant season for food availability 4.4 (1.3), 4.8 (1.1) and 2.9 (0.9) in Kenya, Vietnam and Zambia respectively. Food groups consumed by fewer than 50% of respondents in all sites and across all seasons include beans and peas, nuts and seeds, eggs and other fruits. Based on this assessment communities participated in different agriculture and nutrition interventions aimed to diversify both production as well as dietary intake.

Conclusions: This approach enabled communities to identify locally available foods to improve diet and production diversity. The identification of local solutions can also add environmental benefit such as adding diversity to the landscape that can improve soil fertility, pollinator density and also reduce distance food travels between producer and consumer.

Keywords: Diet diversity. food systems. biodiversity. sustainability. Seasonality.

144/1759

A HYBRID APPROACH: MERGING AGRICULTURE AND HEALTH-BASED FORMATIVE RESEARCH TOOLS TO INFORM NUTRITION BEHAVIOR CHANGE INTERVENTIONS AMONG MOTHERS AND YOUNG CHILDREN IN SIERRA LEONE

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Background and objectives: The 2014 Ebola outbreak in Sierra Leone left rural districts with reduced food production and deteriorating household nutrition practices. This adversely effected nutrition status of pregnant and lactating women (PLW) and children under two years old. The USAID-funded Strengthening Partnerships, Results, and Innovation Globally (SPRING) project developed a hybrid formative research approach combing traditional agriculture Extension Advisory Services (EAS) and nutrition-based social and behavior change (SBC) tools to inform a more comprehensive response to this nutrition crisis.

Methods: SPRING adjusted traditional formative research tools common to both agriculture and health. EAS often use an agricultural value chain assessment to identify constraints to increasing income and yields. SPRING adjusted the value chain assessment tool to also identify constraints and opportunities to improving supply and quality of vitamin A-rich and animal-source foods (deficient in the diet of the target population), and to adopting agriculture practices that reduce impacts on time, energy, and income control of PLW. Health programs commonly use formative research tools such as barrier analysis and trials of improved practices to identify barriers and enablers to the adoption of improved household-level nutrition practices. SPRING adapted these tools to include nutrition-sensitive agriculture and hygiene practices (such as such as clean play spaces and handwashing) to identify factors related to the accessibility of targeted foods and to reducing environmental enteropathy. SPRING used the revised tools to assess 506 agriculture actors and PLW in Tonkolili District, Sierra Leone from March-June 2016.

Results: The merged tools provided unique information on the intersection of both the agriculture system and household-level nutrition behaviors that would not have been found using the traditional agriculture and health tools separately.

Conclusions: These new tools allowed SPRING to develop a tailored set of SBC communication materials for Sierra Leone that complement each other to affect change at both the market/value chain level (to improve the supply of highly nutritious foods) as well as the household level to enhance demand and consumption of nutritious foods and improve hygiene. Merging tools and approaches across sectors can greatly facilitate the development of more effective SBCC tools.

Keywords: Nutrition. Agriculture. Social Behavior Change.

Conflict of Interest Disclosure: K. Granger. Manoff Group. P Koniz-Booher and P. Moses John Snow, Inc. V Pinga Save the Children

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144/1814

COMPATIBILITY OF NANO-FIBRILLATED CELLU-LOSE TO THE PHYSIOLOGICAL HOMEOSTASIS IN THE GASTROINTESTINAL TRACT

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Background and objectives: Cellulose is a major component comprising dietary fiber in many food products. Many studies indicated that dietary fiber exhibits various physiological functions not only for leading a decrease in the incidence of colon cancer but for promoting our health, exemplified by the control of mobility of the intestines and population of gut microflora. Recently nano-fibrillation techniques have been developed to apply cellulose as new and effective food materials acting as thickeners and/or stabilizer of emulsion, focusing on some attractive characteristics of cellulose nanofiber (CNF) including a high viscosity and water-holding activity. However, it remains largely unknown how CNF affects the physiological functions in the intestines, therefore, we aimed to reveal the compatibility of CNF to the physiological functions in the gastrointestinal tract in this study.

Methods: The nano-fibrillation for cellulose samples was treated using a grinder after wood tips were subjected to softening and delignification processes. Carboxymethylated cellulose nanofiber (CMC-NF) was produced by a surface modification of cellulose and nano-fibrillation. Mice were fed with the diet containing 3% cellulose, CNF or CMC-NF.

Results: There were no significant differences in body weight and dietary intake among the three groups of mice fed with cellulose during 8 weeks. After 8 weeks feeding, the plasma level of TNF-α and the concentration of lipocalin in feces were evaluated as inflammatory parameters. Myeloperoxidase (MPO) activity was measured as an indicator of neutrophils' infiltration into colon tissue. However, any significant difference was not observed in plasma TNF-α level, lipocalin concentration, and MPO activity among the three groups. Histological observation showed no reduction in the length of the large intestine and no incidence of colitis as seen in mice that had been administered dextran sodium sulfate. No symptom of inflammation was also supported by the data showing no significant difference in liver weight and some blood parameters. Moreover, analysis of T cell population in mesenteric lymph node using flow cytometer showed no significant fluctuation in the frequency of regulatory T cells and Th17 cells.

Conclusions: It thus follows that CNF can be used as a new promising food material so that nutritional, physiological, and immunological homeostasis are maintained.

Keywords: Compatibility. gastrointestinal tract. nano-fibrillated cellulose. physiological homeostasis. Safety.

144/1924

LIVESTOCK REARING AND DEPRESSION IN ADOLESCENTS ARE ASSOCIATED WITH THEIR MENTAL DEVELOPMENT IN THE KASSENA-NANKANA DISTRICT OF GHANA

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Background and objectives: Animal source food and mental well-being have long been thought to be essential for child mental development. This results are part of a larger study to adapt and use a mental development tool in Ghana and evaluate the long-term effect of the Enhancing Child Nutrition through Animal Source Foods (ENAM) project in Ghana.

Methods: This study evaluated the effect of the ENAM project on the 2-5 y old children who were enrolled in the study in 2005. The vocabulary and similarity subtests of Wechsler Abbreviated Scale of Intelligence II were translated and back translated and then the vocabulary subtest was adapted to the local context to be used in rural and peri-urban communities in Ghana. The block design, matrix reasoning and similarity subtests did not need much translation. The adapted tool was then tested and re-tested in a selected school within the Kassena-Nankana district of Ghana. Information on adolescent's academic performance, nutritional status, assets, livestock rearing, and depression symptoms using a self-reporting questionnaire was taken. Data were analyzed using SAS 9.4 version.

Results: A total of 30 children (56.7% girls) with an average age of 11 y (range= 8 - 14 y) participated in the first part of this pretest. They had high assets (8 out of 10), raised livestock (67.9% had >1) and had a depression symptom score of 6 out of 20. The

average school attendance of 62 out of 70 d and academic score of 69.7%. Livestock rearing was negatively associated with depression (r=-0.5; p=0.02), while child academic score was associated with similarity subtest (r=0.43; p=0.03). In boys, the block design was associated with livestock rearing (r=-0.7, 0.04) and similarity was associated with school attendance (r=0.7, p=0.04) and depression (r=-0.7, p=0.03). However, in girls vocabulary, matrix reasoning and school attendance were associated academic score (r=0.5, p=0.04), (r=0.5, 0.04) and (r=-0.6, p=0.03) respectively.

Conclusions: The modified WASI appears to be valid in relation to academic performance, and in boys is positively related to livestock rearing and negatively to depression.

Keywords: Livestock, child development, depression, academic.
Further collaborators.

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144/2122

ADVANTAGES OF SUGAR REDUCTION WITH BLENDS VERSUS INDIVIDUAL STEVIOL GLYCO-SIDES

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Background and objectives: Healthier lifestyles, clean label and natural-origin are of rising interest among consumers around the world which gives stevia leaf extract, a zero-calorie sweetener a unique opportunity. Stevia leaves contain over 40 steviol glycosides (SGs) that provide different sweetness and organoleptic properties. Rebaudioside A (Reb A) is one of the most abundant and the primary focus of stevia usage to date, but not without some taste challenges. This has led to an exploration of the characteristics of other SGs, both, individually and in combinations.

Methods: We hypothesized that blends of SGs may provide improved taste profiles versus Reb A. To test this hypothesis, two separate studies were conducted. Trained sensory panelists assessed the performance of Reb A versus a custom blend, versus an 8% sugar control, in acidified water at 3.2pH sugar reduction in study-1 and, in a 20% orange juice-drink with a 50% sugar reduction in study-2. Study-1 assessed the temporal profiling of the three products while study-2 was a descriptive analysis.

Results: The results study-1 showed that the duration of sweet aftertaste lasted longer for Reb A versus the custom blend and full sugar control (55.55 vs. 44.03 vs. 40.43 secs, P≤0.20). Other study parameters were not significantly different. Study 2 showed that the bitterness of the custom blend was significantly lower than the full sugar control (0.89 vs 1.34, P≤0.10) and, the Reb A and sugar control were not significantly different. In addition, metallic flavor (0.11 vs 0.55, P≤0.20) and licorice-root notes (0.15 vs. 0.67, P≤0.20) were lower with the custom blend versus Reb A, respectively. Reb A had a significantly higher "artificial-taste" character versus the control sugar and the custom blend (1.05 vs 0.28 vs. 0.25, P≤0.10), respectively.

Conclusions: These data suggest that the taste profile of the custom SG blends in these studies were closer to that of sugar, the preferred taste profile and, an improvement over Reb A. Future success will lie in the science of combining the right SGs for acceptable better tasting products that can positively impact reduced-sugar intake and health.

Keywords: Stevia, sugar reduction, sensory, taste, Reb A.
Conflict of Interest Disclosure: Marcia Petit works at PureCircle and the research was funded by PureCircle Ltd.

Dr Priscilla Samuel works at the Global Stevia Institute which is supported by PureCircle Ltd.

144/2256

EXPOSURE BIOMARKERS OF ACRYLAMIDE AND GLYCIDAMIDE HEMOGLOBIN ADDUCTS AND ALL-CAUSE AND CARDIOVASCULAR MORTALITY IN NHANES 2003-2006

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Background and objectives: Acrylamide has been acknowledged for its neurotoxicity, genotoxicity and reproductive toxicity, and classified as a Group 2A carcinogen. However, the relationship between the internal exposure to acrylamide and its metabolite glycidamide and mortality remains unclear. The aim of this study is to examine the association of hemoglobin adducts of acrylamide (AA-Hb) and glycidamide (GA-Hb) with all-cause and cardiovascular mortality in NHANES 2003-2006.

Methods: We followed 5504 participants who were ≥ 25 years of age. The exposure biomarkers and related variables were measured, including AA-Hb, GA-Hb, their sum (GA-Hb + AA-Hb) and their ratio (GA-Hb/AA-Hb). Hazard ratios (HRs) and 95% confidence intervals (Cls) were determined for all-cause mortality and cardiovascular mortality through the end of 2011. HRs and 95% Cls were estimated using Cox proportional hazards regression models using age as the underlying time metric and adjusted for sex, race/ethnicity, education level, physical activity, alcohol intake and other suspected risk factors.

Results: A total of 314 deaths were documented during 9 years of follow-up. After adjustment for known and suspected risk factors, GA-Hb/AA-Hb was inversely associated with all-cause mortality (hazard ratio [HR] comparing extreme quarters 0.606; 95% Cl, 0.372-0.987; P < 0.05 for trend) and cardiovascular mortality (hazard ratio [HR] comparing extreme quarters 0.368; 95% Cl, 0.169-0.802; P < 0.01 for trend). We did not observe any evidence to support the hypothesis that levels of biomarkers of acrylamide and glycidamide exposure measured as hemoglobin adducts (AA-

Hb and GA-Hb) were associated with the risk of all-cause and cardiovascular mortality. However, we found strongly suggestive evidence that GA-Hb/AA-Hb is inversely associated with all-cause and cardiovascular mortality in US adults. The ratio of hemoglobin adducts of glycidamide to acrylamide means the extent of acrylamide metabolism and can be used as an indicator of formation of the genotoxic metabolite glycidamide in the body and its detoxification. Moreover, the ratio GA-Hb/AA-Hb can be used as a useful marker of the mortality.

Conclusions: The ratio of GA-Hb to AA-Hb was inversely associated with all-cause and cardiovascular mortality. Efforts on further up-regulate GA-Hb/AA-Hb in the population can contribute to a substantial decrease in cardiovascular disease burden.

Keywords: Acrylamide; Glycidamide; Cardiovascular disease; Mortality; NHANES.

144/2359

DOES LOCAL FOOD AVAILABILITY SUPPORT IMPLEMENTATION OF FOOD-BASED DIETARY RECOMMENDATIONS IN NORTHERN GHANA?

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Background and objectives: Local feasible food-based dietary guidelines (FBDGs) help provide guidance to policy makers and consumers to redesign food systems and to improve diets of vulnerable populations. As FBDGs are based on the actual dietary patterns and their costs, it is assumed that they are available, affordable and acceptable for the population under study. However, often extremes of the distribution of foods consumed are used and therefore it remains unclear whether FBDGs are supported by the local availability of food.

Methods: Using quantitative dietary intake data of young children in rural Northern Ghana, we developed local FBDGs and studied whether these are supported by the diversity and quantity of household's foods production and the associations between household's production diversity, household's food and nutrient coverage and the child's diet.

Results: We found very low coverage of household's food needs (according to the developed FBDGs) and nutrient needs by their food production. None of the households cover their vegetables needs and more than 50% of household do not cover their calcium, vitamin A, vitamin B12 and vitamin C needs. Household's food production diversity is positively related with household's food and nutrient coverage. Household's production diversity, food and nutrient coverage are not related with the child's diet.

Conclusions: This study shows that although local FBDGs are based on actual dietary patterns and costs, the availability of food can be a limiting factor in the ability of populations to implement the FBDGs. Therefore the promotion of food-based recommendations through nutrition education or behavior change communications activities alone is not enough to lead to improvements in diets. Additional strategies are required such as agricultural- and market-based strategies in combination with nutrition specific interventions including food fortification, and home fortification options. These may offer opportunities to further facilitate adoption of recommendations and provide additional support to improve diets of vulnerable populations. The relation between household food availability and children's diet need to be further investigated for better understanding and identifying opportunities for strategies to improve children's diet.

Keywords: Food-based dietary guidelines; food coverage; nutrient coverage; crop diversity; dietary diversity

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144/2486

EFFECT OF POLISHING ON CONTENT AND BIO-ACCESSIBILITY OF SELECTED MINERALS FROM FIVE RICE VARIETIES

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Background and objectives: Rice is a staple food for more than half of worlds' population. There are many varieties of rice grown with inherent compositional differences. Rice also undergoes excessive polishing to remove the bran layer and the consumer acceptability of white rice is much higher on account of better organoleptic characteristics. However, polishing also reduces the nutritional content of rice as most of the protective nutrients are concentrated in the brown aleurone layer.

Objective: The objective of the study was to estimate the mineral content and analyze bioaccessibility of calcium, iron and zinc in selected rice varieties with different degrees of polishing.

Methods: Rice samples selected were IEI-13901, KHP-2, KHP-5, KHO-10 and Rajamudi. These were subjected to different levels of polishing (0, 15, 30, 45, and 60 seconds) and analyzed for calcium, iron, zinc and phosphorus content following standard techniques. The bioaccessibility of calcium, iron and zinc was studied with dialysis technique.

Results: Results indicated that the calcium content of rice varieties ranged from 14.52 to 24.53 mg/100g in rice with no polish and reduced to 5.19-11.43 mg/100g in highly polished rice. Among the varieties, KHP-10 had a higher calcium content. Similar variations were also found in bioaccessible calcium which was in the range of 12.58-30.54%. Rice is fair source of iron with contents ranging from 0.83-3.03 mg/100g and highest bioaccessibility was seen in rice with first degree of polish (3.68-4.20%). Excessive polishing reduced iron availability considerably in all samples. Polishing also reduced zinc content, though the effect was lesser in both in content and availability which ranged from 11.27-17.51% in four varieties with one being much higher at 201-23.3% (Rajamudi). Phosphorus content also showed a decline with polishing.

Conclusions: In conclusion polishing of rice reduced the mineral content of all varieties, though the bioaccessibility were influenced to varying extent. Varietal differences were also observed in mineral content and bioaccessibility.

Keywords: Rice polish, brown rice, calcium, iron, zinc.

144/2600

REORIENTING FOOD SYSTEMS TOWARDS IMPROVING NUTRITION OUTCOMES: MEASURING NUTRITIONAL QUALITY OF AGRICULTURAL PRODUCTION

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Background and objectives: Food production systems are traditionally designed to maximising yields or income for producers. Shifting the goal of food systems away from 'feeding people to nourishing people' requires valuing and measuring the nutritional quality of production systems. The objective of this study was to identify indicators which capture the ability of a production system to nourish the most people, which could potentially be useful for prioritising and decision-making in agricultural production systems.

Methods: Two comprehensive agriculture and nutrition indicator guides were reviewed to identify indicators that capture an aspect of food or nutrient availability, access, consumption or utilisation. Relevant indicators were then mapped to the applicable stage of the food and nutrition system (production, distribution, consumption, nutrition). Those pertaining to agricultural production were applied to selected aquaculture production systems to yield insights into the strengths and limitations of different indicators that capture an element of nutritional quality of production output.

Results: The majority of existing indicators are relevant at the consumption or nutrition stages (n=33) of the food and nutrition system, rather than production (n=7). Application to aquaculture production systems demonstrates that different indicators capture different aspects of nutritional quality. Indicators that reflect nutrient composition of foods produced, diversity in nutrients produced, and the abundance or quantity of those nutrients, which are simple to calculate and interpret by decision makers are of most relevance here.

Conclusions: In capturing the ability of a production system to nourish the most people, the indicators 'nutritional yield, 'potential nutrient adequacy' and 'Rao's quadratic entropy' are likely to be of significant value.

Keywords: Food system, nutritional quality, production, aquaculture, diversity.

144/2620

COMPARATIVE STUDY OF THE CHEMICAL COMPOSITION OF PINE NUTS GROWN IN SIX COUNTRIES

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Background and objectives: Pinus pinea L. produces highly valued commercial pine tree nuts. It is endemic to the Mediterranean Basin, where pine nuts are part of the Mediterranean diet. The aim of the study was to compare the chemical composition of pine nuts harvested from six countries. In this comparative study, geographic zones and agro-climatic conditions that may affect the chemical composition of pine nut seeds were considered.

Methods: The chemical composition of pine nuts harvested from 15 growing areas, distributed in Chile (3), Argentina (2), Italy (3), Spain (1), Turkey (3), and Israel (3) was determined. All proximate analyses were performed using AOAC methodologies (2012). The relative contribution of climatic variables to chemical components was estimated using CART algorithms. As confirmatory analysis, the groups suggested by the identified climatic variables thresholds were compared by ANOVA. A principal component analysis was applied, generating a biplot for chemical composition of pine nuts and climate variables of different countries. Analyses were achieved using the software Infostat® and its interface with the software R®.

Results: The main component was fat (3.47 to 4.53 g kg-1), followed by protein (3.21 to 3.66 g kg-1). Dietary fiber averaged 1.23 g kg-1, while ashes averaged 0.44 g kg-1. Pine nuts from Chile and Argentina were similar, both countries exhibiting the highest thermal oscillation and rainfall. Italian nuts had the highest fiber content, while Spanish nuts had the highest fat content. Israel exhibited the highest number of dry months, and pine nuts contained more protein and minerals, while nuts from Turkey showed an intermediate position. The climatic variables affecting the chemical composition were: minimum and maximum average temperatures, amount of dry months, and thermal oscillation.

Conclusions: The differences observed in the chemical composition of pine nuts grown in different regions may be explained, at least in part, by the environment and soil type variability between regions. However, all pine nuts exhibited high nutritional quality, independently of the zone where they were grown.

Keywords: Pinus pinea L.; pine nuts; chemical composition; growing zone; agro-climatic conditions.

144/2737

ASSESSING HOUSEHOLD FOOD SAFETY WITH A VALIDATED INDEX: CRITICAL ISSUES IN FOOD SAFETY AMONG HOUSEHOLDS WITH AND WITHOUT CHILDREN BELOW 5 YEARS

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Background and objectives: Home is one of the primary locations of foodborne illnesses risks. Chances of food handling errors can pose high risk to susceptible people at home, especially under-five children (U5C). About 40% of global foodborne disease burden is contributed by this susceptible group, more so in countries like India where 15% of foodborne diseases are reported at household (HH) level. Food safety risks could be different among households with/without this vulnerable population. Given this background, we aimed to assess household food safety using a validated food safety index and identify critical issues in HHs with/without U5C.

Methods: A cross-sectional study was conducted among primary food preparers at home (N=400) with and without U5C (@200 in each category) drawn from rural and urban areas of Telangana State in south India. An 11-item validated food safety index (Maximum score-17) was administered. Data on incidence of food/waterborne illnesses in the fortnight preceding the survey was also collected. In addition, leftover cooked-foods (100g), drinking water (250ml) at point-of-use (PoU) and hand-rinses were collected for microbiological analysis (USFDA-BAM).

Results: About 23% of the respondents reported at least one foodborne illness in the previous 15 days of the survey. Of those who suffered, as many as 53% were children. About 50% of HHs were at food safety risk (Index cut-off score ≤9) and among these, a higher number had U5C. Such HHs have also shown significantly higher levels of food contamination than their counterparts with no U5C. Improper food storage, lack of pure water at PoU and fewer enabling assets (like separate kitchen; piped-water facility) were found to be critical issues affecting food safety among HHs with/without U5C. Along with these, practices like not re-heating the leftovers and presence of pest/pet near the kitchen area

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144/2657

OPERATIONALIZING MULTI-SECTORAL COORDINATION AND COLLABORATION STRATEGIES FOR IMPROVED NUTRITION

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Background and objectives: The 2013 Lancet nutrition series argues that in order to achieve global targets for reducing undernutrition, there needs to be a multi-sectoral approach including scaled-up, proven nutrition-specific interventions and nutrition-sensitive agriculture and other sector interventions. While a multi-sectoral approach is arguably the most effective way to improve nutrition, little evidence exists about how to implement it,. To understand the role multi-sectoral collaboration may play in improving nutrition, the SPRING Project asked: how can we make multi-sectoral collaboration operationally feasible?

Methods: To answer this, SPRING conducted a literature review and analysis of attempts to coordinate nutrition across USAID portfolios in Bangladesh, Guatemala, and Rwanda. SPRING collected data through over 50 key informant interviews in those countries, and extensive review of project documents and existing literature. The Garrett conceptual model for working multi-sectorally was used to formulate interview questionnaires and analyze responses. 3

Results: The countries used different approaches and were at various stages in the cross-sector collaboration process, but shared similar obstacles in implementing structures, processes, and practices that affected their ability to initiate and sustain their efforts, including difficulties developing strategies that defined shared roles and responsibilities and systems for communications, monitoring and feedback. Lack of shared mandates and metrics created disincentives to investing time and resources toward collaboration. From findings, SPRING developed a set of key considerations along the program cycle that may contribute to making multi-sectoral collaboration more feasible and effective.

Conclusions: While collaboration strategies, goals, and models vary, they often follow a similar life cycle that can be systematically designed, implemented, and monitored. Understanding the context and opportunities in each phase can help standardize certain key approaches and inform future strategies. Incorporating the recommendations highlighted by this assessment may lead to more successful and sustained collaboration for nutrition.

Keywords: Nutrition-sensitive agriculture. Multi-sectoral collaboration. Program cycle.

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were also affected food safety in HHs with U5C. However, poor hand-hygiene was critical among HHs without U5C. Rural HHs with U5C reported significantly (p<0.05) higher food safety risk than urban HHs.

Conclusions: This study highlighted critical issues affecting food safety among HHs with/without U5C. These would be useful to design targeted food safety education programmes and thus improve child health.

Keywords: Household, Food safety, Index, Under-five children.

144/2866

PROMOTION OF BIOFORTIFED CROPS TO IMPROVE MICRONUTRIENT INTAKE AMONG CHILDREN UNDER FIVE AND WOMEN IN CHILD BEARIGN AGE IN TANZANIA, PAKISTAN AND BANGLADESH

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Background and objectives: ENRICH is a Maternal Newborn and Child Health and Nutrition program funded by the Government of Canada and implemented in Bangladesh, Pakistan, Myanmar, Kenya and Tanzania. ENRICH will use nutrition pathway to reduce U5M by strengthening health systems and improving basic nutrition and nutrition sensitive services and addressing nutrition-related causes such as: poor breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (Lancet, 2013).

One of the strategies is promotion of production and consumption of biofortified micronutrient-rich crops which help to reduce vitamin A deficiency and improved iron status among CU5

Methods: ENRCH program trained and supported Lead Farmers, para-professional farmers and agricultural extension agents to become Trainers of Trainers (ToTs) within their communities and train select growers to become bio-fortified crops producers and seed multipliers in all 3 countries. ENRICH staff oversaw and directed the training of farmers on the production, harvest and post-harvest handling of bio-fortified crops. The program sensitized communities on bio-fortification to build consumer demand. Beneficiary farmers were encouraged to pass on the information to other farmers and scale up crop production.

Results: In Pakistan a total of 600 farmers were trained and 600 bags (each package weighing 25 kg) of Zincol-2016 seed was distributed among 600 farming households (438 male, and 162 female) for cultivation of half an acre of land. In Bangladesh, 17 trainers were trained on zinc rice production technology. The program selected 1560 rice farmers and 4.68 tons of zinc rice variety, BRRI dhan74, seeds were purchased and distributed. In Tanzania a total of 72 lead farmers were trained and received training manuals and vines for OFSP production. Twenty seven (27) OFSP production demonstration farm sites were also established. In all countries, the program negotiated an agreement with local stakeholders for the delivery of biofortified planting materials.

Conclusions: Local stakeholders involvement and participation is key to promotion of production and consumption of biofortifed crops. Lead farmers approach and passing on information to other farmers in the villages is a feasible delivery model for introduction and scale up biofortification. Integrating biofortification to public programs is key to sustainability.

Keywords: Biofortification, Orange Flesh Sweet Potato, Zinc Rice, Zinc Wheat.

Further collaborators.
World Vision Works with HarevstPlus on Biofortification

144/2967

PERFORMANCE AND CARCASS CHARACTERISTICS OF BROILER CHICKENS FED DRIED CASHEW APPLE PULP IN REPLACEMENT FOR MAIZE

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Background and objectives: Alternative ingredients have become a major focus of the broiler industry given the dire competition between man, industry and livestock for conventional ingredients such as maize. Dried cashew apple pulp (DCAP) has been used to replace maize broiler diets in Brazil and Asian countries. This study was to evaluate the effect of replacing maize with dried cashew apple pulp (DCAP) in broilers chicken diets on performance and carcass characteristics in Nigeria.

Methods: A total of 250 four weeks old Arbor Acre plus commercial broiler chickens were randomly selected and assigned to 5 dietary groups of 0%, 5%, 10%, 15% and 20% DCAP replacement for maize in a twenty- eight day trial . Each group comprised 5 replicates of 10 birds each. Growth performance characteristics was recorded, birds were slaughtered at the end of the experiment and carcass characteristics were measured.

Results: It was observed that 10% replacement level had the highest final weight, weight gain and least feed conversion ratio (FCR) while 20% replacement level had the least final weight, weight gain, feed intake and highest FCR. There were no significant differences (P>0.05) in head, neck, drumstick, breast, back, wings, gizzard, empty gizzard, heart, liver and gastrointestinal tract weight except thigh weight, abdominal fat and spleen which are higher at 10% replacement level.

Conclusions: Dried cashew apple pulp compared favourably with maize at the given level, it therefore can be used successfully in its replacement without deleterious effect to growth and carcass characteristics.

Keywords: Alternative ingredient, dried cashew apple pulp, maize, broiler chicken.

144/3002

RESIDUAL B-CAROTENE AND CYANIDE LEVELS IN GARI PRODUCED FROM UNFERMENTED YELLOW CASSSAVA (MANIHOT ESCULENTA CRANTZ) USING LOCAL PROCESSING METHOD

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Background and objectives: In order to find ways of improving the consumption of vitamin A rich foods in Nigeria, yellow fleshed cassava was introduced to farmers. This study was carried out to determine the level of the retained β-carotene in processing yellow cassava (variety IITA TMS 01/1371 or UMUCASS 38) into gari using local processing method, and also to determine the residual cyanide after processing (fermented and unfermented) of the yellow-fleshed cassava.

Methods: Harvested samples of the yellow fleshed cassava were fermented in the traditional way (natural fermentation for 48hr) while some samples were unfermented. The fermented cassava were processed into cassava grit- gari which is a staple food commonly consumed in Nigeria. High performance liquid Chromatography (HPLC) was used to determine the level of β-carotene in gari produced from fermented and unfermented yellow cassava while the cyanide level was determined by an automated enzymic method.

Results: Results showed that the gari produced from fermented yellow cassava had a higher level of β-carotene depending on the number of days of fermentation compared with the gari from unfermented yellow cassava. The gari produced from unfermented cassava had the least content of β-carotene (8.076±0.311ug/g) during the first week of storage compared with those produced from fermented cassava (10.600±0.470- 20.610±0.098ug/g). There was a reduction in the β-carotene contents in all groups during the 5week storage period. The rate of loss of β-carotene over a five week period showed that the gari from unfermented cassava had the least rate of loss (0.885ug/week) compared with the gari from fermented cassava over the same period (0.955-2.447ug/week). However the level of Hydrogen cyanide (HCN) retained was more in the gari from unfermented yellow cassava (3.160±0.006mg/100g) compared with the gari from fermented cassava (0.470±0.046-1.423±0.006 mg/100g).

Conclusions: On the basis of the result, it is suggested that yellow cassava should be fermented before being roasted into gari and adequate method of storage be adopted to reduce loss of the β-carotene while in storage.

Keywords: β-Carotene, Cyanide, Unfermented, Gari, Yellow Cassava

Annals of Nutrition & Metabolism

Track 1: Advances in Nutrition Research

144/282

INFLAMMATORY AND IRON STATUSES AND THEIR RELATIONSHIP WITH BODY FAT MASS IN LEAN AND OBESE INDIGENOUS GUATEMALAN WOMEN

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Background and objectives: Obesity is usually accompanied by chronic, low-grade, systemic inflammation and up-regulated hepcidin gene expression, often reflected by higher circulating C-reactive protein (CRP) and 25-hepcidin levels. These events lead to lower intestinal uptake and increased tissue sequestration of iron. The high prevalence of overweight/obesity and poor living conditions observed amongst indigenous Mayan populations may both predispose to inflammation and disturbances in iron metabolism. Here, we sought to explore the differences in biomarkers of iron and inflammation status, and their relationship with body fat mass, in lean and obese indigenous Guatemalan women.

Methods: Twenty-two non-pregnant, non-anemic, pre-menopausal women, aged 30-45 years, from Sololá, Guatemala were recruited, evaluated and classified into two groups of lean (n=11) and obese (n=11) women, using combined body mass index (BMI) and % body weight as fat mass (%FM) criteria. Serum 25-hepcidin and ferritin concentrations for both groups were assessed and compared using one-tailed Student T-tests, whereas CRP values were analyzed with a Wilcoxon test (one-tailed).

Results: The mean age for lean (34.8±5.0 years) and obese (36.2±3.3 years) did not differ (p=0.23). Mean BMI and %FM for the lean and obese groups were: 21.2±1.5 kg/m2, 27.1±4.5% and 32.0±2.6 kg/m2, 45.4±4.0%, respectively. The average concentrations of serum 25-hepcidin were: (means) 3.1±1.2 and 3.9±2.3 ng/ml (p=0.12); ferritin: 41.3±24.1 and 72.9±47.6 ng/ml (p=0.03); and

(median) CRP: 1.3 (95% CI -0.2,6.0) mg/L and 3.9 (95% CI 2.2,8.0) mg/L (p<0.005) for the lean and obese women groups, respectively.

Conclusions: The biomarkers of inflammation observed in this group of women perform as expected, confirming the paradigm of the effect of obesity on inflammation and iron status, when women were carefully selected and polarized using the dual criteria for both relative body mass (BMI) and adiposity (%FM).

Keywords: inflammation, 25-hepcidin, body fat mass, obesity, women

144/348

ASSOCIATIONS OF PLASMA AMINO ACID AND ACYLCARNITINE PROFILES WITH THE INCIDENCE OF HYPERURICEMIA IN A CHINESE POPULATION

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Background and objectives: Hyperuricemia is casually linked with pathogenesis of gout and cardio-metabolic diseases with prevalence of 8-22% worldwide. Profiling metabolites by metabolomic approach will facilitate discovering metabolic pathway(s) and novel markers involving pathophysiology of hyperuricemia. Previously, certain amino acids and acylcarnitines were reported to be cross-sectionally associated with serum uric acid, but longitudinal associations remain to be established. Therefore, we aimed to investigate the associations between amino acid and acylcarnitine profiles with incident hyperuricemia in a prospective Chinese cohort.

Methods: A total of 1,616 Chinese aged 50–70 years participating in a 6-year cohort with a baseline free of hyperuricemia

were included. Baseline plasma amino acids and aclycarnitines were profiled by targeted gas or liquid chromatography coupled to mass spectrometry metabolomics. Hyperuricemia was defined as serum uric acid ≥416.0 μmol/L (7.0 mg/dL) in men and ≥357.0 μmol/L (6.0 mg/dL) in women. Multivariable log-Poisson models were used to examine the associations between metabolites and incident hyperuricemia. Statistical significance was defined as P <0.0009 (0.05/56) with Bonferroni correction.

Results: The 6-year incidence of hyperuricemia was 24.6%. Among all quantified metabolites (22 amino acids and 34 acylcarnitines), only cysteine and long-chain acylcarnitines C20:4 were positively associated with incident hyperuricemia. The relative risks (95% confidence intervals [CI]) per standard deviation increment) were 1.24 (1.14-1.36; P = 8.4E-07) for cysteine and 1.16 (1.07-1.25; P = 0.0004) for C20:4, respectively, after multivariable adjustment including lifestyle, body mass index, fasting glucose, lipids, creatinine and uric acid. The underlying mechanism(s), which although remains unclear, might involve oxidative stress or mitochondrial dysfunction accompanied by elevated cysteine and long-chain acylcarnitines.

Conclusions: This study is the first one showing the longitudinal associations of cysteine and long-chain acylcarnitines C20:4 with future incident hyperuricemia, independent of established risk factors. More studies are needed to confirm our findings in different ethnical populations and also potential utilization for early prediction and prevention.

Keywords: Amino acid, uric acid, hyperuricemia, prospective study, metabolomics

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IRON CONTAMINATION IN PARENTERAL NUTRITION MIXTURES

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Background and objectives: Iron is an essential trace element, but it is not recommended to add excessive amount of it to total parenteral nutrition (TPN) because it affects the mixtures stability. Nevertheless, the variable iron contamination has been documented in the components used to prepare TPN. This contamination must be taken into account by the compatibility limitations regarding lipids destabilization.

Objectives: 1) to determine iron contamination levels in commercial individual components available in Argentina to prepare TPN mixtures. 2) to calculate the iron contamination amount present in a neonate, an infant and an adult. typical TPN prepared with individual components.3) To calculate the contamination amount regarding the iron requirements.

Methods: Iron was determined in 40 individual solutions, from different labs and lots, belonging to 11 commercial products available in Argentina. Three replicates of each sample were analyzed by Argon Inductively Coupled-Plasma- Optical Emission Spectrometry (ICP/ OES). Perkin Elmer 5100 DV. Samples containing organic substances were digested in a laboratory microwave oven, using concentrated nitric acid. Analysis were carried out according to the guidelines provided by ISO/ IEC 17025: 05.

Results: Iron levels for each individual solution were (μg/mL): mean value±SD: Dextrose 50%: 1.12±0.03; Dextrose 70%: 1.32±0.52; Amino acids 10%: 0.25±0,11; Lipids 20%: 4.58±0.80; Potassium chloride: 0.11±0.03; Sodium chloride 20%: 0.11±0,03; Magnesium sulfate: 0.11±0,00; Sodium glicerophosphate: 2.76±0.48; Sodium phosphate: 4.51±0.13; Calcium gluconate: 2,01±0,27; Zinc sulfate: 0.12±0,04; Sterile water: non detectable.

According to the obtained values, the calculated iron total amount (mg) provided by the individual components contamination would be for a typical TPN mixture: adult 2.352; neonatology: 0.073; pediatric: 0.524.

Conclusions: iron found as contaminant in the studied components was not declared in the label. The Fe contamination levels in both pediatric mixtures were around 0.5 mg/L, but levels in adult TPN were 1.2 mg/L, which would affect the TPN stability. Regarding the iron daily requirements, Fe contamination in TPN mixtures for adults would be very high, but near 70% in infant and very low in neonate TPN. Therefore, It would be advisable that manufacturers declare the Fe contaminant content in the label products to avoid iron excess which would compromise the evolution of critical patients.

Keywords: Parenteral nutrition, Iron contamination, adults, pediatric

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MEASURING BRAZILIAN BREAKFAST QUALITY: THE DEVELOPMENT OF AN INDEX TO BE USED IN DIFFERENT POPULATIONS

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Background and objectives: Breakfast is considered an important eating event. A single index to assess and compare the quality of this meal across different populations is needed. We are proposing an index to evaluate the nutritional quality of the breakfast, that can be applied across populations with different cultural backgrounds.

Methods: We used a representative sample of the Brazilian population aged 19 years or older with data of individual food consumption from the National Dietary Survey conducted in 2008-2009. We considered as breakfast the episode of consumption with the highest energy intake contribution in the time range 6AM to 10AM. The final study sample included 31.735 adolescents and adults of both genders. The Breakfast Meal Index (BMQI) was based on Main Meal Quality Index and nutritional guidelines and recommendations as World Health Organization and the World Cancer Research Fund nutritional recommendations and was composed by nine components: fruits, calcium, fiber, carbohydrate, total fat, saturated fat, processed meat, added sugar and energy density. Each component can score between zero and 10 points and the final score range is 0-100 points.

Results: The BMQI was positively (p<0.001) associated with intake of carbohydrate, protein, fiber, vitamins E, C and B6, thiamine, niacin, riboflavin, folate, iron, phosphorus, magnesium, zinc, selenium, calcium and potassium. Total fat, saturated fat, cholesterol, sodium and added sugar were negatively associated with indicator. The Cronbach's coefficient alpha for reliability was 0.66, and the BMQI score was positively associated with age (p<0.001) and income (p=0.045), and negatively associated with male (p<0.001) and residents of urban area.

Conclusions: The proposed BMQI seems to be an useful instrument for evaluating, monitoring and comparing the breakfast quality in populations studies.

Keywords: Meal quality. Breakfast. Meal index. Dietary quality. Nutritional guidelines.

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TENOMODULIN GENE IS POTENTIALLY INVOLVED ON METABOLISM AND ADIPOGENESIS IN HUMAN DIFFERENTIATED ADIPOCYTES

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Background and objectives: Tenomodulin (TNMD) is a transmembrane protein inhibiting angiogenesis and it is highly expressed during the adipogenic differentiation. In this sense, it has been reported an up-regulation of mRNA levels in adipose tissue from adults with obesity; and a down-regulation during diet-induced weight loss. Our group has observed that TNMD gene was up-regulated in omental adipose tissue from obese pre-pubertal children compared with their normal-weight peers by genome analysis and qRT-PCR. The aim of the present work was to study the putative metabolic function of TNMD and its association with adipogenesis and metabolism in human adipocytes.

Methods: Human adipose-derived stem cells (hADSC) were differentiated into adipocytes for 14 days. TNMD gene expression and protein levels were analyzed at different times from day 0 to day 14 (d0, d7, d10 and d14) by qRT-PCR and Western blotting. Subsequently, the mature adipocytes at d14 were incubated with an adenovirus-5 (Ad-5) vectors containing a shRNA-TNMD or shRNA-scrambled as a control for 48 hours. Different genes related to glucose and lipid metabolism and adipogenesis were analyzed by qRT-PCR such as CCAAT/enhancer-binding protein alpha (C/EBP-α), peroxisome proliferator-activated receptor-gamma (PPAR-γ), glucose transporter 4 (GLUT4), adiponectin (ADI-POQ), hormone-sensitive lipase (HSL), adipose triglyceride lipase (ATGL) and perilipin (PLIN).

Results: TNMD expression and protein levels were significantly up-regulated during the adipogenic differentiation (P<0.05). TNMD inhibition, both mRNA as protein levels, was approximately 90 % in the Ad-5-shRNA-TNMD-treated adipocytes compared with the Ad-5-shRNA-control. C/EBP-α, PPAR-γ, GLUT4, ADIPOQ, HSL, ATGL and PLIN gene expressions were significantly down-regulated in the Ad-5-shRNA-TNMD-treated cells (P<0.05).

Conclusions: TNMD is highly expressed in human differentiated adipocytes from hADSC. TNMD inhibition provokes a generalized alteration on glucose and lipid metabolism and adipogenesis in human adipocytes.

Keywords: Obesity, adipogenesis, metabolism.

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THE EFFECT OF INGESTION OF THE AMAZON DIET ON ELDERLY NEUROPSYCHIATRIC PATIENTS

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Background and objectives: Changes in the nutritional condition of the elderly may be related to the aging process and / or pathological processes. With regard to the psychological aspect of this elderly person, the manifestation of neuropsychiatric disorders may also impair good nutrition. The fact that some also present underlying diseases reinforces the need for supply and nutrient balance, which can be found in foods of native cooking. Objective: to investigate the action of the Amazon diet during the period of home care for the elderly using psychotropic drugs.

Methods: It is an observational study in loco, to determine the effect of the food intake of the Amazonian diet on the improvement of signs and symptoms of adverse reactions to the use of psychotropics, by the elderly, with moderate and high risk for fragility.

Results: Some of the foods in the Amazon diet have natural compounds that may have activity in the fight against cardiometabolic diseases, chronic non-transmissible diseases, due to its antioxidant, anti-inflammatory, cholesterol-lowering, polyphenol-rich properties. The elderly, accompanied by the Pilot Health at Home Project and who presented neuropsychiatric disorders, were cared for by a multiprofessional team and oriented to the Amazonian diet, according to the categorization of Ribeiro and Cruz (2012) in fruits, flours and fish, and Its effects on health, quality of life, optimal amount of nutrient intake. It was verified that the elderly who started to insert in their daily food the native cuisine, have reported improvement of the symptoms related to the adverse effects of the administered psychotropics. The nutritional evaluation by the health professionals of the team also showed improvement of nutritional standards, lipid profile, glucose, blood pressure, and self-esteem improvement.

Conclusions: Nutrition for the elderly population needs to be carefully discussed by the health team, especially when these elderly people use psychotropic drugs that are almost always associated with other medications. In view of the diversity and peculiarity of food in the Amazon region, the study also reveals the importance of the health team in the region to be bringing this information to the population and carrying out actions aimed at native nutritional education.

Keywords: Amazon diet; psychotropic drugs; elderly

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THE ASSOCIATION BETWEEN STUNTING, WASTING AND BREASTFEEDING, AND FAT-FREE MASS AND FAT MASS IN KENYAN CHILDREN AGED 6 AND 15 MONTHS

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Background and objectives: It is important to understand the linkage between nutritional status, growth, breastfeeding and body composition in order to design interventions to prevent growth faltering, but few data from low- and middle-income countries are available.

The objective was to assess the role of nutritional status and other correlates of body composition in Kenyan children aged 6 and 15 months.

Methods: Four hundred and forty nine (449) infants were enrolled in an observational study embedded in a nutrition intervention trial conducted in rural Kenya. Infants were enrolled at 6 months of age. Anthropometric measurements were conducted, and fat-free mass (FFM) and fat mass (FM) were measured with the deuterium dilution technique when the children were 6 and 15 months of age, respectively. Linear regression was used to assess the association of sex, breastfeeding, stunting and wasting as correlates of fat-free mass index (FFMI), fat mass index (FMI) and body mass index (BMI).

Results: At the age of 6 months, boys had a 0.45 (95% CI 0.10-0.80) kg/m2 higher FFMI compared to girls. There was no difference in FMI.A similar pattern was seen when the children reached the age of 15 months. Those who stopped breastfeeding before the age of 15 months (11%) had a 0.10 (95% CI -0.60; 0.40) kg/m2 lower FMI when they reached 15 months. At 6 months, stunted infants had a 0.28(95%CI -0.85; 0.29) kg/m2 lower BMI than infants with LAZ above 0, due to 0.66(95% CI -1.08;-0.23) kg/m2 lower FMI, but not FFMI. Stunting was not associated with body composition at 15 months of age. Wasted children had both lower FFMI and FMI at 6 and 15 months of age.

Conclusions: Further research is needed to establish the relation between these early changes in body composition and later body functions and the risk of infectious and chronic diseases.

Keywords: lean mass,fat mass,rural Kenya,breastfeeding,stunting

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BODY COMPOSITION AND GRIP STRENGHT BETWEEN OLDER ADULTS, INSTITUTIONALIZED AND TAI CHI CHUAN PRACTITIONERS IN CUBA. A SARCOPENIA STUDY

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Background and objectives: Background: Aging is associated with profound changes in body composition that occur in late life. With age, adiposity increases and skeletal muscle mass is re-duced. This loss with age leads to sarcopenia, which is a multifactorial process that includes physical inactivity in its development. Sarcopenia establishes its symptoms in inactive individuals, but is also observed in some who remain active throughout their lives. Training with physical exercise is favorable to delay sarcopenia, like adequate food and nutrition, among other factors that improve the quality of life in old age.

Objectives: To analyze body composition and hand grip strength in elderly, institutionalized and active TAI CHI practitioners.

Methods: An anthropometric study was performed in old people attending day care for the elderly institutions and assiduous practitioners Tai Chi Chuan in the National School of Wushu. Fat mass (FM), fat free mass (FFM) and total body water (TBW) were calculated by electrical bioimpedance with an Impedimed DF50 analyzer. From the resistance, skeletal muscle mass (SMM) was obtained by equations. Muscle strength was obtained with a JAMAR dynamometer. Statistical analysis used the general linear model, principal component analysis, and polynomial logistic regression.

Results: The women had higher FM, lower FFM, TBW, SMM and muscular strength than men, verified with a General Linear Model. There is a significant effect of age on weight increase, decrease in height, SMM and muscular strength. The FFM and the subcomponents TWB and SMM corresponded to strength force and were more diminished in the institutionalized elderly. Logistic regression showed that decreased muscle strength was more representative in the institutionalized elderly. In them, sarcopenic obesity is also more frequent. Tai Chi Chuan practitioners have significantly more lean body mass development and physical performance than older adults who stay in day care institutions, that have a more sedentary behavior, corresponding to the sarcopenia.

Conclusions: The physical activity of TAI CHI CHIAN offers better predictions for body composition to reduce sarcopenia in the elderly.

Keywords: Body Composition, Sarcopenia, Obesity, Grip Strength

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GESTATIONAL PROTEIN RESTRICTION PLUS RICH-SUCROSE DIET IN ADULTHOOD PROMOTES AFFECTATIONS IN LIVER OF RATS

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Background and objectives: Background. Gestational protein restriction increases metabolic diseases. The consumption of a high-sucrose diet has been associated with non-alcoholic fatty liver

disease in both infant and adult populations. The combination of gestational protein restriction and the intake of a carbohydrate-rich diet during adulthood on the development of non-alcoholic fatty liver disease is yet unknown. Objective. To analyze that sugared water consumption promotes cell damage and liver fat accumulation in adult offspring exposed to gestational protein restriction.

Methods: Four groups of rats Wistar (22 weeks age): 1) The offspring from mothers feed with a control diet, 2) the offspring from mothers feed with protein-restricted diet 3) the offspring from mothers feed with a control diet but with access to water with sucrose 5 % plus in adulthood, and 4) the offspring from restricted mother and with access to water with sucrose 5 % plus in adulthood. Growth and consumption of food and water were monitored throughout the study. We evaluated with histological analysis of the liver and anti 3-Nitrotyrosine with inmunohistochemistry technique.

Results: No differences were found in body weight throughout of 22 weeks. Food and water consumption were affected for sucrose diet. In female and male offspring from restricted mothers, the sweetened water consumption in adulthood promoted an increase in the liver weight and fat accumulation. In male offspring, only the sweetened water consumption induced fat accumulation and an intense cytoplasmic staining of anti 3-Nitrotyrosine in the liver.

Conclusions: Thus, female offspring from malnutrition mothers are more susceptible than male one to be affected by a sucrose-diet in adulthood.

Keywords: Malnutrition, sucrose diet, fatty liver disease, 3-Nitrotyrosine.

Further collaborators: Laura García.

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THE EFFECTS OF VERY-LOW CARBOHYDRATE DIETS ON WEIGHT LOSS AND HEPATIC LIPIDS AND GENE EXPRESSIONS IN DIET-INDUCED OBESE MICE

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Background and objectives: Obesity is caused by excessive fat or carbohydrate intake. The improvement of obesity is an important issue, especially in Western societies. Low-carbohydrate diet is used to achieve weight loss in humans. To clarify the effect on weight loss, we investigated the serum chemicals and the gene expression in liver of a very-low carbohydrate diet (VLCD)-fed diet-induced obese (DIO) mice.

Methods: DIO male ddY mice were divided into high-fat diet (HFD) and VLCD groups. The body, liver and white adipose tissue (WAT) were weighed and the serum chemicals and hepatic lipids and the mRNA expression were analyzed after feeding for 3, 12 and 24 weeks.

Results: The mice fed VLCD decreased their body weights for the first three weeks. After 24w, the body weights of HFD and VLCD groups were similar, namely the mice in VLCD group gained more weight than the other for 21w. There were no significant differences in the weights of liver and WAT between HFD and VLCD groups. The concentration of insulin of VLCD-fed mice was significantly decreased compared with HFD-fed mice throughout the whole period. On the contrary, serum FGF21 concentration was significantly increased in the VLCD -fed mice. After feeding for 24w, the VLCD-fed mice showed heavier liver TG contents than HFD-fed mice. In the liver, the mRNA expressions of CD36 and FGF21 were increased in VLCD-fed mice.

Conclusions: VLCD-fed mice increased their body weights and the liver TG contents after feeding for 24w, in spite of the decrease in serum insulin concentration. Since hepatic expression of CD36 was increased, the increase in hepatic lipid might be caused by the activation of peroxisome proliferator-activated receptor γ. VLCD seems to be beneficial for the loss of weight for a short time.

Keywords: very-low carbohydrate diet, weight loss, hepatic lipids

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DO DIETARY PATTERNS DETERMINE LEVELS OF VITAMIN B6, FOLATE, AND VITAMIN B12 INTAKES AND CORRESPONDING BIOMARKERS IN EUROPEAN ADOLESCENTS? THE HELENA STUDY

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Background and objectives: Adolescence is a period in which micronutrients status might be compromise due to frequent consumption of food with low nutritional value and due to increased requirements for growth and development. Among those, B-vitamins, as key-role micronutrients, might be affected. For this reason, the aim of this study is to determine the dietary patterns (DPs) explaining the highest variance of vitamin B6, folate, and B12 intake and related concentrations among European adolescents.

Methods: 2,173 adolescents participating in the HELENA (Healthy Lifestyle in Europe by Nutrition in Adolescence) study met the eligibility criteria for B-vitamins intake analysis (46 % males) and 586 did it for biomarkers analysis (47 % males). Two non-consecutive 24-h dietary recalls were used to assess mean intakes. Concentrations were measured by chromatography and immunoassay. Reduced rank regression was applied to elucidate the combined effect of food intakes in B-vitamins intakes and concentrations.

Results: Identified dietary patterns (one per each B-vitamin intake and biomarker and by sex) explained a variability between 34.2 % and 23.7% of the B-vitamin intakes and between 17.2 % and 7% of the biomarkers. Fish, eggs, cheese, and white and buttermilk intakes, loaded positively for B-vitamins intake in both sexes; in contrast, soft drinks and chocolate, loaded negatively. For biomarkers, there was a higher heterogeneity in terms of foods loads in the identified patterns, like in the case of cheese, that loaded negatively for the identified pattern in males and females for plasma vitamin B12, and positively in the pattern of males and females for RBC-folate, and also positively for PLP in females. Besides, some food items loaded differently between intakes and biomarkers, like fish products which, in females, loaded positively for intakes, but negatively for plasma folate.

Conclusions: The identified dietary patterns explained more variance of the B-vitamins intake than for their related biomarkers both in males and females. The dietary patterns were different for the same B-vitamin between males and females, and between intake and status of the same B-vitamin. Further studies are needed to elucidate the factors determining such differences.

Keywords: Dietary patterns, Reduced Rank Regression, B-vitamins, Europe, adolescents

Further collaborators:

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RELATIONSHIP BETWEEN NON NUTRITIVE SWEETENERS INTAKE AND NUTRITIONAL STATUS

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Background and objectives: Obesity and associated metabolic diseases are going through a constant worldwide increase. At the need to prevent and/or maintain a good health condition an interest for non-nutritive sweeteners (NNS) rise. Although their impact on intake and body weight is unclear, its consumption is high for being widely distributed in foods. Epidemiologic studies associate NNS consumption with excessive food intake and body weight gain.

The objectives are to estimate NNS consumption's prevalence in diet products on an adult population, evaluate association between nutritional status and NNS consumption and estimate NNS intake and compare it with the Acceptable Daily Intake (ADI).

Methods: Transversal, observational and analytic study, carried out from August 2015 to February 2016. Age, gender, current weight and height (Body Mass Index -BMI- calculation), diet food with NNS intake frequency (images) and information about consumption time periods, reasons, and others, were registered via survey.

Results: The sample was formed by 336 people. 95.5% of them consumed NNS. Only the saccharin intake was associated positively and statistically significant to BMI (p<0.05). Aspartame was the most consumed NNS. Consumption of cyclamate and saccharin was greater than the ADI. NNS consumption was higher in females (p<0.05).

Conclusions: There was no conclusive data on the effects of NNS on energetic intake, appetite or its relation with sweet flavor. Almost the entire sample has consumed NNS and most of them presented high BMIs. Only the saccharin intake was associated positively to BMI. NNS consumption was widely spread amongst the surveyed, regardless of BMI.

Keywords: non nutritive sweeters, overweigth, obesity, appetite.

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FERMENTATION OF ¹³C-INULIN IS NOT AFFECTED BY A SINGLE ADMINISTRATION OF DIFFERENT WHEAT BRAN FRACTIONS IN HEALTHY SUBJECTS

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Background and objectives: Wheat bran (WB) is a constituent of whole-grain products, which may be colonized by specific bacteria in the human colon and hereby stimulate cross feeding, leading to a more efficient carbohydrate fermentation and an increased butyrate production.

We investigated to what extent WB fractions with different fermentation characteristics affect the fermentation of other carbohydrates (13C-inulin) in the colon.

Methods: Ten healthy subjects performed four test days on which they consumed a standard breakfast, labelled with inulin-14C-carboxylic acid, an oro-caecal transit time marker and supplemented with 10 g 13C-inulin and 20 g of a WB fraction (unmodified WB, WB with reduced particle size or destarched pericarp-enriched WB). On the control test day, no WB was consumed. Breath and blood samples were collected on regular time points for 14h to measure the start of fermentation and plasma 13C-labelled short chain fatty acid (SCFA; acetate, propionate, butyrate) concentrations, respectively. The relative proportions of acetate:propionate:butyrate were calculated to examine cross-feeding.

Results: The amount of 13CO2 in the breath samples started to increase before the breakfast reached the colon (14CO2 increase in breath) (208.5 ± 29 min and 219 ± 24.2 min after the breakfast, respectively), indicating that the fermentation of 13C-inulin already started in the terminal ileum. In addition, fermentation of inulin resulted in higher plasma 13C-SCFA concentrations for approximately 8h, with maximal concentrations reached 6h after the breakfast, but compared to the control, SCFA levels were not further increased by WB (Wilcoxon signed ranks test; All p>0.1). Relative proportions of acetate:propionate:butyrate in plasma amounted 89:4:7, 89:4:7, 90:4:6 and 83:5:12 with unmodified WB, WB RPS, PE WB and the control, respectively, but were not changed by any WB fraction compared to the control, indicating that WB did not stimulate cross-feeding (Wilcoxon signed rank test; All p>0.1).

Conclusions: Fermentation of 13C-inulin resulted in increased plasma SCFA for about 8h, suggesting that a sustained increase in plasma SCFA can be achieved by administering a moderate dose of carbohydrates three times per day. However, addition of a single dose of a WB fraction did not further increase the 13C-SCFA concentrations in plasma, nor stimulated cross-feeding between the gut bacteria.

Keywords: colonic fermentation; carbohydrates; inulin; wheat bran; short-chain fatty acids

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144/730

HEME IRON ABSORPTION AND GENE EXPRESSION OF PROTEINS RELATED TO HEME IRON ABSORPTION IN RAT SMALL INTESTINE

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Background and objectives: It is widely known that the absorption of heme iron is higher than nonheme iron, but mechanism of heme iron absorption has not been clarified. HCP1 (heme carrier protein-1) has been identified as a heme iron transporter expressed in the small intestinal mucosa. However, HCP1 is considered to be a folate transporter, and its function as a heme iron transporter is not clear. In order to clarify the heme iron absorption site in the small intestine, we investigated the gene expression of proteins related to heme iron absorption, and the absorption of hemin and water-soluble heme iron in the duodenum, jejunum and ileum.

Methods: To investigate the response of gene expression to iron deficiency, small intestine of normal and iron deficient rat were used. The small intestine was divided into five sections, and Hcp1, Flvcr (feline leukemia virus subgroups C receptor), HO-1 (heme oxygenase 1), and Fpn1 (ferroportin 1) mRNA were de-

termined by real-time PCR. Also, duodenum and jejunum was ligated and water-soluble heme or hemin iron was administered to measure the uptake of iron into mucosal cells and portal vein blood.

Results: Levels of expression of HO-1 and Fpn1 mRNA were high in the duodenum, and these were upregulated in iron-deficient rats. In the duodenum, iron uptake was about 30% after loading with water-soluble heme iron, but hemin was not absorbed. Levels of expression of Hcp1 and Flvcr1 mRNAs were high in the jejunum, and iron uptake was also high after loading with hemin in this section. Hcp1 and Flvcr1 mRNAs were not upregulated by iron deficiency.

Conclusions: In the duodenum and jejunum of the small intestine, different iron absorption mechanisms for water-soluble heme iron and hemin are considered to exist.

Keywords: heme iron absorption, HCP1, Flvcr, iron deficiency, hemin

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144/769

PLASMA FREE FATTY ACID CONCENTRATIONS IN SCHOOLCHILDREN WITH AND WITHOUT ABDOMINAL OBESITY

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Background and objectives: In adults with abdominal obesity (AO), increased concentration of free fatty acids (FFAs) is associated with cardiometabolic risk factors. However, this association remains controversial in children. This study aimed to compare plasma FFAs concentration in children with and without AO, and to examine FFAs associations with cardiometabolic risk factors.

Methods: Twenty-nine children with AO were matched, one by one, according to sex and age, with 29 non-obese peers. Abdominal obesity was classified using the ninety percentile from the IDEFICS-Study (Identification and prevention of Dietary- and lifestyle-induced health EFfects In Children and infantS). Fasting plasma glucose, insulin, and lipids were determined by colorimetric and enzymatic methods. Plasma FFAs were analyzed by gas chromatography.

Results: Seventeen boys and twelve girls with similar average age (7.1 ± 2.6 vs 7.2 ± 2.7 y; p>0.05) were included in each group. Children with AO showed higher body mass index (BMI) (19.7 vs 15.4 kg/m2; p<0.001), waist circumference (64.9 vs 53.7 cm; p<0.001), systolic blood pressure (98.6 vs 93.5 mmHg; p<0.01)

and fasting insulin (70.2 vs 42.4 pmol·L; p<0.05). There were not significant differences in plasma total FFAs concentration between groups. However, children with AO had higher palmitoleic acid (0.94 vs 0.70 wt%; p<0.05) and dihomo-gamma linoleic acid (2.76 vs 2.07 wt%; p<0.05). Palmitoleic and dihomo-gamma linoleic acids correlated (p<0.05) with BMI (r=0,397; r=0,296, respectively) and waist circumference (r=0,380; r=0,276, respectively). Myristic and palmitoleic acids correlated (p<0.05) with high-density lipoprotein cholesterol (r=-0.408; r=-0.572, respectively).

Conclusions: These findings suggest that abdominal obese children have different plasma FFAs concentrations than non-obese peers, and the associations of FFAs with cardiometabolic risk factors are present in childhood.

Keywords: Students, body mass index, cardiometabolic risk factors, palmitoleic acid, dihomo-gamma linoleic acid.

144/823

THE EFFECT OF EXERCISE-TO-REST PERIOD RATIO ON THE RECUPERATION OF STORED FUEL FROM EXERCISE IN EXERCISE TRAINED RATS

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Background and objectives: Replenishment of body's fuel store after exercise is a key process for the next bout of exercise. This study was conducted to examine the effect of exercise-to-rest period ratio and physical training on the recuperation of stored fuel.

Methods: Forty rats weighing 95-105 g were randomly assigned to either non-exercise training (NT) or regular exercise training (T) groups for 5 weeks and were subdivided into two groups: non-exercise(NE), exercise and recuperation group(ER). NE group were sacrificed without exercise and ER group were sacrificed after 1 hour rest from exercising for 0.5(ER2:1), 1(ER1;1), 2(ER1:2) hours.

Results: Liver glycogen level was increased in ER group and was reached to the highest level at ER1:1 ratio while it was not different between NE group and ER group in NT animal. Muscle glycogen level was increased at ER2:1 ratio and returned to the level of NE in NT animal while it was reached to the highest level at ER2:1 ratio and decreased but still higher than those of the level of NE in T animal. Free fatty acid level was reached highest level at ER2:1 ratio and decreased and was lower than those of NE at ER1:1 and ER1:2 ratio in NT animal while it was reached to the highest level at ER2:1 ratio and decreased but was not lower than those of NE at ER1:2 ratio in T animal. Muscle triglyceride level of of ER group was lower than that of NE group regardless of the different exercise-to-rest period ratio in NT animal while it was decreased and lower than that of NE group at ER2:1 and ER1:1 ratio but returned to that of NE in T animal. Muscle protein level was decreased at ER2:1 and started to be increased but was not reached to the level of NE group in NT animal while it was de-

creased at ER2:1 and ER1:1 but was returned to the level of NE group in T animal.

Conclusions: Animal would have to rest for periods in the 1:2 ratio in non trained group and 1:1 ratio in trained group to replenish the body's fuel store after exercise.

Keywords: exercise, rest, recuperation, training, fuel

144/827

EFFECT OF EXERCISE-TO-REST PERIOD RATIO AND PHYSICAL TRAINING ON THE RECUPERATION OF ANTIOXIDATIVE DEFENSE SYSTEM IN RATS

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Background and objectives: Successful recuperation after exercise is a key process to prepare the athlete for the next bout of exercise and the major components of recuperation may be the recuperation of antioxidative defense system of the body. This study was conducted to examine the effect of exercise-to-rest period ratio and physical training on the recuperation of antioxidative defense system of tissue from exercise in animal.

Methods: Forty 4-week old male Sprague-Dawley rats weighing 95-105 g were randomly assigned to one of two groups: non-exercise training (NT) or regular exercise training (T). At the end of week 5, the rats were subdivided into two groups: non-exercise(NE), exercise and recuperation group(ER). NE group were sacrificed without having performed exercise at the end of week 5. ER group were sacrificed after 1 hour rest from exercising on a treadmill (15° incline, 0.5-0.8 km/hr) for 0.5(ER2:1), 1(ER1;1), 2(ER1:2) hours respectively. Catalase activity was determined in plasma. The activity of superoxide dismutase (SOD), ratio of reduced glutathione to oxidized glutathione (GSH/GSSG), and levels of malondialdehyde (MDA) were determined in liver cytosol.

Results: SOD activities of NT animal were decreased at ER1:2, ER1:1, ER2:1 ratio and was not recovered to that activity of NE group while that of T animal were decreased at ER2:1, ER1:1 ratio and was recovered to that activity of NE group at ER1:2 ratio. Catalase activities of both NT and T animals were not different at ER2:1, ER1:1, ER2:1 ratio from that of NE group. MDA levels of both NT and T animals were increased at ER2:1, ER1:1 ratio but decreased at ER1:2 ratio and were not recovered to level of NE group. The results of this study suggest that training may improve exercise performance by enhancing the antioxidative defense system.

Conclusions: Animal would have to rest for periods in the 1:2 in non trained group and 1:1 in trained group to recuperate an antioxidative defense system and this system is effective in exercise trained animals.

Keywords: exercise, rest, recuperation, training, antioxidative system

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144/835

VALIDITY OF NUTRIENT INTAKES DERIVED FROM WEBSITE DISH-BASED DIETARY ASSESSMENT

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Background and objectives: We compared the relative validity of nutrient intakes derived from Internet website dish-based dietary records (WDDR) and weighed dietary records (DR).

Methods: The study participants were 218 registered users of a dietary management website and all were female. After excluding participants with missing data, 137 participants were included in the final analyses. The participants recorded their daily meals on both the DR and WDDR. The DR calculated energy and nutrient intakes using Standard Tables of Food Composition in Japan. For the WDDR, energy and nutrient intakes were automatically calculated by the website. We compared differences in the DR and WDDR with respect to intakes of energy and 13 nutrients.

Results: The median values for the intake of protein and seven nutrients showed no significant difference between the DR and the WDDR, and the estimated values were generally similar. The interquartile range of nutrients with a significant difference did not show a large deviation with the exception of vitamin A. Correlation coefficients showed a strong correlation of 0.7 with the exception of sodium and vitamin E. The kappa coefficients for energy, calcium, iron, vitamin C, and dietary fiber were good to fair and all others were moderate. Using Bland-Altman plots, we found proportional errors in intake values for vitamins and minerals. We could not confirm obvious systematic errors for energy, protein, fat, and carbohydrate intake.

Conclusions: Overall, the WDDR is considered to be a valid method of estimating energy and nutrient intake.

Keywords: web, dish-based, dietary records, Internet

Conflict of Interest Disclosure: Eri Matsuzaki, Mikiko Michie, and Terue Kawabata declare that they have no conflicts of interest. The authors whose names are listed certify that they have NO affiliation with any organizations or any entities in relation to financial interest.

144/869

FERROPENIC ANEMIA: OXIDATIVE STRESS AND CYTOMOLECULAR DAMAGE ASSOCIATED WITH FERROUS SULFATE PREVENTIVE ADMINISTRATION

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Background and objectives: Iron deficiency anemia (IDF) is a pathological condition characterized by insufficient iron to synthesize iron-containing proteins and enzymes. Iron is an essential trace mineral for a number of biological functions. Although iron deficiency may be prevented by adequate dietary intakes, it is internationally agreed that iron supplementation to lactating mothers and infants is a priority. The Argentine Pediatric Society recommends daily ferrous sulfate supplementation as a preventive strategy. Since the 90´s, a single weekly dose of ferrous sulfate has been an alternative treatment. On the other hand, ferrous sulfate is known for its pro-oxidant properties, leading to increased oxidative stress that may seriously damage membranes, proteins and DNA. The aim of this study was to determine the possible cytomolecular damage and oxidative stress caused by daily and weekly administration of ferrous sulfate for IDF prevention, in in vitro cultured human lymphocytes.

Methods: We performed two controls (negative and positive) and two ferrous sulfate treatments (weekly and daily). Cytomolecular damage was assessed by the comet assay and oxidative stress using T-BARS.

Results: Weekly ferrous sulfate treatment elicited a decreasing trend in the production of oxygen free radicals and, consequently, of oxidative stress and cytomolecular damage.

Conclusions: Since weekly ferrous sulfate supplementation causes less side effects, it would allow higher treatment compliance, thus decreasing IDF prevalence. Future in vivo studies and the development of further techniques would enable us to obtain more conclusive results.

Keywords: Iron deficiency anemia, T-BARS, Comet assay, Preventive treatment

144/877

IN VITRO AND IN VIVO EVALUATION OF THE FERMENTABILITY OF TWO DIFFERENT WHEAT-DERIVED FIBRE FRACTIONS

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Background and objectives: Dietary fibre (DF) is neither digested nor absorbed in the small intestine but is fermented in the large intestine by the resident microbiota with production of short-chain fatty acids (SCFA). The extent of DF fermentation depends on structural and physicochemical characteristics of the fibre.

In this study, the SCFA production from two structurally different wheat-derived fibre fractions was quantified using in vitro fermentation experiments and a dietary intervention study in healthy humans.

Methods: Readily fermentable arabinoxylan oligosaccharides (AXOS) and water-insoluble dietary fibre-enriched bran (DF-B) were produced from both unlabelled and 13C-enriched wheat bran (WB). Both (unlabelled) fractions were incubated in vitro with faecal slurries obtained from healthy subjects at 37°C for 24h. Remaining arabinoxylan (AX) was quantified using GC-FID and metabolite profiles, including SCFA, were analysed using GC-MS. In the human intervention study, ten healthy subjects consumed 13C-labelled AXOS and 13C-labelled DF-B at breakfast on two separate days followed by collection of breath and blood samples on regular time points for 14h. Breath samples were analysed for 13CO2 and H2 and blood samples were analysed for 13C-SCFA levels. A faecal sample was analysed for butyrate-producing capacity.

Results: After in vitro incubation of faecal slurries with AXOS for 24h, only 5% of residual AX was retrieved whereas almost 90% of the AX remained after DF-B incubation. Fermentation of AXOS resulted in a faster and higher increase in SCFA compared to DF-B. Metabolite profiles showed that AXOS fermentation was associated with SCFA, some alcohols and aldehydes, whereas DF-B fermentation was associated with branched-chain and median-chain fatty acids. In humans, excretion in breath of the fermentation gases, 13CO2 and H2 increased after 13C-AXOS but not after 13C-DF-B. Cumulative total 13C-SCFA levels in blood were significantly higher after 13C AXOS compared to 13C-DF-B (89 [74-103] mmol vs. 9.3 [5.4-15.5] mmol; p=0.005). Total butyrate recovery was not correlated to the butyrate-producing capacity in the faecal samples.

Conclusions: In conclusion, the molecular structure and physicochemical characteristics of AX in WB, clearly determine the extent of fermentation. Furthermore, the use of stable isotope labelled substrates provides an efficient manner to establish differences in in vivo fermentation.

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FROM STARCH STRUCTURE TO ITS IN VIVO METABOLIC FATE: ADVANCED IMAGERY TECHNIQUES TO EXPLAIN THE CHANGES IN STARCH STRUCTURE DURING DIFFERENT BISCUIT-MAKING PROCESSES

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Background and objectives: Based on WHO recommendations, starch represents the largest component of our daily energy intake (40% to 50%). During food manufacturing, heat, moisture and pressure alter dramatically the digestibility of starch in processed foods (Bornet et al. 1993; Vinoy et al. 2016). The control of these major process parameters can lead to large differences of starch digestibility (Englyst et al. 2003).

The originality of this work was to combine complementary measures to characterize the extent of starch gelatinization, its structure through sophisticated imagery as well as its rate of digestion measured in vitro (Englyst method) and in vivo (Glycaemic Index (GI) determination).

Methods: Four different technologies were chosen for their different process parameters: rotary biscuits, extruded cereals, soft cakes and rusks. The first three were made in two versions, wholegrain by addition of wheat bran and plain using regular wheat flour. Samples were sent for starch digestion analysis in vitro and a GI test using all 9 products was launched. Conjunctively, the internal structure and aspect of the starch were determined by using x-ray diffraction (XRD), x-ray micro-tomography and field emission gun scanning electron microscopy (FEG-SEM).

Results: The study highlighted several differences between technologies. Only the rotary products, with and without bran maintained a high slowly digestible starch (SDS) level (24g/100g, and 28 g/100g respectively) and a low GI (47 ± 5, and 43 ± 3 respectively). Soft cakes with and without bran showed low SDS values (2g/100g for both product) and medium GI values (63 ± 6, and 66 ± 5 respectively). Rusk products displayed low SDS values (1g/100g) and a medium GI (61 ± 4). The extruded cereals, with and without bran had the lowest SDS values (0.1g/100g for both products) and higher GI values (66 ± 4 and 77 ± 4 respectively). The imaging technologies unveiled significant changes in starch structure and showed a higher level of preservation for the rotaries which corresponded to the in vitro and in vivo digestion results.

Conclusions: By controlling food process, slow digestibility of starch can be maintained because of its starch structure preservation.

Keywords: Carbohydrate metabolism, Digestion, Wholegrain, Glycaemic index, Food Process

144/903

THE PROTECTIVE ROLE OF MITOCHONDRIAL SERINE HYDROXYMETHYLTRANSFERASE AGAINST OXIDATIVE STRESS-INDUCED MITOCHONDRIA DYSFUNCTION AND DNA DAMAGE

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Background and objectives: Two different isoform enzymes serine hydroxymethyltransferase (SHMT) involved in folate metabolism occurs mainly in the cytosol and mitochondria (mt). Numerous studies suggested that polymorphisms of cytosol SHMT (cSHMT) were associated with related to plasma homocysteine levels and increased risks of cancer development. The functional role of mitochondrial SHMT (mSHMT) remains obscure. By use of the Chinese hamster ovary (CHO) mutant cells, glyA, with defective mSHMT, we have previously shown that treatment of glyA with tert-Butylhydroperoxide (tBH), an exogenous oxidative stress, resulted in elevated superoxide levels and depleted mt folate levels. Aims of the study were to determine the role of mSHMT and its interaction with folate insufficiency in mt function upon oxidative stress.

Methods: Treated with 50μM tBH for 72hrs and pre-incubation with folate supplements in glyA.

Results: Treated with 50μM tBH for 72hrs in glyA was showed that mt biogenesis increased including mtDNA content and mt mass. Additional, mtDNA-encoded genes also increased including cytochrome c oxidase subunit (COX) II, III and ATP synthase Fo subunit 6. However, it also increases 8-hydroxy-20-deoxyguanosine (8-OHdG), a DNA damage indication in glyA treatment via tBH. Intriguingly, pre-incubation with folate supplements increase both cytosolic and mt folate and reduced the t-BH-induced ROS. The folate supplementation was attenuated confusing mt biogenesis and 8-OHdG by t-BH treated glyA.

Conclusions: Taken together, the data suggest that functional defects of mSHMT in the mt, as observed in glyA, has handicapped the biosynthesis of folate, and folate in the mt plays a critical role in the protective action of exogenous oxidative stress.

Keywords: Folate, mitochondria, serine hydroxymethyltransferase, mitochondrial biogenesis, DNA damage

144/925

BIOMARKER OF LONG-CHAIN N-3 PUFA AND RISK OF BREAST CANCER: ACCUMULATIVE EVIDENCE FROM AN UPDATED META-ANALYSIS OF EPIDEMIOLOGICAL STUDIES

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Background and objectives: Long-chain (LC) n-3 polyunsaturated fatty acid (PUFA) in different biospecimens (serum/plasma/erythrocyte/adipose tissue) as biomarkers of fatty acid intake can provide objective measures that reflect both dietary consumption and relevant biological processes. Nevertheless, results of epidemiological studies on biomarker of LC n-3 PUFA in relation to risk of breast cancer (BC) are inconsistent. We therefore conducted a meta-analysis to assess the up-to-date pooling effects based on prospective cohort and case-control studies.

Methods: The compositions of LC n-3 PUFA in erythrocyte membrane (EM) and adipose tissue (AT) were compared between BC cases and noncases as a standardized mean difference (SMD). Risk ratios (RRs) or odds ratios (ORs) with 95% confidence interval (CI) from prospective and case-control studies were pooled using a random-effects model in the highest vs. lowest categorical analysis, respectively.

Results: A database was derived from 19 eligible studies (10 cohorts with circulating LC n-3 PUFA as biomarker, 6 case-control with AT and 3 with EM), comprising 133,943 individuals (4,386 cases and 129,557 noncases). BC cases have significantly lower LC n-3 PUFA compositions in EM than noncases (SMD = -0.27; 95% CI: -0.41, -0.13; I2 = 28.10%), whereas no significant difference was found in AT (SMD = -0.15; 95% CI: -0.06, 0.36; I2 = 81.50%). In pooled analysis of cohort studies (n=10), circulating LC n-3 PUFA was significantly associated with reduced risk of BC (RR = 0.88; 95% CI: 0.78-0.99; I2 = 0.00%), and the summary RR was 0.85 (95% CI: 0.72-1.00; I2 = 0.00%) for 20:5n-3, 0.98 (95% CI: 0.81-1.19; I2 = 0.00%) for 22:5n-3, and 0.86 (95% CI: 0.76-1.02; I2 = 10.00%) for 22: 6n-3, respectively. In pooled analysis of case-control studies (n=9), LC n-3 PUFA composition in EM was inversely associated with risk of BC (OR = 0.36; 95% CI: 0.18-0.70; I2 = 86.40%), whereas no significant association was observed for AT (OR = 0.91; 95% CI: 0.64-1.28; I2 = 29.90%).

Conclusions: Circulating LC n-3 PUFA was inversely associated with risk of BC, especially 20:5n-3 and 22:6n-3. Such findings support that LC n-3 compositions in circulating blood may be an independent predictive factor for BC.

Keywords: Fatty acid, PUFA, Biomarker, Breast cancer, Meta-analysis

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TRANSCULTURAL ADAPTATION OF THE EATING MOTIVATION SURVEY (TEMS) TO BRAZILIAN PORTUGUESE

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Background and objectives: When we think about food that are many reasons why the people eat what they eat. People can eat motivated by factors like hunger, the appearance of the food, desire, taste, price, to control weigh or maybe handle some emotions, because it is fashionable or because of the nutritional content - and still by cultural or family traditional reasons. Understanding these motivations is crucial to development of nutritional recommendations able to modify inappropriate and dysfunctional eating patterns. This understanding can be evaluated by instruments – among the existing ones, The Eating Motivation Survey (TEMS) allows the identification of the motivations to eat and food choices. Therefore, the aim of this study is to present the TEMS transcultural adaptation process for applicability in Brazilian population studies.

Methods: The process involved the conceptual and item equivalence; semantic equivalence by 2 translators, 1 linguist, 22 experts (response frequency) and 23 bilinguals (comparing the results by paired t test, Pearson Correlation and Intraclass Correlation Coefficient); and the operational equivalence carried out with 32 adult individuals.

Results: All these equivalences showed satisfactory results to use the scale in Brazil, which allows the TEMS application to evaluate the food choices motivations in our context.

Conclusions: All these equivalences showed satisfactory results to use the scale in Brazil, which allows the TEMS application to evaluate the food choices motivations in our context.

Keywords: Eating behaviour, motivation, cross-cultural comparison, questionnaires

MULTIVARIATE NUTRITIONAL ASSESSMENT THROUGHOUT SEXUAL MATURATION

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Background and objectives: The form of analysis can lead to confusion in the influence of sexual maturation in the assessment of nutritional status.

Methods: Data came from 680 adolescents surveyed in city of Piracicaba (SP, Brazil), 1134 adolescents surveyed in city of Sao Paulo (SP, Brazil) and 3321 adolescents American research National Health and Nutrition Examination Survey (NHANES III). Multivariate patterns of nutritional status were estimated using Principal Components Analysis. We set eigenvalues to 0.7 and loadings to 0.2. Sexual maturation was self-evaluated according to five Tanner stages.

Results: The first 4 components are responsible for 63.5% of the variability of Piracicaba, 71.13% NHANES and the first three components in Sao Paulo account for 81.45%. The first component of Piracicaba and NHANES was characterized by anthropometric variables especially skinfolds (triceps, subscapularis, suprailiac and thigh) and waist circumference. The data of Sao Paulo held the second component was characterized by the same anthropometric variables. The second component was characterized by sexual maturation in Piracicaba and NHANES (pubic hair, breast and external genitalia) beyond the age, height, weight and phase angle. In São Paulo, the component that marks the sexual maturation was retained in the first, and presented the same characteristics of other banks with the same markings variables. The third was characterized by cholesterol, triglycerides and glucose in Piracicaba and NHANES. The third and final component in Sao Paulo was characterized by body composition variable (phase angle). The fourth component mixed load presented for biochemical variables. The adequacy of the sample in relation to the degree of partial correlation between variables was estimated by the Kaiser-Meyer-Olkin (KMO), which was 0.8031 Piracicaba, 0.8712 NHANES and 0.7713 Sao Paulo.

Conclusions: Multivariate analyses of nutritional status reveals many possible profiles whose cannot be properly described using usually a single univariate indicator, such as body mass index. We have no conflict of interest to declare.

Keywords: Adolescent; Nutritional Assessment; Sexual Maturation; Body Composition; Biomarkers.

VEGETARIAN DIET, NUTRITIONAL STATUS AND CIRCULATING BRAIN DERIVED NEUROTROPHIC FACTOR LEVELS IN ADULTS

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Background and objectives: Introduction: Recent studies have demonstrated that the Brain Derived Neurotrophic Factor (BDNF) is related to a possible endocrine role and also to nutritional factors, since they are involved in the regulation of energy metabolism and a positive correlation with the Body Mass Index (BMI). Objective: To evaluate nutritional status (waist circumference [WC] and BMI) and circulating BDNF levels in adult vegetarian individuals compared to omnivores.

Methods: A cross-sectional study was carried out with 96 subjects (56 vegetarians and 40 omnivores) adults. BMI was obtained by dividing body weight (kg) by squared height (m2). To obtain weight, we used an electronic scale (Welmy®, model R-110) and the stature was measured using a portable anthropometer (Estad® - Alturexata, 0,35m to 2,13m). The waist circumference (WC) was used to evaluate the body composition with the umbilical scar measurement using an inextensible metric tape with a Sanny® brand lock. The classification of the nutritional status according to BMI followed the cut-off points recommended by the WHO (1995) and classified as normal (18,5 kg/m2 to 24,9 kg/m2) and altered (> 24,9 kg/m2). The WC was classified according to the risk of metabolic complications associated with obesity, according to gender, considered normal for women, when <80 cm and altered or at risk if > 80 cm, for men normal WC was considered < 94 cm and altered or at risk >94 cm (WHO, 1998). BDNF levels were evaluated with the BDNF Emax ImmunoAssay System (Promega, Madison, WI, USA) according to the manufacturer's specifications and was classified according to the median (626.0 pg/mL).

Results: In relation to nutritional status, the VEGs are leaner (63,9 ± 10,4 kg vs 69,4 ± 14,6 kg, p=0,032), they have a lower BMI (22,5 ± 2,6 kg/m2 vs 25,0 ± 3,9 kg/m2, p< 0,001) and lower values of WC (81,8 ± 8,2cm vs 87,8 ± 10,9cm, p=0,003). Regarding the BDNF variable, there was no difference between vegetarians and omnivores (662,8 ± 276,5pg/ml vs 698,1 ± 314,9 pg/ml, p=0,563).

Conclusions: The results suggest that the vegetarian diet has a beneficial role in relation to the nutritional status of these individuals.

Keywords: Nutritional status; Brain Derived Neurotrophic Factor; Vegetarian diet.

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THE TRUE EFFECT OF SEXUAL MATURATION ON THE ASSESSMENT OF THE NUTRITIONAL STATUS OF ADOLESCENTS

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Background and objectives: The index used in analysis can lead to confusion about influence of sexual maturation in the assessment of nutritional status. We will estimate multivariate indices from a pool of body measures to describe nutritional status.

Methods: Data came from 833 adolescents surveyed in Piracicaba(Brazil) and 3321 in United States(NHANESIII). Principal Components Analysis was applied to define multivariate patterns of nutritional status from anthropometric measurements (weight, height, skinfolds, and waist circumference), body composition (phase angle) and biochemical exams (glucose, cholesterol, triglycerides and hemoglobin). To define multivariate patterns of nutritional status we set eigenvalues to 0.7 and eigenvectors to ±0.2. Each pattern was set as outcome in a mixed multilevel regression with two levels. In the individual level we included sex and in the second we included Tanner stages, age, sex and socioeconomic score.

Results: The first four components are responsible for 63.5% of the variability in Piracicaba and 71.1% in NHANESIII. All patterns were the same for both surveys. The first component was characterized by anthropometric variables; especially skin folds (triceps, subscapular, suprailiac and thigh) and waist circumference a pattern of adiposity. The second was characterized by sexual maturation (pubic hair, breast and gonad),age, height, weight and phase angle a pattern of linear growth process. The third was characterized by cholesterol, triglycerides and glucose a pattern of metabolic markers linked to adiposity. The forth component was characterized by phase angle and hemoglobin(positive eigenvector) and glucose(negative eigenvector) patterns of metabolic markers linked to lean mass. The adequacy of the sample in relation to the degree of partial correlation between variables was estimated by Kaiser-Meyer-Olkin(KMO), which was 0,80Piracicaba and 0,87NHANESIII. In mixed effects regression models, variance attributable to sexual maturation at level 2 was low; the individual fixed effects explained changes in body composition mostly. The two surveys Tanner's stages explained less than 20% of patterns that are unrelated to sexual maturation and explained more than 80% pattern two that is related to linear growth and sexual maturation.

Conclusions: The nutritional status in adolescents does not require adjustment by sexual maturation. Adolescent weight gain may be the source of confusion at the time of diagnosis.

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GLYCEMIC PROFILE AND CIRCULATING BRAIN DERIVED NEUROTROPHIC FACTOR LEVELS IN ADULT VEGETARIANS

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Background and objectives: Introduction: Data from the literature have repeatedly demonstrated the beneficial role of the vegetarian diet in reducing risk factors for cardiovascular diseases, mainly because they positively modulate biochemical parameters, particularly those related to glycemic control and lipemia. Recently, animal studies have demonstrated the relationship of the Brain Derived Neurotrophic Factor (BDNF) and its relationship with increased insulin sensitivity and consequent lowering of blood glucose levels. Objective: To evaluate the glycemic profile (fasting glycemia) and circulating levels of BDNF in adult vegetarian individuals compared to omnivores.

Methods: A cross-sectional study was carried out with 96 subjects (56 vegetarians and 40 omnivores) adults. The biochemical parameters were obtained by means of blood collection, glycemia by the Automated Enzymatic Colorimetric method and the BDNF levels by BDNF Emax® ImmunoAssay System (Promega®, Madison, WI, USA), according to the manufacturer's specifications . For analysis, biochemical variables were classified as normal and altered using the following reference ranges for altered fasting glycemia (> 110mg/dL) and for BDNF (median [626.0 pg/mL]). The analyzes were performed in Statistical Package for Social Sciences (SPSS) version 20.0 and for all a level of significance of 5% was considered.

Results: Vegetarians had lower fasting blood glucose levels when compared to omnivores (82,13 ± 9,11 mg/dL vs 85,8 ± 10,87 mg/dL, p=0,004). Regarding the BDNF variable, there was no difference between vegetarians and omnivores (662,8 ± 276,5pg/ml vs 698,1 ± 314,9 pg/ml, p=0,563).

Conclusions: The results indicate that the vegetarian diet has a beneficial role in relation to the glycemic control of these individuals, research with a greater number of subjects is necessary to understand its relationship with BDNF levels.

METIGENTITY, A NUTRIGENETIC APPROACH GUIDING INDIVIDUAL NEEDS AND PREFERENCES TOWARDS OPTIMAL AND PERSONALIZED NUTRITION

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Background and objectives: Nutritional assessment is based on reliable information that combines nutrient exposure, its bioavailability and metabolic function. However, individual's response to dietary assessment can be highly variable, which has been associated with small genetic differences found throughout people's DNA, being SNP (single nucleotide polymorphisms) the most common. Therefore, implementation of personalized nutritional guidance requires the development of evidence-based biomarkers able to dissect the interaction between gene variants, nutrients and life-style aspects.

The objective has been the design and implementation of a nutrigenetic approach characterizing a set of gene variants focused on genetic susceptibility to obesity (Metigentity) and extended to analysis of sports performance (MetigentitySport).

Methods: A panel of genes were selected from studies showing association with obesity, sports performance or related issues (diabetes, hypertension, sliming pattern, endurance, motivation, etc). In addition, a selection of genetic variants playing a role in individual responses to nutrients or ergogenic aids was also included.

Results: Around 50 gene variants have been priorized and incorporated at Metigentity. Identification of the number of alleles associated with the risk-benefit variants allowed the setting of specific genetic scores (GS) and assessment of people's genotype. Metigentity estimates GS for (1) risk to develop metabolic alterations associated with obesity (type 2 diabetes, hypertension, hypertriglyceridemia,…); (2) macronutrient metabolism performance; (3) eating behaviour; (4) gustative perception and nutrient/food preferences; (5) the impact of dietary components on biomarkers related to metabolic diseases; and (6) the ability to lose weight and to experience the rebound effect in response to dietary interventions. MetigentitySport analyzes around 30 gene variants and estimates (1) genetic capacity to practice aerobic endurance sports and power, sprint and speed sports; (2) psychological aptitude towards sports; (3) genetic susceptibility to suffer from sport injuries; (4) response to nutrients and supplements related to performance; and (5) the response to particular exercises in terms of performance and health. Holistic integration of all GS is elaborated and guidelines best suited to the individual's genotype is supplied.

Conclusions: The nutrigenetic approach Metigentity (http://www.metigentity.com/), and its extension MetigentitySport, constitute evidence-based biomarkers and are valuable tools for nutritionists guiding individual needs and preferences towards optimal and personalized nutrition.

Keywords: nutrigenetics, SNP, obesity, sports performance, personalized nutrition

THE INFLUENCE OF THE PEAKING TRAINING ON SALIVARY IGA SECRETION IN COLLEGE TRIATHLETE

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Background and objectives: Some triathletes often feel sick in conditioning period (peaking period) toward the race. The aim of this study is to consider the method of conditioning athletes by investigating the changes of the immunity through examining the variation of salivary IgA secretion.

Methods: For the college students' triathletes of 33 males and 7 females who participate the race, the amount of salivary IgA about one month before the race were continuously measured. In addition, meal content and the amount of water intake and physical activity in the training were recorded and the relationship with salivary IgA secretion was evaluated.

Results: No significant change in nutrition intake during the test period was observed. Significant high level of water intake was shown only on the race day. The average amount of physical activity a week of two to three weeks before the race was the highest as 744.7 ± 51.5 kcal/day, and that of one to two weeks before the race was 513.2 ± 28.5 kcal/day. That of last week before the race was 305.5 ± 29.9 kcal/day, and this value was significantly lower than the initial value (P <0.05). In the subjects whose average amount of physical activity of the three days in one to two weeks before the race (pre-race 12 to 14 days) was more than 1000 kcal/day, the amount of salivary IgA secretion significantly reduced at one week before the race (P <0.05), and at the day before the race further reduction was observed (P <0.1). When the daily high-intensity exercises above a certain level two weeks before the race were performed, the salivary IgA secretion from the week to the day before the race reduced. Therefore, peaking method performed during a certain period before the race which contains high-intensity exercise weakens the mucosal immune function and induces the state which is easy to break a condition.

Conclusions: In the college students' triathletes, the amount of the salivary IgA secretion was decreased by the peaking carried

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out toward the race. This was considered to be one of the causes breaking the condition just before the race.

Keywords: IgA, triathlete, peaking training, conditioning

EFFECT OF JAPANESE SOUP STOCK "DASHI" IN AUTONOMIC NERVOUS SYSTEM ACTIVITY AND MENTAL FATIGUE

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Background and objectives: The Japanese soup stock, called "Dashi", is used in many traditional Japanese cuisine and it's taste and flavor assume a fundamental part in most of the dishes. Recently, some studies have indicated that a long-period intake of dashi brings beneficial influence on health. In this study, we focused on the instant effect of dashi intake on the autonomic nervous system activity and emotion related to a feeling of fatigue.

Methods: Healthy and non-smoking volunteers aged 20-25 were participated in this study. The subjects consumed assigned breakfast at 9:00, and the experiments were conducted between 10:30 and 11:30. Heart rate variability (HRV) was employed to assess the autonomic nervous system (ANS) activity. To measure degree of mental fatigue condition, the flicker test was used with 30 minutes simple calculation tasks "Uchida Kraepelin Test". The subjective assessment for emotional states were also determined by a Visual Analog Scale (VAS) method.

Results: We observed that the increase of parasympathetic nerve activity at 15 minutes time point after intake of dashi, which means that the emotional condition supposed to shift to the phase of relaxing. Interestingly, only the inhalation of dashi odor also induced similar effect on ANS. The results of flicker test and VAS showed that dashi intake decreased an accumulation of a feeling of fatigue.

Conclusions: These results suggested that dashi has acute effects on improving the emotional states, and the distinctive odor of dashi plays an important role in these effects.

Keywords: dashi, autonomic nervous system activity, flicker test, visual analog scale, anti-fatigue

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AN INCREASE IN 4E-BP1 LEVEL MEDIATES TO ENHANCE TRIGLYCERIDE ACCUMULATION IN RAT LIVER UNDER PROTEIN MALNUTRITION

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Background and objectives: We have shown that feeding of a low-protein diet increases the amount of eukaryotic translation initiation factor (eIF) 4E-binding protein 1 (4E-BP1), a substrate of mammalian target of rapamycin complex 1 (mTORC1) in rat liver. There are increasing evidences that mTORC1 pathway controls lipid metabolism. However, the role of 4E-BP1 in the regulation of lipid metabolism is not clear. The present study was undertaken to examine whether 4E-BP1 is involved in the enhancement of hepatic triglyceride (TG) accumulation in rats fed a low-protein diet.

Methods: Experiment 1. In order to increase 4E-BP1 in the liver artificially, five-week-old rats were injected via their tail vein with adenovirus (Ad) expressing rat 4e-bp1 or LacZ and fed a standard chow. Seven days after Ad injection, their livers were collected.

Experiment 2. In order to knockdown hepatic 4E-BP1 under protein malnutrition, five-week-old rats were injected via their tail vein with Ad expressing rat 4e-bp1 short-hairpin RNA (sh4E-BP1) or non-specific short-hairpin RNA. Eight days after Ad injection, each Ad-injected group was divided into two groups. One was fed a 15% casein diet as a control diet and the other was fed a 5% casein diet (5C) as a low-protein diet for 4 days. On the 5th day, their livers were collected.

Results: Experiment 1. The 4E-BP1 overexpression did not change hepatic TG levels.

Experiment 2. The 5C-feeding increased 4E-BP1 levels in the liver of both Ad-injected rats, but 4E-BP1 knockdown by sh4E-BP1 Ad injection suppressed 5C-feeding-induced increases in hepatic 4E-BP1 levels. The 4E-BP1 knockdown also suppressed 5C-feeding-induced increases in the protein levels of eIF4G, a translation initiation scaffolding protein, in the liver. Hepatic TG levels were significantly increased by 5C-feeding in the liver of both Ad-injected rats. However, 4E-BP1 knockdown attenuated 5C-feeding-induced hepatic TG accumulation.

Conclusions: These data indicate that TG accumulation is not enhanced just by increasing 4E-BP1 in the liver, although the increase in 4E-BP1 levels is necessary to enhance TG accumulation in the liver under protein malnutrition. In addition, it is suggested that 4E-BP1 might control TG levels in concert with eIF4G in rat liver under protein malnutrition.

Keywords: protein malnutrition, liver, 4E-BP1, triglyceride, rat

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RISK OF EATING DISORDERS IN PATIENTS WITH CELIAC DISEASE

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Background and objectives: Several cases of eating disorders (EDs) were reported in patients with celiac disease (CD), suggesting that ED could be a comorbidity associated with CD. However, few epidemiological studies have assessed this potential association. We aimed to evaluate the risk of EDs in individuals diagnosed with CD in comparison to healthy controls.

Methods: A total of 98 cases and 98 controls matched by gender, age and body mass index between 10 and 23 years-old were studied. A questionnaire was completed on medical history, and sociodemographic and anthropometric characteristics. Various ED screening self-reported tests were administered.

Results: A total of 61.2% of the study population were girls with a mean age of 15.3±3.7 years-old. Patients with CD scored non-significantly higher on all the ED screening tests than control participants. No differences were observed between study groups in terms of the frequency of individuals who exceeded the clinical cutoff identifying those at risk of ED. Being a patient with CD above 13 years-old was associated with a 2.15 point increase in the Eating Attitude Test (EAT) score compared to being a control [βcoefficient=2.15 SE 1.04; P=0.04] after adjusting for various confounders.

Conclusions: Although being a patient with CD was associated with a significantly higher EAT score in individuals above 13 years old, no clear differences were observed between individuals with CD and controls in terms of risk of ED when other screening tests were used. More studies with larger samples and prospective designs are warranted to confirm these findings.

Keywords: Celiac disease, eating disorders, Eating Attitude Test.
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A RANDOMIZED TRIAL OF IRON-BIOFORTIFIED BEANS IN SCHOOL CHILDREN IN MEXICO

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Background and objectives: The objective of this randomized efficacy trial was to determine the effects of iron-biofortified beans (Fe-Beans) on iron status in children, compared to control beans (Control-Beans).

Methods: A randomized trial of biofortified beans (Phaseolus vulgaris L), bred to enhance iron content, was conducted for six months in Oaxaca, Mexico. Participants were school-aged children (5-12 y) attending 20 rural, public, boarding schools from the Mexican state of Oaxaca. Iron status [hemoglobin, serum ferritin (SF), soluble transferrin receptor (sTfR), and total body iron (TBI)], inflammatory biomarkers (C-reactive protein (CRP) and -1 acid glycoprotein (AGP)), and anthropometric indices were evaluated at enrollment and at the end of the trial. The primary outcomes evaluated included: hemoglobin, serum ferritin, and sTfR concentrations; anemia (Hb <12.0 g/dL) and iron deficiency (serum ferritin <15.0 µg/L); and total body iron. Hemoglobin concentrations were adjusted for altitude, and serum ferritin levels were adjusted for inflammation (CRP, AGP) using Thurnham and BRINDA methods. Total body iron was calculated using Cook's equation. Mixed models were used to examine the effects of Fe-Beans on hematological outcomes, compared to Control-Beans, adjusting for baseline indicator, with school as a random effect.

Results: At baseline, 17.8% of children were anemic (Hb <12.0 g/dL) and 15.9% were iron deficient (serum ferritin <15.0 mg/L). A total of 14.5% of children had elevated CRP (>5.0 mg/L) or AGP (>1.0 g/L) concentrations at baseline. During the randomized efficacy trial, indicators of iron status, including hemoglobin, serum ferritin, sTfR, and TBI concentrations improved from baseline to endline (6 months) in both intervention and control groups. However, Fe-Beans did not significantly improve iron status indicators, including hemoglobin, serum ferritin, sTfR, or total body iron, compared to Control-Beans. Similarly, there were no significant effects of the iron-biofortified beans intervention on anemia or iron deficiency, compared to the control beans.

Conclusions: In this 6-month randomized efficacy trial of iron-biofortified beans in school children in Mexico, indicators of iron status improved in both intervention and control groups. However, there were no significant differences in the effects of Fe-Beans on iron status, compared to Control-Beans.

Keywords: Iron, biofortification, anemia, iron deficiency, Mexico

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MUSCLE STRENGTH, METABOLIC PROFILE, SARCOPENIA AND SARCOPENIC OBESITY IN OLDER CUBAN PEOPLE. PRELIMINARY RESULTS

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Background and objectives: Background: Sarcopenia is the age-associated loss of skeletal muscle mass and function; and the sarcopenic obesity may be defined by a high fat to fat-free mass ratio. These conditions can be accompanied by reduced muscle strength and metabolic disorders due to a decline of both number and fibre size of the muscle. Objectives: To evaluate variations on the muscle strength and metabolic profile associated to sarcopenia and sarcopenic obesity in elderly people.

Methods: A sample of adults older than 60 years, not institutionalized or attending day care institutions for the elderly, was evaluated to get information on body composition, blood glucose and lipids, and muscle strength. Muscle strength was measured by dynamometry; body fat, by electrical bioimpedance; and skeletal muscle mass (SMM) and skeletal muscle index (SMI), by Baumgartner equations. Univariate and multivariate statistical analysis were used.

Results: The frequency of sarcopenia was similar between men and women. Older individuals were more likely to have this condition. Body Mass Index (BMI), SMM and SMI were lower in sarcopenic subjects. Grip strength was markedly decreased in sarcopenic men, while no significant difference was found within women. Body fat was higher in sarcopenic men and not in sarcopenic women. Therefore, Sarcopenic obesity was more frequent within men. Subjects with this condition in both sexes were older, had higher BMI and body fat; and lower SMM, SMI and grip strength. The metabolic profile showed no differences between subjects with or without sarcopenia and was not associated with sarcopenic obesity either.

Conclusions: Reduced muscle strength is evident in both sarcopenia and sarcopenic obesity, and was more marked as the age increases. The lack of association between sarcopenia, sarcopenic obesity and metabolic disruptions must be further analysed using multivariate analysis and include treatment for metabolic diseases, physical activity and diet.

Keywords: elderly, sarcopenia, sarcopenic obesity, metabolism, strength.

144/1215

FOOD OR WATER FOR SANITATION: EXPLAINING REGIONAL DIFFERENCES IN CHILD MALNUTRITION RATES IN UGANDA

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Background and objectives: Child undernutrition rates remain high across Uganda. However, there are important regional differences in malnutrition rates, with the southwestern region—described as the country's food basket— persistently recording disproportionately higher levels of child undernutrition compared to, for example, the northern region which has higher poverty and food insecurity linked to many years of civil war. It is important for policymakers to understand context-specific determinants of poor nutrition and not assume that higher agricultural productivity alone can solve such problems.

This study analyzes factors explaining differential child stunting rates between Southwestern and Northern Uganda.

Methods: Using panel data collected from two rounds of household surveys in rural Uganda in 2012 and 2014, the analysis includes >3,300 households (in each round), containing >5,400 children below 5 years of age. In addition to child anthropometry, the data contains variables on agriculture, socioeconomics, as well as on water, sanitation and health practices. Oaxaca decomposition methods, controlling for time and locational fixed effects, were used to examine factors that drive mean differences in height-for-age z-scores (HAZ) between regions.

Results: Mean HAZ scores were -0.95 ± 0.03 and -1.77 ± 0.06 for northern and southwestern Uganda, respectively. This represents a significant mean difference of 0.82 ± 0.07 ($p < 0.001$). Decomposition analysis reveals major differences in water access/volumes and important divergence in levels of food output. Households in Northern Uganda on average use 8 more liters ($p < 0.001$) of water per capita per day for domestic purposes than households in the southwest. This difference alone accounts for 0.40 ± 0.07 ($p < 0.001$) in variability in HAZ scores observed. Interacting domestic water use with sanitation patterns showed that northern households are likely using domestic water for sanitation related habits, such as washing hands after toilet use.

Conclusions: Contrary to conventional wisdom, this study showed that differentials in undernutrition across regions of Uganda are not necessarily due to differences in food production or diet diversity, but are heavily driven by differences in domestic water use. This does not negate the need to address serious problems of food insecurity across the country, but the findings suggest

a need for greater attention to WASH in development programming alongside agricultural productivity enhancement.

Keywords: Child malnutrition, height-for-age (HAZ), domestic water use, sanitation, Uganda.

A NEW ALLOMETRIC BODY MASS INDEX FOR CHILDREN AND ADOLESCENTS AND THE CORRELATION WITH HEIGHT AND ADIPOSITY

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Background and objectives: Allometry presents an alternative for to discuss and analyze the weight and height gains during the growth, monitoring the peculiarities of physical growth and changes in the body for a good nutritional assessment. To propose a new allometric nutritional index based on the weight-height relation and to evaluate its performance according to Benn's premises.

Methods: Individuals under 19 years old from Brazil, USA, South Korea, Mexico and England. The cleaning excluded values under or above 2SD of the residues of the regressions weight-Age, height-Age and weight-height by country, gender and age. The coefficient b0 of the log-linear weight-height regressions were used as exponent at each age for the calculation of the new international allometric body mass index (IMCA). The exponent was modeled between the ages by spline. Associations between traditional BMI (IMCT) or IMCA with height and adiposity were estimated by the Pearson coefficient.

Results: Cleaning excluded 8.5% individuals from the data pool. The value of b0 is 2 at birth in both genders and evolves to values of 3 at the beginning of puberty (in different moments for boys and grils), gradually regressing to the value 2 at the end of growth. The association between IMCA and height was zero and higher than 0.8 with total adiposity in all age groups. In the same comparison, the associations with IMCT were near to 0,4 in some genders and ages, and above 0.8 for association with adiposity.

Conclusions: The exclusion of extreme values of the sample provided b0 exponents more consistent than in other published works. The IMCA showed a superior performance to that recorded for the IMCT in the two premises of Benn and revealed an index not influenced by height, which makes it more suitable to analyze the nutritional status of children and adolescents under 19 years. The new IMCA requires additional studies to determine new cutoff points.

Keywords: Allometry; BMI; Growth; Nutritional Evaluation; Adiposity

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INTERDISCIPLINARITY ON COMMUNICATION OF NUTRITIONAL INFORMATION BY SOCIAL MEDIA - FACEBOOK

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Background and objectives: BACKGROUND: Social medias has increasingly been used by individuals from Brazil's different regions and social strata, what turn them relevant to communicate nutritional knowledge in a planned and referenced way. Its use can be optimized by nutrition and marketing knowledge interdisciplinarity.

OBJECTIVES: It aims to observe the effects of nutrition and marketing knowledge interdisciplinarity during planning and execution of publications related to nutrition, available on Facebook's DIETÉCNICA page; and its metrics variations in two distinct moments.

Methods: Metrics provided by Facebook's DIETÉCNICA page were compared between 2013 and 2015, in which publications development and execution were not planned, and between 2015 and 2017, applying "Digital Marketing Decalogue". This tool consists of ten steps that are used in accordance with the time in which the media has been. In this project was used "social networks", "search", "planning", "blogs", "final touch" and "results" for contents planning and execution, decision of publication frequency and collection of its metrics. Metrics are composed by number of people who view the publication; likes, clicks, comments and shares.

Results: As a result of the use of "Digital Marketing Decalogue" there was a greater increase on DIETÉCNICA's metrics. Without the use of the marketing tool, number of views on publications (range) was around 300, after the its implementation it achieved about 3000, demonstrating the relevance of planning publications. It was observed that nutrition and marketing knowledge interdisciplinarity during publications planning and execution contributed positively to average increase on Facebook metrics, when compared with the moment when there was no interdisciplinarity.

Conclusions: With this project is possible to observe that knowledge interdisciplinarity is essential for planning interventions of nutritional information communication on social media, such as Facebook, because it enables directing efforts to achieve a common goal; in this project it was a greater communication of nutritional knowledge for media users, which was achieved.

Keywords: Nutrition, Communication of Nutritional Information, Digital Marketing, Social Media.

144/1302

GENETIC POLYMORPHISMS IN THE AHR AND ADORA2A GENES ARE ASSOCIATED WITH COFFEE CONSUMPTION

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Background and objectives: Coffee is among the most widely consumed beverages in the world and has received considerable attention regarding health risks and benefits. Recent epidemiological studies identified single nucleotide polymorphisms (SNPs) in aryl-hydrocarbon receptor (AHR) and adenosine A2A receptor (ADORA2A) genes that are associated with caffeine and coffee consumption. The aim of this study was to examine whether the genetic polymorphisms from the AHR and ADORA2A gene regions were associated with usual coffee consumption in the Brazilian population.

Methods: Data came from the 'Health Survey of Sao Paulo' (ISA-Capital 2008). The study sample included 540 participants aged 20 years or older, in Sao Paulo City, Brazil. Diet was assessed by two 24-hour dietary recalls (24HR) and usual intakes were calculated using the Multiple Source Method. Coffee consumption was categorized into <1, 1-3, and ≥3 cups/day. DNA extraction occurred by salt method, with the support of a mass spectrometry-based detection for quantification. Three SNPs (rs2298383, rs4410790, rs6968865) using the CRP-based assays were genotyped. Multiple logistic regression models were performed to estimate the association between SNPs and categories of coffee consumption, adjusting for potential confounders i.e. age, sex, race, body mass index, smoking status, physical activity level, alcohol consumption, and total energy intake.

Results: The final study population showed a mean age of 44.9 (SE 1.1) years, mostly women (54.3%), self-declared white (60.1%), never or former smokers (76.8%), insufficiently active (77.4%), and with overweight/obesity (55.5%). The mean of coffee consumption was 141.1 mL/day. After multivariate adjustment, significant and positive associations were observed between coffee consumption (≥ 3 cups/day) and ADORA SNP (rs2298383) and AHR SNPs (rs4410790, rs6968865). Compared with subjects who consumed ≤1 cup coffee/day, subjects who consumed ≥3 cups/day were more likely to be carriers of mutant allele. The corresponding odds ratio (OR) and 95% confidence interval (CI) were 1.68 (1.01, 2.82), P-trend=0.047; 1.84 (1.07, 3.17), P-trend=0.025; and 1.71 (1.03, 2.84), P-trend=0.037 for rs2298383, rs4410790, and rs6968865, respectively.

Conclusions: Our findings show that genetic variations in the ADORA2A and AHR receptor gene polymorphisms were associated with coffee consumption (≥ 3 cups/day).

Keywords: coffee consumption; ADORA2A, adenosine A2A receptor gene; AHR, aryl-hydrocarbon receptor gene; polymorphisms; genotype.

144/1332

DIFFERENT ISOMERS OF TOCOPHEROL EVOKE DISSIMILAR CYTOSOLIC CALCIUM INCREASES AND ANTIOXIDANT IMPACT IN LIVING CACO-2 CELLS

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Background and objectives: Tocopherols are hydrophobic bioactive compounds, which isomers together are considered as vitamin E. Particularly abundant in seeds and nuts, each isomer is present at different proportion, being the α-tocopherol the most abundant. However, comparisons of biological impact of each individual isomer are scarce; therefore we have evaluated the acute impact of α, γ and δ-isomers on intestinal epithelial cell line, Caco-2.

Methods: Cell line Caco-2 was used in the passages 40-60. Living cell imaging was accomplished by epifluorescent microscopy technique in an open chamber modality. Cytosolic calcium recordings were possible by loading the cells with fura-2, a fluorescent calcium indicator. Antioxidant cellular capacity was achieved by transducing HyPer biosensor, a fluorescent protein able to sense intracellular H_2O_2. This study also determined fluctuations in intracellular sodium and pH by SBFI and BCECF, respectively.

Results: Acute exposure with tocopherol isomers evoked a rapid and consistent increase in cytosolic calcium by Caco-2 cells at concentration as low as 5 μM, with slight differences between them. Removal of extracellular Ca2+ was only effective to reduce the number of responsive cells by α-tocopherol but did not affect the calcium response evoked by γ and δ isomers. On the other hand, redox impact of tocopherol isomers was evaluated in Caco-2 cells expressing the HyPer biosensor, α- and δ- were the isomers that evoked bigger changes in the biosensor signal than γ-tocopherol. By mimicking a rapid cytosolic increase with ionomycin and monensin, both ionophores with different intrinsic mechanisms, we also could observe a deflection in HyPer signal, suggesting a role for cytosolic calcium in activate redox cellular machinery.

Conclusions: The different isomers of tocopherol elicited an acute redox response in Caco-2 cells, along with this cellular response we also detected a fast increase in cytosolic Ca2+, which had an extracellular origin only for α-tocopherol, whereas that calcium responses evoked by γ and δ isomers were not affected by extracellular Ca2+ removal. By inducing a massive entry of Ca2+ we were also able to record a redox response, suggesting that fluctuations in cytosolic Ca2+ are enough to mediate a redox response in living cells.

Keywords: tocopherol, Caco-2, Calcium imaging, HyPer, antioxidant capacity

144/1344

ASSOCIATIONS BETWEEN FOOD INTAKE, PERCEIVED EXERTION, SUM OF 6 SKINFOLDS AND LEG CROSS-SECTIONAL AREAS IN PROFESSIONAL ARGENTINEAN CYCLISTS ASSESSED BETWEEN MARCH-AUGUST 2016

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Background and objectives: Road Cycling is known to be one of the most physically demanding sports, where athletes aim to achieve optimum muscle and fat parameters through a meticulous training and nutrition, which are crucial when seeking high performance. The aims of this study were to explore and relate Professional Cyclist's diet in terms of Carbohydrates, Proteins and fats, their perceived exertion during competition and their fat and muscle parameters.

Methods: Argentinean professional road cyclists were studied. 104 active elite road cyclists were assessed in terms of Age, Weight and Height, sum of 6 Skinfolds and leg cross-sectional areas, in order to quantify adipose and muscular tissues and compare with optimum standards. Perceived Exertion was inquired regarding a competition. Food Intake was evaluated through a 3-day register. Data was assembled in SARA System to assess nutrition in terms of calories, carbohydrates, proteins and fats. The rest of the variables were processed in order to create a full-descriptive statistical analysis and seek possible association between them through the x2 test.

Results: 40% of the cyclists reported a high sum of 6 skinfolds (55,2mm ±14,6mm). Diet was deficient in terms of energy and carbohydrates, and excessive in proteins. Significative association was found between an elevated sum of 6 skinfolds and a high perceived exertion (p<0,0001). An adequate consumption of energy (p=0,002) and carbohydrates (p=0,00001) were associated to a lower range of perceived exertion. An optimum sum of 6 skinfolds was associated to an adequate energy intake.

Conclusions: Nutrition assessment is needed to promote proper eating habits according to the demands of Argentinean proffesional cyclists, in order to reach optimum fat and muscle ratios and to a maximum performance. It is important that Argentinean cyclists begin to cover their high carbohydrate needs rather than exceeding their protein daily intake.

Keywords: Sport Nutrition, Cycling, Anthropometry, Perceived Exertion.

Conflict of Interest Disclosure: Identifying the feeding practices of Argentinean cyclists and their anthropometric profile, as well as the way these affect effort perception, could be useful not only approach a diagnosis, but also to estimate possible improvements in performance by developing more accurate diet patterns, looking for a morphological profile that adjusts better to proffesional road cycling.

144/1356

INTERMITTENT FASTING IN DIFFERENT PERIODS OF PREGNANCY: MATERNAL EFFECT AND METABOLIC PROGRAMMING OF THE INSULINIC HYPOTHALAMIC VIA AND OBESITY IN THE MALE PROLE

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Background and objectives: Chronic dietary restriction during gestation may promote changes in fetal metabolism and impair the hypothalamic signaling of insulin in the offspring. Nonetheless, nausea and vomiting are common during gestation and induce intermittent feeding. However, it is not clear whether this intermittent involuntary fasting causes harm to offspring in adult life. We evaluated whether intermittence between feed restriction and ad libitum (IFR) in pregnant Wistar rats is capable of inducing obesogenic changes in male offspring.

Methods: Pregnant rats were kept with free access to chow (the control group, C) or with 60 % restriction of C on alternate days during the first half (fasting 1 group, F1) or in the second half (fasting 2 group, F2) or in whole pregnancy (total fasting group, TF). In lactation, the diet was ad libitum. After the period of lactation, the progenitors were euthanized for visceral fat collection, while the male offspring were maintained until adulthood (100 days) with ration ad libitum. Part of the adult offspring received intrahypothalamic cannula for administration of insulin (20 mU) or vehicle (0.9 % saline) and evaluated visceral adiposity.

Results: The offspring C responded to intracerebroventricular infusion of insulin, but F1, F2 and TR did not reduce food intake after 12 h and 24 h of insulin injection versus vehicle infusion. The maternal weight gain during pregnancy did not differ, but the cumulative consumption of group C was higher versus the other groups. Binge eating was observed in the ad libitum period of F1 and TF parents versus C and F2. There was no difference in the adiposity in the offspring.

Conclusions: Pregnant rats subjected to intermittent fasting were able to adjust energy homeostasis while maintaining adequate gestational weight gain, still the restriction induced metabolic programming and ruptured the hypothalamic anorectic response of adult offspring, increasing the risk of obesity at this stage.

Keywords: intermittent feeding, metabolic programming, female rat pregnancy, male rat offspring

144/1368

THE RELATIONSHIP OF NUTRITIONAL STATUS WITH INTELLECTUAL COEFFICIENT AND ACADEMIC ACHIEVEMENT IN MEXICAN CHILDREN FROM URBAN PRIMARY SCHOOLS

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Background and objectives: The objective was to determine the magnitude of association of the nutritional status with the IQ and academic performance in children from urban primary schools in Hidalgo, Mexico.

Methods: An analytical observational study was carried out on 459 schoolchildren aged 6 to 10 years old from a public and a private school located in Tula, Hidalgo, during the 2013-2014 school cycle. The students were given weight and height measurements with calibrated instruments and standardized personnel, Koppitz test was applied to assess IQ and emotional indicators (EI), the grade point average was recorded as an indicator of academic achievement (AA), and socioeconomic status (SE) was assessed with household assets and father's level of schooling. Body mass index (BMIZ) and height-for-age (HAZ) Z scores were calculated using WHO 2007 references. Differences, correlations and interactions were assessed, and the magnitude of association of predictor variables (BMIZ and HAZ) and response (IQ and AA) with adjusted linear regression models (LRM).

Results: In school children of middle SE, obesity was 10 percent higher compared to high and low SE (p <0.01). The grade point average was higher in school children of high SE (8.9) compared to low SE (8.1) (p <0.01), and IQ average was higher in high SE school children (4.7) compared to low SE (4.2) (p <0.01). HAZ correlated positively with AA and IQ in low SE school children (r = 0.30 and r = 0.27, respectively); and the BMIZ correlated negatively with AA in school children of high SE (r = -0.41). The LRM for AA of school children of low SE, the HAZ, adjusted for EI, age and gender; explained the 33% of academic performance. The LRM for IQ of school children of low SE, the BMIZ, adjusted for EI, age and gender; explained the 44% of the IQ.

Conclusions: The anthropometric variables of HAZ and BMIZ explained the third part of academic and cognitive performance in low SE school children; indicating the strong influence that nutrition still has on the poorest children in countries in economic transition.

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HEPATIC STEATOSIS INDUCED BY AMINO ACID DEFICIENCY OR BY MANIPULATION OF THE DIETARY AMINO ACID COMPOSITION

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Background and objectives: A low-protein diet causes young rats to decrease serum insulin and IGF-I levels, leading to mild growth retardation. In addition, such animals show increased insulin sensitivity and marked lipid accumulation in peripheral metabolic organs. In the present study, we unveiled this process to induce lipid accumulation in response to amino acid deficiency, especially focusing on hepatic steatosis development.

Methods: For animal experiments, we prepared a control diet containing 15% (w/w) amino acids equivalent to 15% casein and a low-amino acid diet containing 5% (w/w) amino acids or diets deficient in a single amino acid, and fed these diets to 6-week-old male Wistar rats for 7 days. Additionally, we applied a cell-culture model in which rat primary hepatocytes, and H4IIE and HuH7 cells, rat and human hepatoma cell lines respectively, were cultured in serum-free media containing complete amino acids (Full) or no amino acids (Zero).

Results: While a low-amino acid diet could induce triglyceride (TG) accumulation in the rat liver, simply a low-threonine or low-arginine diet could also develop the hepatic steatosis, accompanying an unexpected change in serum amino acid profiles, which implies that particular amino acid-specific signals were involved in hepatic lipid metabolic regulation. Since respiratory exchange ratios were not significantly different between control group and low-amino acid diet group, their lipid consumption rate might be comparable. On the other hand, when hepatocytes were cultured in Zero medium, their intracellular TG levels were increased, compared to Full medium, indicating that amino acid deficiency can induce hepatocytes to accumulate TG in a cell-autonomous manner. In addition, lipid synthesis activity of H4IIE and HuH7 cells using glucose as a substrate was enhanced in Zero medium. Similar to the rat model, when H4IIE cells were cultured in media deficient in a single amino acid, TG accumulation levels varied according to the amino acid composition of the media.

Conclusions: We conclude that a manipulation of dietary amino acid composition causes a dynamic change in blood amino acid profiles, which is sensed by hepatocytes and accelerates their lipid synthesis in a cell-autonomous manner, leading to hepatic steatosis.

Keywords: amino acid, liver, triglyceride, steatosis, rat

144/1424

LYSINE DEFICIENCY SIGNAL SELECTIVELY IN-DUCES LIPID ACCUMULATION IN MUSCLE AND ADIPOSE TISSUES OF RATS

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Background and objectives: We have previously reported that dietary amino acid restriction reduces serum levels of IGF-I and insulin, resulting in growth retardation, and additionally accumulation of triglycerides (TG) in liver, skeletal muscle and adipose tissues. The present study was undertaken to elucidate the effects of dietary amino-acid deprivation on lipid accumulation in muscle and adipose tissues.

Methods: We fed growing rats with the control diet containing sufficient (15%, w/w) amino acids (CN), or deficient (5%, w/w) amino acids (5AA) or diets deficient in each single amino acid in which only a single amino acid was reduced to the same amount as a 5AA diet and the others were the same as a CN diet (low AA) for a week. TG content was measured in muscle and liver tissue. And adipose tissues were imaged by computerized tomography (CT) scans.

Results: Lipid accumulated in adipose and skeletal muscle tissues in rats fed the 5AA diet and low-Lys diet compared with rats fed CN diets. Then rats were fed the 5AA diet or low-Lys diet for 8 weeks and we investigated lipid accumulation in each tissue. Adipose tissues in abdomen were imaged by CT scans and we calculated the volume of adipose tissues in each rat. The volume of adipose tissues was increased in rats fed the 5AA diet and low-Lys diets. The cell size of adipocytes of epididymis fat tissue was enlarged in the rats fed the 5AA and low-Lys diets. TG accumulation in skeletal muscle was also increased at 2-weeks feeding with 5AA and low-Lys diets.

Conclusions: These data suggest that depletion of lysine from the diets resulted in the accumulation of lipids in muscle and adipose tissue. Taken together with the data that lipid accumulated in liver in rats fed with low-Arg diets, selective amino acid deprivation from the diet could become a distinct signal to exert insulin-like activities for lipid metabolism, leading to induction of lipid accumulation in liver, skeletal muscle or adipose tissue selectively.

Keywords: amino acid, muscle, adipose tissue, lipid accumulation

144/1429

EFFECTS OF DIETARY B VITAMINS INTAKE AND FOLATE METABOLISM IN THE DEVELOPMENT OF MILD COGNITIVE IMPAIRMENT AND THE POTENTIAL UNDERLYING MECHANISM

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Background and objectives: There is emerging evidence that blood levels of several B vitamins and cognitive function may be affected by dietary intake of these vitamins but the underlying mechanism is still controversial. DNA methylation together with oxidative stress are key to understanding the pathogenesis of mild cognitive impairment (MCI). The present study aimed to examine the relationship between B vitamins intake and MCI among the middle-older aged and elderly in China and shed light on the potential mechanism.

Methods: A cross-sectional study was carried out in 1487 Chinese adults aged 50 and above. A selection of comprehensive cognitive tests was administered to evaluate their cognitive performance. MCI patients were screened by using Mini-mental state examination (MMSE) Montreal Cognitive Assessment (MoCA) test and then diagnosed by neurologists. A semi-quantified Food frequency questionnaire (FFQ) method was used for dietary intake of B vitamins (mainly folic acid, vitamin B6, and vitamin B12) survey. Serum folate metabolism and oxidative stress markers were measured with ELISA. Global DNA methylation was determined by Illumina Methylation 450K chips.

Results: Subjects with higher intake of folate, vitamin B6 and vitamin B12 performed better in memory and processing speed. MCI patients had significantly higher concentrations of homocysteine (P<0.001) and oxidative stress markers(P<0.001) and lower folate (P<0.001) than non-MCI subjects. Serum levels of homocysteine was negatively correlated with folate and positively correlated with oxidative stress markers. Besides, 2277 different methylation gene loci were screened between MCI patients and non-MCI subjects, suggesting several gene function and metabolic pathways associated with MCI development.

Conclusions: Inadequate dietary intake of B vitamins, disturbances in folate and homocysteine metabolism and oxidative stress, with different DNA methylation as essential cofactors, are integral to MCI development.

Keywords: B vitamins, DNA methylation, folate metabolism, oxidative stress, mild cognitive impairment

MECHANISM FOR THE DECREASE IN PLASMA ALPHA-TOCOPHEROL UNDER PROTEIN DEFICIENCY

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Background and objectives: Alpha-tocopherol is a major form of vitamin E and one of the most important antioxidants in mammals. It has been reported that plasma alpha-tocopherol concentration was reduced in rats fed protein deficient diet, which means that oxidative stress is increased under the condition of protein deficiency. In the present study, we investigated the mechanism for the decrease in plasma alpha-tocopherol concentration under protein deficiency in rats.

Methods: Five-week-old male Wistar rats were fed a control diet containing 20% casein (20C) or a low protein diet containing 5% casein (5C) for 7 days. Alpha-tocopherol concentrations in plasma, liver, peripheral tissues, feces and bile were measured. In order to investigate the effect of protein deficiency on alpha-tocopherol absorption in the intestine and transport from the liver into the circulation, mRNA and protein levels of intestinal transporters (NPC1L1 and SR-BI) and hepatic transporter (alpha-TTP) were measured. In addition, we fed rats with 20C or 5C with/without 0.08% ezetimibe, an inhibitor of NPC1L1, and measured plasma, liver, and fecal alpha-tocopherol concentrations to estimate the contribution of NPC1L1 on alpha-tocopherol absorption.

Results: Plasma and tissue alpha-tocopherol concentrations were lower in protein deficient rats while protein deficiency did not affected hepatic alpha-TTP mRNA and protein levels. These results demonstrate that reduced plasma and tissue alpha-tocopherol concentration is not caused by the decreased alpha-tocopherol transport activity from the liver into the circulation. On the other hand, fecal excretion of alpha-tocopherol was increased in protein deficient rats, demonstrating that reduced alpha-tocopherol absorption in the small intestine is a possible cause for the decrease in plasma and tissue alpha-tocopherol concentration in protein deficient rats. Ezetimibe did not affect fecal excretion of alpha-tocopherol and intestinal NPC1L1 level was not affected by protein deficiency, which demonstrated that reduced absorption of alpha-tocopherol was not caused by NPC1L1. On the other hand, intestinal SR-BI level was decreased in protein deficient rats that may reduce alpha-tocopherol absorption.

Conclusions: Protein deficiency reduces intestinal SR-BI and increases fecal excretion of alpha-tocopherol, which results in the reduction of plasma and tissue alpha-tocopherol concentrations in rats.

Keywords: alpha-tocopherol, protein deficiency, vitamin E

MYOKINE RESPONSES TO RESISTANCE EXERCISE WITH DIFFERENT NUTRIENT AVAILABILITY ON A CONCURRENT EXERCISE DAY IN YOUNG, HEALTHY, PHYSICAL ACTIVE MALES

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Background and objectives: Myokines are proteins produced and released by skeletal muscle in response to exercise, and suggested to play a role in exercise-induced adaptations of muscle tissue. Nutrient availability, in particular carbohydrate (CHO), is proposed as a potential regulator of myokine responses. We evaluated the effects of a pre-exercise carbohydrate-rich meal versus a low carbohydrate -high fat- meal on plasma myokine responses to resistance exercise after a glycogen-depleting endurance exercise earlier that day.

Methods: Fifteen males performed two experimental days with a 90 min bout of endurance exercise at 70% VO2max in the morning (8.30-10 am) and resistance exercise in the afternoon (2-2.30 pm):5 x 8 80% 1-RM repetitions of bilateral leg press and extension. Either a high CHO/low fat meal (110g CHO, 52g protein, 9g fat; ~750 kcal) or a iso-caloric low-CHO /high fat meal (20 gr CHO, 52g protein, 51g fat) was provided 2h before resistance exercise (noon). Blood was drawn after an overnight fast and at regular time intervals up to 3 hours after resistance exercise to measure plasma myokine/cytokine levels.

Results: Postprandial plasma glucose and insulin levels were higher, and FFA lower, on the high-CHO condition compared to the low-CHO. IL-6 increased post-exercise, and was significantly higher after the low-CHO meal in the post-resistance exercise period compared to the high-CHO meal. IL-8 and IL-10 were only increased after the endurance exercise. IL-15 increased postprandial on the high-CHO condition only, and was increased in the early post-resistance exercise period, with a slightly higher level on the high-CHO condition. TNFα and Decorin did not show a clear response, while ANGPTL4 was slightly elevated post-exercise, and strongly increased in the postprandial period, with no differences between meals. MCP-1 tended, on both occasions, to increase after the endurance exercise with subsequent a reduction below baseline.

Conclusions: The composition of the pre-exercise meal did in general not influence myokine responses in the post-resistance exercise period, although plasma IL-6 levels were higher in the low-CHO condition compared with high-CHO. Our findings support the view that pre-resistance exercise carbohydrate availability does not have a major impact on acute responses of myokines.

Keywords: Resistance Exercise, carbohydrate availability, myokines, Interleukin-6

144/1527

EFFECT OF EXERCISE STIMULUS-INDUCED ANDROGEN STEROIDOGENESIS ON LCFA TRANSPORT PROTEINS IN SKELETAL MUSCLE

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Background and objectives: The aim of this study was to determine whether an acute of aerobic exercise would increase androgen hormone concentration in skeletal muscle and LCFA transport proteins.

Methods: 20 Male ICR mice, 9 weeks old, were randomized into three groups: Control (n=7, CON), Exercise (n=7, EX), and Exercise + SRD5A1A2 Inhibitor (n=7, EX-IN, SRD5A1A2 is an enzyme to be needed when free testosterone (FT) is metabolized to dihydrotestosterone (DHT)). Inhibitor was administered to the EX-IN intraperitoneally while the CON and EX were treated with vehicle only. After 1-hour administration in mice, exercise was performed at 60-70%VO2max for 30min. Respiratory Exchange Ratio (RER) during exercise were measured in calorimeter. The levels of FT and DHT in Skeletal muscle tissue were determined using an ELISA kit, and FAT/CD36 and CPT1 were examined by western blot.

Results: We found that FT and DHT concentration in skeletal muscle were no significantly difference among the groups. However, EX group had significantly lower integrated area under the curve in RER at last 10-min during an exercise than EX-IN. The EX and EX-IN groups had greater FAT/CD36 expression in skeletal muscle than CON group. Similarly, EX groups had significantly higher CPT1 expression than in CON group, whereas EX-IN group had significantly lower than in EX group.

Conclusions: Our results provide a novel finding that aerobic exercise did not change FT and DHT levels in skeletal muscle. However, androgen metabolism on skeletal muscle in association with the increase of CPT1 gene activation.

Keywords: Androgenmetabolism, LCFA transport protein, Fat oxidation, Energy metabolism during exercise

144/1546

CARBON STABLE ISOTOPE RATIOS HAVE POTENTIAL AS A BIOMARKER FOR THE ASSESSMENT OF SUGARS INTAKE IN NEW ZEALAND POPULATIONS

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Background and objectives: Carbon stable isotope ratios (13C/12C; expressed as δ13C) in various tissues have recently been shown to predict intakes of free sugars derived from cane and corn in U.S. populations. Whereas corn, cane and sugar-beet derived sugars are commonly used in the U.S., cane sugar predominates in New Zealand (NZ). Our objective was to investigate whether δ13C is associated with sugars intakes in two small cohort studies conducted in NZ.

Methods: The first cohort included young people who identified with at least one Pacific Island group aged 15-20y (n = 80). The second involved Māori (indigenous) adults living in a semi-rural community on the East Coast of NZ (n= 37). Sugars intakes were assessed using culturally tailored and validated food frequency questionnaires. Isotopic compositions for carbon (δ13C) and nitrogen (δ15N) in red blood cells were determined by combustion in an Elemental Analyser and measurement of the resulting N2 and CO2 gases by Isotopic Ratio Mass Spectrometry (EA-IRMS). Compound-specific analysis of the stable isotope ratios in the alanine fraction (δ13Calanine) of red blood cells was determined by Gas Chromatography with combustion and Ipe Ratio Mass Spectrometry (CG-IRMS).

Results: In the Pacific cohort a dual isotope model including δ13C and δ15N correlated with self-reported free sugars intakes; r=0.48 for total free-sugars and r=0.61 for sugar-sweetened beverage intakes in normal-weight subjects (body mass index (BMI): 19-25 kg/m2), but not in overweight and obese participants. Conversely, δ13Calanine was not correlated with free sugars intakes. In the Māori cohort δ13Calanine was correlated with total sugar intake (r= 0.49, p=0.002), sucrose intake (r=0.45, p=0.004), and added sugars intake (r=0.49, p=0.002). Linear regression analysis adjusted for sex, age, BMI and HbA1c showed that δ13Calanine was strongly associated with total sugars intake (r2= 0.49, p = 0.002). The dual isotope model including δ13C and δ15N was not associated with self-reported sugar intakes.

Conclusions: Carbon stable isotope ratios in red blood cells have potential as objective biomarkers of sugar intakes in New Zealand population studies. A larger validation study involving optimal dietary assessment method is now warranted to confirm these preliminary findings.

144/1559

EFFECT OF THE PPM1K GENETIC VARIANT ON GLUCOSE METABOLISM TRAITS IN RESPONSE TO WEIGHT LOSS DIETS

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Background and objectives: Circulating branched chain amino acids (BCAAs) have been related to insulin resistance and type 2 diabetes (T2D) risk. We tested whether the BCAAs-increasing rs1440581 PPM1K T-allele affected changes in glucose metabolism traits depending on dietary fat intake during a weight loss dietary intervention.

Methods: The rs1440581 PPM1K variant was genotyped in 757 non-diabetic individuals (NUGENOB study). Participants were randomly assigned to one of the two energy restricted diets (low-fat diet: 20-25% fat, 15% protein, 60-65% carbohydrate; high-fat diet: 40-45% fat, 15% protein and 40-45% carbohydrate). The changes in fasting glucose, insulin, insulin resistance (HOMA-IR) and cell function (HOMA-B) were measured after 10 weeks of intervention.

Results: Significant interactions were found between the PPM1K genotype and low-/high-fat diet on changes in insulin, HOMA-IR and HOMA-B (p interaction 0.01, 0.02 and 0.003, respectively). In the low-fat dietary group the T allele was marginally associated with smaller decreases in insulin and HOMA-IR (0.69 U/mL per risk allele, p=0.07; and 0.21 per risk allele, p=0.04; respectively). On the other hand, in the high-fat diet group, the T allele was associated with decrease in HOMA-B (-12.5 per risk allele p=0.006).

Conclusions: Our findings indicate that the rs1440581 polymorphism may differently influence changes in glucose metabolism during weight loss depending on dietary fat intake.

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EXTRA-VIRGIN OLIVE OIL OR NUTS CONSUMPTION AND DNA METHYLATION IN PERIPHERAL BLOOD CELLS WITHIN THE PREDIMED-NAVARRA TRIAL

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Background and objectives: Epigenetic marks, including DNA methylation, might be reversible and modulated by environmental factors such as dietary exposures. Some dietary components have demonstrated to mediate metabolic effects through methylation processes. Therefore, some of the beneficial effects of the Mediterranean diet (MedDiet) could involve methylation changes. The objective of this study was to analyse whether an intervention with a MedDiet supplemented with extra virgin olive oil (MedDiet+EVOO) or nuts (MedDiet+nuts) was able to influence the methylation levels in peripheral blood cells.

Methods: A subset of 36 individuals was selected within the PREvención con DIeta MEDiterránea (PREDIMED)-NAVARRA study, a randomised, controlled, parallel trial with three groups of intervention in high cardiovascular risk volunteers: MedDiet+EVOO, MedDiet+nuts and a low-fat control group. Methylation levels were measured at 5 years of intervention and at baseline. CpG sites (CpGs) with high changes in methylation and homogenous dispersion with putative biological implications were chosen by statistically restricted selections.

Results: Five CpGs related to intermediate metabolism, diabetes, obesity, inflammation and signal transduction were finally selected; one with methylation differences in the MedDiet+nuts group (cg01081346–CPT1B) and four in the MedDiet+EVOO group (cg00173776–PUM1, cg12147622–DDIT4, cg21870545–EPB41, cg24045357–LINC01117).

Conclusions: Specific components of MedDiet, particularly nuts and EVOO, were able to induce changes in methylation levels

in several genes from peripheral blood cells. These methylation changes may be related to some of the potential benefits in health and may contribute to explain the role of MedDiet on health outcomes.

Keywords: Epigenetics, DNA methylation, Mediterranean diet, Olive oil, Nuts

Further collaborators:
PREDIMED investigators

144/1577

LOW FOLIC ACID INTAKE IS ASSOCIATED WITH SIK1 HYPOMETHYLATION AND INSULIN RESISTANCE IN OBESE SUBJECTS

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Background and objectives: Folic acid is involved in the regulation of many biological processes including DNA methylation via the one-carbon metabolism pathway. Furthermore, folic acid deficiency has been putatively implicated in the onset of diverse metabolic diseases, including insulin resistance, by altering DNA methylation patterns on key regulatory genes. The aim of this study was to investigate the association between folic acid intake and metabolic features, with emphasis on gene-specific DNA methylation patterns.

Methods: A cross-sectional ancillary study was conducted in obese subjects (n=47) from the RESMENA study (Spain). Fat mass was measured by dual-energy X-ray absorptiometry (DXA). Dietary intake and the metabolic profile were assessed by standardized methods. DNA methylation in peripheral white blood cells was analyzed by microarray (Infinium Human Methylation 450K BeadChips).

Results: Subjects with a folic acid intake lower than 300 µg/day showed more fat mass (especially trunk fat), as well as higher levels of glucose, insulin, HOMA-IR index, cortisol and PAI-1 than those consuming at least or more than 300 µg/day. Noteworthy,

low folic acid was related to salt inducible kinase 1 (SIK1) gene hypomethylation. Moreover, methylation levels of SIK1, a direct CREB target gene involved in glucose metabolism, negatively correlated with HOMA-IR index.

Conclusions: These results suggest that SIK1 hypomethylation could be an epigenetic mechanism underlying low folic acid-induced insulin resistance in obese subjects.

Keywords: Folic acid, epigenetics, DNA methylation, obesity, insulin resistance

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144/1602

IMPROVEMENTS IN INSULIN RESISTANCE AND FGF21 IN OBESE SUBJECTS AFTER A LONG-TERM WEIGHT LOSS INTERVENTION: RESMENA PROJECT

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Background and objectives: Fibroblast growth factor 21 (FGF-21), a potent activator of glucose uptake, has been proposed to be related to insulin resistance, metabolic syndrome (MetS), nonalcoholic fatty liver disease (NAFLD), and weight status. The objective was to evaluate the relationship between FGF21 and criteria of MetS in obese subjects after 6 months under energy restricted diet.

Methods: Sixty-six adults (55.5% men; 49 ± 9 years; BMI: 35.7 ± 4 kg/m2) of RESMENA study were evaluated at baseline and after 6 months. Blood pressure, anthropometric, body composition (DXA), glycemic and lipid profile (Pentra C-200) as well as FGF21 (ELISA assay) were determined.

Results: The participants showed a significant reduction in weight (6.9 ± 2.9 kg), and waist circumference, body fat, visceral adipose tissue, blood pressure, total cholesterol, LDL-c, TG, glucose and HOMA-IR. Interestingly, FGF21 significantly decreased after weight loss intervention (p<0.001), whose change positively

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and significantly correlated with variation in HOMA-index (r= 0.312; p= 0.015). Thus, a linear regression model was set up to assess the influence of FGF21 on HOMA-index (β= 23.6; R2= 0.112; p= 0.040) revealing that the association depend on weight loss.

Conclusions: Our data show a positive relationship between FGF21 and insulin resistance suggesting the potential mediating role of FGF21 on glucose homeostasis in weight loss.

Keywords: FGF21, obesity, weight loss, insulin resistance.

Further collaborators:

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144/1622

ELEVATED THYROGLOBULIN CONCENTRATIONS, BUT NO INCREASED PREVALENCE OF THYROID FUNCTION DISORDERS IN AREAS WITH CHRONIC EXCESSIVE IODINE INTAKE

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Background and objectives: Excessive iodine intake may have adverse effects on thyroid function, including hyperthyroidism, hypothyroidism and thyroid autoimmunity, but the relative effects across the life cycle are unclear. Large regional variations in iodine intake have been reported in Eastern Africa, from deficient to well above recommended levels, questioning the adherence to existing universal salt iodization (USI) programmes. We sought to evaluate the effects of prolonged excessive iodine intake on thyroid function.

Methods: In this cross-sectional study, we evaluated the iodine status (UIC) and thyroid function (tT4, TSH, Tg on dried blood spots) of approximately 3600 participants from 6 population groups (pregnant, lactating and women of reproductive age, schoolchildren, breastfeeding and weaning infants), at two purposefully chosen sites in Kenya (K) and Tanzania (TZ) with previously documented excessive iodine intakes in schoolchildren. We analysed household salt iodine content and groundwater concentrations, and a questionnaire assessed the intake of iodised salt and consumption of foods rich in iodine.

Results: Iodine intake greatly exceeded minimum requirements in all groups: median UIC in schoolchildren was above the 300 g/L WHO cut-off indicating excessive intake, however below that of 500 g/L proposed during pregnancy. At 43.5 mg/kg (IQR 33.5, 54.0), salt iodine concentrations complied with national leg-

islation at both sites. Drinking water iodine concentrations ranged from 0 to 2943 g/L. The prevalence of thyroid disorders was low in all population groups (<0.5% overt, <2.8% subclinical disease), however a high prevalence of elevated thyroglobulin was observed in schoolchildren (K: 46.2%, TZ: 31.1%) and pregnant women (K: 20.1%; TZ: 16.7%).

Conclusions: In these populations, exposed to a prolonged iodine intake exceeding the dietary requirements, the prevalence of thyroid disorders was similar to iodine-sufficient populations suggesting that the thyroid gland may adapt to high intakes. The well-functioning USI programmes should be maintained, but monitoring and surveillance must be strengthened. Groundwater likely contributes to the high iodine intakes in the present study populations. In areas of known iodine excess, monitoring of groundwater sources should be encouraged.

Keywords: Iodine excess, thyroid function, thyroglobulin, USI, groundwater

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144/1649

FEASIBILITY OF COLLECTING NUTRITION INFORMATION USING COMPUTER ASSISTED TELEPHONE INTERVIEWING

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Background and objectives: Regular information on nutrition status within target populations is needed to monitor changes over time, provide early warning, and guide policies and programmes linked to nutrition in vulnerable counties. With rapid growth in mobile phone access and ownership in sub-Saharan Africa, data collection using mobile methodologies such as Computer-Assisted Telephone Interviewing (CATI) could enable quick, affordable and high frequency data collection at scale.

The objective of the study was to understand mobile phone access, ownership, and usage patterns by rural women in Kenya, in particular the opportunities and constraints for monitoring nutrition via mobile phone interviews with women of reproductive age and caregivers of young children.

Methods: We conducted 17 focus group discussions and 16 in-depth interviews with women, as well as 22 key informant interviews with mobile phone vendors, local nutritionists and local government representatives. The study was conducted in two counties in Kenya (Kitui and Baringo) representing different socioeconomic and agroecological conditions. Qualitative data were coded and analysed using NVivo 10 based on defined codes; additional codes and sub-nodes were added based on emerging themes from the data.

Results: Our results show that the majority of women in both counties had access to phones through inter- and intra-household sharing, even if they didn't own one themselves. Similarly, a majority of participants showed high willingness to participate in mobile phone surveys related to diet. However, potential barriers for women to participate in mobile phone surveys included poor network coverage, trust issues, and gender norms.

Conclusions: Innovative data collection methodologies such as CATI can be used to collect nutrition information from rural women. Potential barriers related to trust issues and gender norms can be addressed through prior community sensitization, particularly with local leaders and male household heads. Mobile phone surveys are most feasible in areas where network coverage is good, however pre-scheduling of phone calls can minimize non-response in areas of poor network.

Keywords: Nutrition, Mobile survey, CATI, Data Innovation, Rural Kenya

Conflict of Interest Disclosure: United Nation World Food Programme's mobile Vulnerability Analysis and Mapping (mVAM) project uses various mobile methodologies to collect food security data.

144/1678

CHANGES IN OBESITY METABOLOMIC PROFILE ASSOCIATED WITH MANGANESE INTAKE IN A POPULATION BASED STUDY

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Background and objectives: The amino acids (AA) profile has been reported to be related to metabolism alteration, impairing the mitochondrial activity, in obese individuals. Manganese dietary intake inadequacy could collaborate in abnormal accumulation of body and tissue fat, such as impairers lipid metabolism, and glucose tolerance. The relationship between manganese intake, and AA profile could indicate mitochondrial metabolism alteration, and future diseases. The aim of this study was evaluate the association between dietary manganese intake and AA profile.

Methods: The dietary intake data were obtained from the "Health Survey of São Paulo" (ISA-Capital 2008), a population based cross-sectional survey in São Paulo, Brazil. The blood sample was obtained from 168 adults ($\geq$20 years) and 21 amino acids in plasma were analyzed, using Affinity/HPLC with electrochemical detection method. AA profile was performed using factor analysis with extraction of principal components by varimax rotation. The factor loading considered the eigenvalue more than 0.4. Finally, linear regression was used to verify the relationship between manganese intake and AA profile, adjusting by age, sex, and energy intake.

Results: The factor analysis retained five factors with cumulative variance of 0.662, and Kaiser-Meyer-Olkin of sampling adequacy equal to 0.824: F1 (Isoleucine, Leucine, Lysine, Methionine, Phenylalanine, Tryptophan, Tyrosine, Valine); F2 (Asparagine, Glycine, Serine, Threonine); F3 (Arginine, Glutamate, Histidine); F4 (Citrulline, Glutamine, Ornithine); F5 (Alanine, Aspartate, Proline). F1 (β= -0.2616; p=0.009) and F3 (β= 0.2047908, p=0.047) revealed significant association with the manganese intake. The F1, that represented the AA profile related to β-oxidation, was negatively correlated with manganese intake; while F3, that represent the citric acid cycle, was positively correlated with manganese intake.

Conclusions: The manganese intake was associate negatively to the AA profile related to the β-oxidation, composed mainly by the branch chain amino acids and aromatic amino acids, which ones have been associated to obesity, and metabolism alterations, causing future diseases. However, the manganese consumption revealed positively association with citric acid cycle AA profile, whereas the manganese might be related to the enzymes responsible for aerobic metabolism.

Keywords: Manganese Intake. Metabolomics. Obesity. Metabolism.

144/1689

L-LACTATE ADMINISTRATION STIMULATES FAT OXIDATION AND GLYCOGEN STORAGE IN RESTING RATS

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Background and objectives: L-lactate is known as the end-product of glycolysis. Therefore it is considered as a fatigue product. However, since last decades there has been demonstrated positive effect of L-lactate. Nevertheless it is not known whether the L-lactate changes on energy metabolism and energy substrates utilization.

Methods: Study1. We investigated the effects of L-lactate treatment by using an open calorimetric chamber on resting rats for 6 hours. We randomized 32, 7-week-old male SD rats into 4 groups: the control (Con: DW), caffeine (Caf: 1mg/100g), L-lactate (Lac:400mg/100g), and caffeine and L-lactate mixed compound

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(Caf+Lac: 1mg, 400mg/100g). We treated different substances to each groups by using sonde for oral administration. We examined 6 hours on energy metabolism in resting conditions by using respiratory metabolic chambers.

Study 2. We did Additional experiment to see gene movements within 2 hours with Caf+Lac group, because they were the highest group in fat oxidation. We treated same dose of Caf+Lac and sacrificed 30minutes, 60 minutes and 2 hours after the treatment. We sacrificed zero-point without any treatment and analyzed all the groups by RT PCR.

Results: Study1. There was no significant difference in oxygen uptake and carbon dioxide production between groups. However with fat oxidation, Lac and Caf+Lac were significantly higher than Con in first 2 hours after administration in fat oxidation.

Study2. MCT1 decreased after 2hours compared to zero and FAT/CD36 showed up and down tendency with significant difference within 2 hours. Finally PDK4 increased at 2hours compared to zero.

Also when we examined blood sample we could see there is a significant increase in glycerol level after 2hours.

Furthermore when we analyzed glycogen level in liver, we could find significant increase within 2 hours.

Conclusions: The rejection of glycolysis which might be understood as increase in glycogen synthesis, has possibility of shown to as increase in fat oxidation. For this reason, L-lactate administration could be an effective supplement for aerobic athletes' glycogen loading and therefore it needs to be studied more with metabolism clarification and dose response.

Keywords: L-lactate, Fat oxidation, Glycogen, Resting metabolic rate

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ANTHROPOMETRIC MEASUREMENTS ASSOCIATED TO METABOLIC SYNDROME AND INSULIN RESISTANCE IN CHILEAN SCHOOL AGE CHILDREN

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Background and objectives: The World Health Organization has recommended determining - sex and population – specific relationships between measures of fatness and morbidity. Obesity anthropometric indicators were associated in this study of Chilean children with the metabolic syndrome (MS) and with insulin resistance (IR).

Methods: A cross-sectional study enrolled 3325 subjects attending 5th and 6th grade of primary education during 2009-2011. The relationship of MS and IR with anthropometric indicators was

assessed. Receiver operator characteristic (ROC) curves were used to compare discrimination and estimate optimal cutoffs of body mass index (BMI), fat mass (FM), waist circumference (WC) and waist-to-height ratio (WHtR). Sensitivity, specificity and net classification improvement (NRI) for these cut cutoffs were compared with values obtained applying international recommendations.

Results: Children were 52.2% females and mean age was 11.4±1 years. All anthropometric indicators had similar ROC areas for MS and RI, both in girls and boys. Optimal cutoffs slightly improved NR when compared with international recommendations.

Conclusions: The similarities observed permitted to propose two simpler anthropometric measures for clinical practice. They are BMI and WHtR; the latter has also the advantage of not needing tables to assess the specific diagnosis.

Keywords: children, insulin resistance, metabolic syndrome, fat mass, body mass index

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144/1723

EFFECT OF LEAA SUPPLEMENTATION ON MUSCULAR FATIGUE AND INFLAMMATORY CYTOKINES IN WHEELCHAIR BASKETBALL PLAYERS

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Background and objectives: Several studies found that an effect of amino acid supplement on reducing muscle damage and attenuated development of delayed onset muscle soreness (DOMS) induced by exercise. This study has a purpose of investigating the effect of LEAA (Leucine-enriched essential amino acids mixture) intake on muscle recovery and muscle fatigue of disabled athletes through examining the wheelchair basketball players.

Methods: Ten of wheelchair basketball players with spinal cord injury and amputated participated were recruited. All subjects were exposed to a LEAA (12.0 g/day) or placebo treatment in a double-blind, randomized, and cross-over experiment. We measured the variables related to muscular fatigue or inflammatory response before the intense exercise and followed 4 day of recovery.

Results: In our results, there was significant decrease of circulating IL-6 level in LEAA treated group compared to placebo

group. However, there was not alternation of TNF-alpha and CK levels. There was no significant difference in relative values of muscle soreness with ANOVA analysis. However, significant improvement in relative values of whole body & back soreness with Effect size analysis with Cohen's d.

Conclusions: Based on our results and previous reports, supplementation of LEAA before and after the intense exercise-induced muscular fatigue could be helpful to reduced muscular soreness and inflammatory response in wheelchair basketball players.

Keywords: Wheelchair basketball, Muscular fatigue, Inflammatory, LEAA (Leucine-enriched essential amino acids mixture)

144/1738

SIBLINGS 6-59 MONTHS AND CHILD STUNTING IN 'MULTI -MULTI' NUTRITION PROGRAMME

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Background and objectives: In Rwanda, Nyamagabe and Rutsiro districts have stunting prevalence rates above the WHO critical threshold of 40%. The one UN Nutrition projects 'multi-multi' was implemented between August 2014 and December 2016, to effectively reduce the stunting levels in the two districts. Impact of siblings on child stunting in targeted households was studied.

Methods: A cross-sectional survey sampled 3700 children aged 6-59 months in the two districts. Data were collected between August and September 2016, and were stratified by number of siblings in household. Stunting in children was determined using the World Health Organization (WHO) growth standard 2006 index (HAZ). Data quality was assessed using ENA plausibility check and statistical analysis was performed with SPSS version 24.

Results: Stunting was lower in children enrolled in the project 50.9% vs. 54.9%, P> 0.05. Trend is much significant 46.4% vs. 54.1%, p<0.05 in children enrolled in the project with no sibling under five years in the household. Stunting level was reversed among households having targeted children with older siblings not enrolled in the programme (57.4% vs.56.3%). Stratification by age in household with older siblings, indicates that the older the child is (12-24 months) the more affected he or she is.

Conclusions: Household size especially , presence of one or more siblings under five years is a social determinant of child stunting. Additional research is required on quantifying the impact of siblings on child undernutrition for future programme targeting.

Keywords: Siblings, Stunting, 'multi-multi'
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144/1754

RESEARCH METHODS USED TO DETERMINE COST-EFFECTIVENESS OF A SUPPLEMENTARY FEEDING TRIAL TO PREVENT CHILD UNDERNUTRITION IN BURKINA FASO

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Background and objectives: Policy-makers increasingly call for evidence of cost-effectiveness in international aid and nutrition programming. Guidance on tailoring methods to policy relevant questions is limited, making it challenging to determine cost-effectiveness in programmatic settings. As part of the Food Aid Quality Review (FAQR) funded by USAID/Food For Peace Office (FFP), we describe cost-effectiveness research methods applied to a preventive supplementary feeding trial comparing four specialized nutritious food aid products.

Methods: A cluster-randomized trial enrolled 6,092 children at six months old. Each enrollee received one of four isocaloric foods (three Fortified Blended Foods and one Ready-to-Use-Supplementary Food) with monthly anthropometric measurements for 18 months. Outcomes relevant to cost-effectiveness analysis include number of child-months and number of children ever diagnosed as wasted (Weight-for-Height Z score<-2) or stunted (Height-for-Age Z score<-2). Using an Activity-Based-Costing-Ingredients (ABC-I) approach, we collected costs associated with program fixed investments, food commodities, transportation, storage, distribution, repackaging, programmatic activities, and beneficiary and volunteer opportunity costs. The Incremental Cost-Effectiveness Ratio(ICER) for each cost-effectiveness measure was calculated across the four arms. Cost-effectiveness measures and their formulas were determined based on the nature of the program and outcomes of interest.

Results: Because a child could fall into wasting or stunting more than once over 18 months, we assess the programmatic "cost per child never wasted" and "cost per child never stunted". The ICER formula used to compare across arms is "Difference in total program cost per child / Difference in (number of children ever diagnosed with wasting or stunting / number of children)". Because the length of time during which a child was malnourished is important to long-term growth and development, we will determine "cost per child-month of stunting averted" and "cost per child-month of wasting averted". The ICER formula is "Difference in total program cost per child / Difference in (number of total child-months with stunting or wasting/number of children)".

Conclusions: These methods offer rigor to cost-effectiveness research design, including cost data collection and creation of appropriate cost-effectiveness measures. Meaningful cost-effectiveness estimates produced by the research community will in turn

lead to real impact on better-designed-and-managed nutrition programs and policies in international development.

Keywords: cost-effectiveness, supplementary feeding, stunting, wasting, food aid

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144/1782

PLASMA ALANINE AMINOTRANSFERASE (ALT) ACTIVITY IS A RELIABLE BIOMARKER FOR THE RISK OF INSULIN RESISTANCE AND DIABETES PREDISPOSITION

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Background and objectives: The onset of diabetes is reportedly related with insulin resistance and uncontrolled gluconeogenesis in the liver. In this study, we examined whether elevated plasma concentration of alanine aminotransferase (ALT), a hepatic key enzyme for gluconeogenesis, is associated with the increases in blood HbA1c levels during the 5-year follow-up period after health checkups in middle-aged apparently healthy Japanese men.

Methods: Associations between the baseline clinical parameters or lifestyle factors (categorized in Q1-Q4) and the increase in blood HbA1c levels were determined in 1,729 men aged 35–54 years by logistic regression analyses. We also conducted In vitro analysis where human liver-derived HepG2 cells were cultured with 0.5-100 nmol /L insulin for 8h, and the mRNA levels of ALT gene and the extent of histone acetylation around the gene were measured.

Results: Multivariate logistic regression analyses showed that among the clinical parameters and lifestyle factors, the baseline plasma ALT activity was most explicitly associated with the increase in blood HbA1c levels, and the odds ratios for the increment of HbA1c of 0.5% or more in 5 years were 1.71 and 2.64, in the quartile groups Q3 (p = 0.018) and Q4 (p < 0.001) for ALT, respectively, as compared with Q1. In vitro analysis of human liver-derived HepG2 cells showed that the mRNA levels of ALT2, but not ALT1, were reduced by insulin in a dose dependent manner, and that the insulin-induced suppression of ALT2 mRNA levels was in association with decreases in histone H3 and H4 acetylation surrounding the ALT2 gene.

Conclusions: These results suggest that plasma ALT activity is a reliable biomarker for the risk of insulin resistance and diabetes predisposition in middle-aged apparently healthy Japanese men.

Keywords: ALT, diabetes, insulin resistance, liver

144/1794

BENEFICIAL EFFECT OF PERSONALISED LIFESTYLE ADVICE AS COMPARED TO GENERIC ADVICE ON WELLBEING AMONG ACTIVE DUTCH SENIORS – A PILOT STUDY

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Background and objectives: Ageing is associated with a gradual loss of skeletal muscle mass and function. It is estimated that sarcopenia affects 30% of seniors over 60 years. Also, 60% of Dutch seniors suffer from overweight or obesity. Both obesity and sarcopenia can be treated with a healthy diet and regular physical exercise.

Previous studies have shown that personalised advice is more effective than general information for improving healthy behavior. Personalisation of lifestyle advice can be done by using individual's health status and behavior (biological factors), and by using personal characteristics (socio-psychological factors). The primary focus of this study was to demonstrate whether personalisation of lifestyle advice as compared to generic advice improves measures of wellbeing in a population of active seniors.

Methods: At total of 59 seniors aged 60 years or older and with a self-reported BMI of 20-30 kg/m2 were recruited. The study was designed as a 9-week single-blind randomised controlled trial. At baseline and end, biological, genetic and socio-psychological measurements were performed. Food intake and compliance were measured three times during the study. The intervention group (n=30) received Personalised dietary and lifestyle Advice (PA), based on their dietary intake, phenotype and genotype. The control group (n=29) received Generic Advice (GA) for improving their muscle health.

Results: Scores on the Short Physical Performance Battery (SPPB) increased significantly in both the PA and GA group. Decrease in body fat percentage and hip circumference was significanlty greater in the PA group. Waist circumference decreased significantly in the PA group, but the difference between the PA and GA group was not significant. There were no differences in changes of self-perceived health between groups. However, in the PA group, scores for motivation and resilience increased significantly.

Conclusions: This study showed that both the PA and GA group improved their muscle health as shown by improved scores

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on SPPB. However, the PA group showed a stronger beneficial decline in body fat percentage and hip circumference as compared to the GA group. This indicates that personalised lifestyle advice results in additional health benefits in a population of active seniors as compared to general advice.

Keywords: personalized advice, elderly, lifestyle, nutrition, muscle health

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144/1802

NUTRIENTS AND DNA METHYLATION ACROSS THE LIFE COURSE: A SYSTEMATIC REVIEW OF STUDIES IN HUMANS

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Background and objectives: DNA methylation can be modified by environmental factors, including nutrition. The susceptibility to change of DNA methylation in response to nutrition is particularly high during early life. Nevertheless, nutrition has also been reported to be associated with DNA methylation in other stages of the life course, for instance, during adolescence and adulthood. In order to gain more insight in effects of several nutrients on DNA methylation across the life course, a comprehensive overview of the current knowledge is of importance. Therefore, we conducted a systematic review on the relationship between nutrients and DNA methylation in humans across the life course.

Methods: The literature search was designed by an experienced biomedical information specialist. Six bibliographic databases (Embase.com, Medline (Ovid), Web-of-Science, PubMed, Cochrane Central and Google Scholar) were searched. We selected studies that examined the association between nutrients (blood levels; dietary intake; or dietary supplements) and DNA methylation (global, site specific or genome-wide) in humans of all ages. We did not apply any restrictions on year of publication or language. All abstracts, full text selection and data extraction was performed by two independent reviewers, with a third reviewer available for disagreements.

Results: Of the 3774 references identified, 109 studies met our inclusion criteria. Of the included studies, 31 studies investigated the association between maternal nutrition and offspring DNA methylation, nine studies were carried out in subjects during infancy, childhood, or adolescence, and 69 studies were performed in adults. Several candidate gene and epigenome-wide association studies identified effects of nutrients, including folate, fatty acids, and vitamin D, on DNA methylation of CpG sites known to be involved in several health aspects, such as embryonic development and cancer.

Conclusions: To date, promising results have been reported in the field of nutrition and DNA methylation in humans at different stages across the life-course. Especially for nutrients known to be involved in one-carbon metabolism, such as folate, but also others, such as fatty acids and vitamin D. However, further large-scale studies of high quality are needed to expand our understanding on the role of nutrition in DNA methylation and its effects on health and disease.

Keywords: DNA methylation, systematic review, epidemiology, life-course, epigenetics.

Conflict of Interest Disclosure: The authors Kim V.E. Braun, Trudy Voortman, Jenna Troup, Taulant Muka, and Oscar H. Franco work in ErasmusAGE, a center for ageing research across the life course funded by Nestlé Nutrition (Nestec Ltd.), Metagenics Inc. and AXA. The authors report no conflict of interest related to this work.

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THINK FLEXIBLE TO ADDRESS NUTRITION RESEARCH CHALLENGES

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Background and objectives: Human studies are essential to obtain evidence of beneficial effects of nutritional interventions on health. Nutrition clinical trials have specific challenges to overcome such as population selection, lack of learning phases, small beneficial effects, high heterogeneity of the response and difficulties in finding appropriate endpoints. We believe that this challenging framework favors the need of exploratory but optimized clinical trials: It creates significant opportunities, but also barriers, for the application of adaptive design methods.

Methods: This work highlights specificities and challenges in nutritional clinical trials. The application of adaptive design methods is then evaluated in terms of benefits, challenges and obstacles during implementation. Practical recommendations for implementation are also presented.

Results: In practice, adaptive design provides the opportunity to modify certain aspects of the trial design whilst the study is ongoing, without violating the quality and the integrity of the data. It allows the investigator to correct wrong assumptions made at the beginning of the trial such as power calculation for sample size; it helps to select the most promising option early with limited number of subjects available at interim; and it provides the opportunity to react earlier to surprise either positive (e.g., strong benefits) or negative (e.g., safety concern or futility).

Compared to traditional designs implementation, adaptive designs require additional efforts at each stage of the trial. It requires careful planning. Simulation-based evaluation of the trial and formal assessment of trial options with quantitative comparison of design choices are recommended. It requires a precise operational execution, with appropriate technology. A close collaboration and coordination is needed among different functional and operational teams during the course of the study. Underlying theoretical complexity of adaptive design implies a solid statistical ground and a careful interpretation of the results. Major adaptations or modifications to a trial could prevent from answering to the scientific questions that the original trial intended to answer.

Conclusions: Authors hope this work will allow a better understanding and adoption of the adaptive design methodology by the nutrition scientific community, and will contribute to the design of more efficient and ethical optimized clinical trials.

Keywords: Clinical Research, Nutrition specificities, Adaptive Design, Flexible trials

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144/1841

THE NEEP APPROACH: CLOSING RESEARCH GAPS AND BUILDING CSO CAPACITY THROUGH EVALUATION

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Background and objectives: The Nutrition Embedding Evaluation Program (NEEP) was a four-year program that began in October 2013, funded by the UK Department for International Development and managed by US-based international health organization PATH. The objectives of NEEP were to: 1) build capacity to identify and measure results of nutrition-related interventions, 2) address knowledge gaps on effectiveness and cost-effectiveness of nutrition interventions, and how they can be delivered at scale, 3) support civil society organizations (CSOs) to strengthen their ability to carry out effective evaluations of their nutrition-related interventions, and 4) disseminate evidence of best practice for impact. After conducting a gap analysis to determine NEEP priorities, PATH (following consultation with DFID) allocated grants and provided technical assistance to local CSOs, tracking performance and compliance throughout the program. Altogether, NEEP supported robust evaluation of 18 nutrition-related interventions in 12 different low- and middle-income countries.

Methods: Near the halfway point of the program and approximately one month before CSO contracts were scheduled to end, PATH surveyed grantees to identify any common challenges they faced during the evaluation process and how those challenges were overcome. The authors of this paper reviewed qualitative data from these surveys, monthly and quarterly NEEP grantee reports, and other internal documents and compiled a list of key implementation challenges and recommendations for future nutrition evaluation funding projects.

Results: Grantees reported challenges related to tracking and accessing intervention participants for evaluation, obtaining an adequate intervention sample size to achieve statistically significant results, experiencing delays with local internal ethical review board approval, political unrest creating unsafe conditions for evaluators, and transporting anthropometric measurements/equipment. PATH recognized that the timeline for these evaluations could be made more flexible to allow for thorough data collection and publication, and accommodate for environmental challenges beyond the evaluators' control.

Conclusions: The NEEP administration and implementation process was challenging, but provided valuable lessons that are transferrable to other nutrition program evaluators and funders. NEEP presented a successful model for an "ongoing external presence" for CSO grantees, ensuring quality and consistency in monitoring and evaluation from the initial planning stages to project completion.

Keywords: Evaluations, nutrition-sensitive, CSOs, PATH

Conflict of Interest Disclosure: This abstract was produced on the lessons learned through the project (NEEP) supported by the UK aid and the UK Government; however, the views expressed do not necessarily reflect the UK Government's official views or policies.

EFFECT OF A FUNCTIONAL MILK FAT ENRICHED IN RUMENIC ACID AND VACCENIC ACID ON LIPID AND CARBOHYDRATE METABOLISM IN RATS FED A HIGH-FAT DIET

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Background and objectives: Intake of high-fat (HF) diets has been associated with steatosis, hepatic lipid alterations and insulin resistance in humans and in experimental animal models. Since rumenic acid (RA) and vaccenic acid (VA), naturally present on dairy products, showed to induce health benefits on lipid and carbohydrate metabolism, some efforts have been made to increase their levels in the milk fat (MF) and obtain a functional milk fat (FMF). The aim of the present study is to investigate parameters related to glucose and triacylglycerol (TAG) metabolism in rats fed high-fat diets containing a FMF obtained by PUFA supplementation to dairy cow diets.

Methods: Male Wistar rats were fed (60-d) with S7 (soybean oil, 7%), S30 (soybean oil, 30%), MF30 (soybean oil, 3% + MF, 27%) or FMF30 (soybean oil, 3% + FMF, 27%) diets. Biochemical parameters on serum; TAG levels in liver and skeletal muscle; lipogenic and β-oxidative enzymes activities and expressions in liver; and hepatic TAG secretion rate in vivo were determined. In addition, an oral glucose tolerance test, the metabolites from glycolysis and some key enzyme activities in skeletal muscle were assessed. Statistical differences ($p<0.05$) were tested by ANOVA.

Results: Compared to S7, S30 diet induce TAG accretion in liver (+36%) and skeletal muscle (+61%), decreased muscle glucose utilization by a lower flux through hexokinase (-53%) and 6-phosphofructokinase (-49%), glucose intolerance and hyperinsulinemia (+48%). The FMF30 group showed lower levels of TAG in liver (-26%) associated with an enhanced β-oxidation (CPT-I gene expression +122%) and a higher TAG secretion rate (+31%), compared to S30. In muscle, FMF30 also reduced the TAG levels (-49%) and increased the flux through the 6-phosphofructokinase (+116%) improving the glucose utilization.

Conclusions: In conclusion, the FMF prevented the TAG accretion induced by high fat diet consumption and improve the glucose utilization in skeletal muscle.

Keywords: rumenic acid, vaccenic acid, functional milk fat, lipid metabolism, glucose metabolism

MATERNAL CONJUGATED LINOLEIC ACID MODULATES TRIACYLGLYCERIDE METABOLISM IN ADULT OFFSPRING RATS

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Background and objectives: Conjugated linoleic acid (CLA) might regulate the lipid liver and adipose tissue accretion. Since there is an association between maternal nutrition, fat depots and risk of offspring chronic disease, the aim was investigate the effect of maternal CLA consumption on triacylglycerol (TAG) regulation and some inflammatory parameters in adult male rat offspring receiving or not CLA.

Methods: Female Wistar rats were fed control (C) or CLA-supplemented (1%,w/w) diets during 4 weeks before and throughout pregnancy and lactation. After weaning, male offspring of CLA rats were fed C or CLA diets (CLA/C and CLA/CLA groups, respectively), while C male offspring rats were fed C diet (C/C group) for 9 weeks. Serum TAG concentration, liver TAG content, lipogenic and oxidative enzyme activities, gene expressions, transcriptional factors (SREBP1c, PPARα and PPARγ) and inflamatory cytokines mRNA levels; and epididymal white adipose tissue (EWAT) LPL activity were measured.

Results: Serum TAG levels were increased in CLA/CLA (+65%) and CLA/C (+92%) groups, associated with a reduction of EWAT LPL activity (-41%) and (-67%), respectively. Liver TAG levels were decreased in CLA/CLA (-22%) group related to a significant reduction of FAS (-37%) and ACC (-27%) enzyme activities, as well as of FAS (-44%), ACC (-48%), SCD1 (-54%) and SREBP1c (-25%) mRNA levels, without changes in β-oxidation parameters. Even though in CLA/C rats a normal liver TAG levels were founded, FAS (-38%) and ACC (-31%) activities, as well as ACC (-62%) expression were significantly diminished, associated with a lower expression of the key enzyme of β-oxidation (CPT-Ia) (-23%), PPAR-α (-22%) and PPAR-γ (-45%). Liver IL-1β gene expression showed a significant decrease in both, CLA/CLA and CLA/C groups. No changes were observed in IL-6 mRNA levels.

Conclusions: These results demonstrate that maternal CLA supplementation programs male rat offspring liver lipid metabolism leading to a prevention of the TAG accretion in adipose tissue and liver. The present findings could be important to develop some dietary strategies to reduce the incidence of obesity and fatty acid liver disease in humans.

Keywords: Conjugated linoleic acid, Offspring, Triacylglycerol, Fetal programming, Lipid metabolism

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144/1879

SYSTEMATIC REVIEW ON THE MARKERS OF GLYCAEMIC EXPOSURE IN THE NON-DIABETIC POPULATION

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Background and objectives: Reducing dietary glycaemic exposures in the general population is increasingly supported as a preventive approach to address the growing global burden of Type 2 diabetes. To study the impact of dietary modifications affecting glycaemic exposures, the availability of established biomarkers suitable for use in non-diabetic populations is essential. Therefore, our objective was to review and characterize alternative markers of sustained glycaemic exposures that could be used to evaluate and compare the glycaemic impact of dietary interventions among non-diabetic populations.

Methods: The protocol has been described in the PROSPERO database of systematic reviews, register number CRD42017037408. The following markers/measurements were pre-selected: continuous glucose monitoring, di-carbonyl stress, 1,5-anhydroglucitol, fructosamine, glycated albumin/proteins, advanced glycated end products (AGEs), HbA1c, and metabolomics. Systematic searches were done for publications of human studies in MEDLINE and EMBASE published until July 2016, to identify research where these markers had been measured in relation to diet as part of intervention or observational studies. Results were interpreted with respect to sensitivity, time-responsiveness, conditions and range of response.

Results: The systematic search generated 6547 unique records. After the screening process, 111 papers were included, ranging from only 4 for 1,5-anhydrioglucitol to 30 for AGEs. The selected papers highlighted the paucity of available data for these markers as tools to assess the glycaemic exposure in non-diabetic populations.

Conclusions: Considerable additional work is needed to validate the use of any of these as biomarkers for assessment of glycaemic exposure in non-diabetic populations. Such work includes demonstration of dose response, sensitivity and specificity, development of quantitative measurement assays and measurement in larger cohorts.

Keywords: biomarkers, glycemic exposure, type 2 diabetes, prevention, carbohydrates

Conflict of Interest Disclosure: This work was conducted by an expert group of the European branch of the International Life Sciences Institute, ILSI Europe. This publication was coordinated by the Dietary Carbohydrates Task Force. Authors DM, FR, ST and SV are employed by commercial organizations that manufacture carbohydrate-containing foods and beverages or ingredients used in making these. The expert group received funding from the ILSI Europe the Dietary Carbohydrates Task Force members. Industry members of this task force are listed on the ILSI Europe website at http://ilsi.eu/task-forces/nutrition/dietary-carbohydrates/. Experts are not paid for the time spent on this work; however, the non-industry members within the expert group were offered support for travel and accommodation costs from the Dietary Carbohydrates Task Force to attend a meeting to discuss the manuscript and a small compensatory sum (honoraria) with the option to decline. The research reported is the result of a scientific evaluation in line with ILSI Europe's framework to provide a precompetitive setting for public-private partnership (PPP). ILSI Europe facilitated scientific meetings and coordinated the overall project management and administrative tasks relating to the completion of this work. The opinions expressed herein and the conclusions of this publication are those of the authors and do not necessarily represent the views of ILSI Europe nor those of its member companies.

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144/1884

GHRELIN AND LEPTIN SERUM LEVELS AND ANTHROPOMETRIC NUTRITIONAL STATUS IN RELATION TO HELICOBACTER PYLORI GENOTYPE AND GASTRIC PATHOLOGY OF DYSPEPTIC ADULTS

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Background and objectives: Hormonal regulation of appetite could be affected by the bacterium Helicobacter pylori. The objective of this study was to evaluate the association of H. pylori genotype and the type of gastric pathology, with serum ghrelin and leptin concentrations and Body Mass Index (BMI).

Methods: Fasted dyspeptic adults referred for an upper gastrointestinal endoscopy were enrolled. Height, weight and nutrient intake were assessed. Serum total ghrelin and leptin levels were analyzed by enzyme-linked immunosorbent assay. 13C-Urea Breath Test was performed and four gastric biopsies were obtained during endoscopy for histopathology and H. pylori DNA amplification and genotyping. Data analysis was performed using the $\chi 2$, Mann–Whitney U, and Kruskal-Wallis tests, Spearman's correlation and linear regression.

Results: 163 patients ($40.8 \pm 14.0y$), 98/65 females/males, were included. H. pylori prevalence was 53.4% (CI95%; 45.7 - 65.8%). Neither nutrient intake nor BMI differed significantly between groups. Serum ghrelin concentrations were significantly lower in H. pylori+ patients [median 311.0 pg/mL (IQR; 230.0 – 385.5)], independently of their cagA genotype, than in H. pylori- [median 355.0 pg/mL (IQR; 253.8 - 547.8)] (P = 0.025), even after adjusting for BMI and gender (P = 0.03). Leptin levels did not differ significantly between infected and uninfected patients [median 1.84 (0.80 – 4.85) vs 1.84 (0.50 – 5.09), (P = 0.87)]. The type and severity of gastric pathology in the corpus was associated with lower ghrelin serum levels (P = 0.04); whereas, gastric pathology of the antrum was not associated to ghrelin levels (P = 0.08).

Conclusions: H. pylori infection, independently of its cagA genotype, and the severity of gastric pathology of the corpus, are associated with lower ghrelin serum concentrations in dyspeptic patients, emphasizing its role on appetite regulation.

Keywords: H. pylori, cagA genotype, ghrelin, leptin, gastric pathology

144/1898

EXPLORING VARIATIONS IN HEMOGLOBIN CONCENTRATION AND MEASUREMENT – THE HEMOGLOBIN MEASUREMENT (HEME) WORKING GROUP

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Background and objectives: Measurement of hemoglobin concentration is common practice for monitoring and evaluating anemia reduction programs. Accuracy of hemoglobin measurement may vary widely. In order to improve the accuracy and quality of hemoglobin measurement across contexts, the USAID-funded Strengthening Partnerships, Results: **Methods:** Data were identified from cross-sectional studies among different population groups (children 6 -59 months, and pregnant and non-pregnant women 18-45 years) to assess precision, agreement, and measures of clinical validity to diagnose anemia.

Results: We identified data from nine studies conducted in Asia (Lao PDR, Cambodia, and India), Africa (Ghana, Rwanda, and Republic of The Gambia), and the Americas (Mexico, Guatemala, and USA) that compared hemoglobin measurements done using multiple devices (hematology autoanalyzers, and HemoCue devices) in different settings (laboratory and field). Priority research topics generated include: (1) factors influencing hemoglobin concentration, specifically capillary versus venous blood samples, type of analyzer, different models of the Hemocue devices, collection methods, and effect of sex, age, and climate.

Conclusions: This multi-investigator, multi-country research collaboration is the first of its kind to study variations in hemoglobin measurement. The findings from the study will contribute to the World Health Organization (WHO)'s review of its global guidelines for hemoglobin thresholds used to define anaemia at the individual and population level.

Keywords: Hemoglobin Anemia Measurement Variation Collaboration

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144/1911

HARMONIZATION OF DATA COLLECTION ACROSS 4 COUNTRIES – THE ENRICH EXPERIENCE

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Background and objectives: Undernutrition remains a major contributor to maternal and childhood morbidity and mortality. Enhancing Nutrition Services to Improve Maternal and Child Health in Africa and Asia (ENRICH) is a multi-country, broad-spectrum and integrated intervention program designed to help member countries achieve their global nutrition targets.

Methods: As part of ENRICH impact evaluation, a baseline assessment was conducted via household surveys (HHS) using a quasi-experimental design. In three of the four countries (Bangladesh, Kenya, Tanzania), a comparison area likely to have baseline characteristics similar to the intervention area was selected. In Pakistan, no comparison area was planned due to contextual reasons.

Results: The survey questionnaires were developed by University of Toronto (UofT) in coordination with World Vision Canada (WVC), ensuring consistency in tools, variables and response sets across settings. In-country research partners (CRPs) in each of the four countries carried out local contextualization and translation of the questionnaires. Data collection at all sites was conducted via Open Data Kit (ODK) platform on android tablets. English and predominant local language ODK templates for field-based entry of HHS were designed in Excel, converted into XML format, and uploaded to country-specific secure ODK Aggregate servers. Blank ODK forms were then accessed by field teams on their android tablets to be filled in during data collection in each country. Completed forms were saved on the tablets until uploaded to the ODK Aggregate server at the end of each working day. Multiple challenges were encountered and met across settings.

Conclusions: ODK is an effective and efficient platform for collecting large amounts of data across different geographical sites in a relatively short period of time under a range of field challenges. Data thus collected were of high quality, with minimal effort required for data cleaning and management. Using ODK also allowed for rapid, real-time updates to data collection tools based on feedback from enumerator training and first few days of data collection in each country. Strong training, supervision and real-time international coordination was key to maximizing the potential and flexibility of ODK platforms for complex and large scale evaluations in low-income settings.

Keywords: harmonization of data collection, maternal and child nutrition, nutrition intervention program, ODK, multi-country

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144/1913

PARATHYROID HORMONE AND FETAL LENGTH IN A PREGNANCY COHORT IN DHAKA, BANGLADESH

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Background and objectives: The prevalence of fetal growth restriction remains high throughout South Asia, but the causes remain unclear. An important measure of fetal skeletal growth is birth length, which has been associated with psycho-motor development and postnatal length gain. Maternal parathyroid hormone (PTH) is a potential modifiable factor that may be a marker of fetal skeletal growth. PTH is a peptide hormone important in regulating calcium homeostasis, mineral metabolism, and bone turnover. In the present study, we aimed to investigate the association of maternal parathyroid hormone (PTH) with infant length at birth in a pregnancy cohort in Dhaka, Bangladesh.

Methods: This was a cross-sectional study using mother-infant data and biospecimens obtained at birth from a subset of participants (n=519) enrolled in the Maternal Vitamin D for Infant Growth (MDIG) trial, a dose-ranging prenatal vitamin D supplementation trial in Dhaka, Bangladesh. Infant anthropometry was collected within 48 hours of birth. Laboratory analyses were performed to estimate concentrations of maternal serum 25-hydroxyvitamin D and maternal plasma PTH, magnesium, FGF23, and CRP at delivery. We derived relative maternal calcium intake using a limited food frequency questionnaire. The primary outcome was newborn length-for-gestational-age z-scores (LAZ). Secondary outcomes included other newborn anthropometric indices. Statistical analyses were performed using multivariable linear regression models.

Results: At delivery, median maternal perinatal PTH concentration was 3.20 pmol/L (IQR: 1.94-4.80). Mean infant LAZ

at birth was -0.89 (SD=0.99). The associations between maternal PTH concentrations at delivery and infant LAZ as well as other anthropometric indices will be presented.

Conclusions: The association of perinatal PTH concentrations and infant anthropometric indices at birth will be summarized. The significance of the findings, including the potential role of PTH as a marker of fetal growth restriction and maternal nutrition status will be discussed.

Keywords: Parathyroid hormone, pregnancy, fetal growth restriction, skeletal growth

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144/1930

METHODS FOR RIGOROUS IN-HOME OBSERVATION CONDUCTED DURING A FOOD AID COST-EFFECTIVENESS TRIAL IN BURKINA FASO

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Background and objectives: To satisfy the need for direct assessments of feeding behaviors, in-home observation methods are gaining in use in global health and nutrition research. Bolstering existing methodological literature, we describe an approach to in-home observation aimed at understanding food preparation and feeding practices during a study comparing the cost-effectiveness of food aid in Burkina Faso.

Methods: From November 2014 to October 2016, we conducted four consecutive days of non-participant observations in randomly selected households of project beneficiary children receiving one of four foods in a supplementary feeding programme. Female observers surveyed beneficiary children aged 6-23 months, using a pre-coded grid in 30-minute time increments from 06:00 to 18:00 to record feeding and hygiene practices linked with product use. Qualitative notes were taken on events related to childcare, health and feeding. Post-observation, observers collected self-reported data on feeding practices by administering structured in-depth surveys to each household. The protocol was designed to minimize any Hawthorne effect. Village leaders were informed of observations, and consent was obtained from households. Family members were instructed to ignore the presence of the observer. Observers first spent a day in each household without taking notes to habituate their presence, and lodged elsewhere to reduce influence on normal practices.

Results: A total of 209 of the 224 selected households were observed; one household refused observation. Challenges included ensuring that observer presence did not noticeably influence practices, place undue burden on families, or induce social desirability bias. Additionally, it was challenging to create instruments that allowed efficient collection, entry and analysis of data. Advantages to conducting multi-day consecutive observations were habituation of the observed household to the presence of the observer, thoroughness and objectiveness of data, accurate time tracking of beneficiary opportunity costs, and validating reported versus observed behaviors. Observers report that acclimatization after multiple days may reduce social desirability bias, and that village leader buy-in was essential.

Conclusions: Multi-day in-home observations can provide rigorous data on observed food preparation and feeding practices and reduce the Hawthorne effect. Techniques, including using tablets, which may streamline data collection, should be further refined to address noted challenges.

Keywords: Food Aid, Observation, Supplementary Feeding, Stunting, Wasting

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144/1956

CLASSIFICATION OF FOODS INTO FOOD GROUPS IN THE DIETSYS DATABASE

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Background and objectives: The DietSys is a diet-data processing system for research that incorporates an international food database to maximize and improve the accuracy of diet-data assessment across countries. However, while using an international database it is difficult to locate a particular food due to the large number of items. This difficulty can be mitigated by classifying food items into food groups. This study aimed to describe the classification of foods into food groups in the DietSys database.

Methods: Three food composition tables were merged: the Argentinean food composition table (Argenfoods), the Brazilian food composition table (TACO), and the U.S. Department of Agriculture - Agricultural Research Service (USDA). Food items were classified into 21 food groups: Alcoholic beverages; Non-alcoholic beverages; Cereal and derivatives; Condiments and sauces;

Egg products; Fats and oils; Finfish and shellfish products; Fruits and derivatives; Infant formula & baby food; Legumes and derivatives; Meats and derivatives; Milk and Dairy; Miscellaneous; Mixed dishes; Nuts and seed products; Other; Sugars; Sausages and luncheon meats; Snacks and sweets; Soy products; Vegetables, leafy greens and derivatives.

Results: The DietSys database comprised 9851 food items; 4.7% (465 items) from Argenfoods, 6.1% (597 items) from TACO, and 89.2% (8789) from USDA. Food items from Argenfoods fell within 15 of the 21 food groups, with 21.7% categorized as finfish and shellfish products and 20.6% as milk and dairy. From TACO, 26% of food items belonged to miscellaneous, 19% to fruits and derivatives, and 4.6% to meats and derivatives. Of the 9851 food items in the DietSys database, the USDA accounted for 91% of meats and derivatives (N=2060), 96.8% of mixed dishes (1194 items) and 95.9% of snacks and sweets (N=1205 items).

Conclusions: The DietSys incorporates a comprehensive database making it feasible to assess diet-data from Argentina, Brazil, and the United States. Classifying foods into food groups expedited and facilitated the search for food items in the large database of the Dietsys system.

Keywords: DietSys, DietSys database, food groups database, food groups

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144/2008

EFFECTS OF THE STIMULATION WITH DIFFERENT MIXES OF MONO, SATURATED AND POLYUNSATURATED FATTY ACIDS ON HEPATIC CELLS

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Background and objectives: The rate of hepatic disease has increased worldwide over a decade. One of the causes may be the high intake of saturated fatty acids (SFA). These fatty acids acid have been considered as lipotoxic for hepatic cells, induce insulin resistance, inflammation and endoplasmic reticulum stress. Furthermore, oleic and omega 3 polyunsaturated fatty acids may revert the effects of SFA. However, the effect of mixtures of fatty acids that resemble their proportion and concentration in human plasma has not been tested. The purpose of this study is to evaluate the effect of the exposure to two mixtures of fatty acids similar to those found in plasma of subjects exposed to a diet rich in SFA and to a Mediterranean diet, on cultured HepG2 cells.

Methods: Cultured HepG2 cells were incubated with Mix 1 (67% saturated, 26% monounsaturated, and 6.5% polyunsaturated) or Mix 2 (55% saturated, 28% monounsaturated and 14.5% polyunsaturated), for 24 h and control. Three different concentrations were tested (100, 200 and 400 µM). Triglyceride accumulation, markers for apoptosis, inflammation and proteins of the insulin signaling cascade were tested using Oil red, immunofluorescence and Western blot, respectively.

Results: Both mixes induced apoptosis at 400 µM concentration as compared with lower concentrations. Mix 1 induced macrovesicular steatosis and Mix 2 treatment induced microvesicular steatosis. Higher expression of IL-6, IL-17 and IL-8 and lower expression of Akt protein found in Mix 1 as compared with Mix 2.

Conclusions: The results suggest that the mixture of fatty acids associated with the consumption of Mediterranean diet induced less inflammation, apoptosis, insulin resistance and macrovesicular steatosis than a mixture with higher content of SFA in hepatic cells.

Keywords: Fatty acids, hepatic cells, inflammation, steatosis.

144/2013

NUTRIENT INTAKE, APPETITE SENSATION AND GASTRIC PATHOLOGY IN HELICOBACTER PYLORI INFECTED PATIENTS BEFORE AND AFTER ERRADICATION

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Background and objectives: H. pylori could be involved in apetite regulation. Our study aimed to evaluate the nutritional anthropometric status, the appetite sensation and nutrient intake and the gastric pathology in patients before and after H. pylori erradication.

Methods: Dispeptic adults referred for an upper gastrointestinal endoscopy were enrolled. We assessed weight and height for body mass index determination. Nutrient intake was evaluated by 24-hour recalls and appetite sensation by a validated questionnaire (SNAQ). We obtained biopsies for gastric pathology analysis. Infected patients returned for control 12 weeks after eradication therapy. During the control we evaluated the same variables as in the first appointment. We used the proportion test and the Wilcoxon Signed Rank Test to perform statistical analysis.

Results: 117 patients (43.2±12.8y), 66.7% females (CI95%; 57.7-74.5), were included in this study. H. pylori infection preva-

lence was 69.0% (CI95%; 60.0–76.6%). In this population, 25.9% had low/normal weight, 48.3% overweight and 25.9% obesity, with no statistically significant differences between H. pylori positive and negative patients (P = 0.63). We administered eradication therapy to 80 patients. From 31 who have returned for control until now, 18 eradicated the infection (eradication rate 58.1%). We did not find statistically significant differences in the nutritional anthropometric status of the patients before and after eradication (27.7% normal-weight and 72.3% overweight/obesity pre-eradication, vs. 33.3% normal-weight, 66.7% overweight/obesity post-eradication, P=0.11). In addition, dietary intake of the patients did not differ pre- and post-eradication, either [energy (P=0.84), carbohydrates (P=0.87), protein (P=0.77) and fat (P=0.43)]. Results: **Conclusions:** Although dietary and anthropometric nutritional status did not differ before and after H. pylori eradication, a tendency towards an appetite sensation increase was observed after H. pylori cure that would be related to an improvement of gastric pathology of the patients.

Keywords: Nutritional status, appetite sensation, H. pylori, eradication treatment, gastric pathology.

144/2022

BREASTFEEDING PRACTICES AND CHALLENGES EXPERIENCED BY LOW-INCOME WOMEN WORKING IN AN AGRICULTURAL ESTATE IN KENYA IN COMBINING WORK WITH BREASTFEEDING AND CHILDCARE

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Background and objectives: Optimal breastfeeding and childcare in the early life are critical for child growth and development, and eventually for achievement of sustainable development. Work environment is particularly important for optimal breastfeeding and childcare in sub-Saharan Africa as over 60% of women of reproductive age are in the workforce, majority in the agricultural sector. The main objective of this study is to establish the role of work on breastfeeding and childcare practices, and child nutritional status of children of low-income women working in the agricultural sector in Kenya; and views on potential feasibility of a workplace support initiative.

Methods: The study involved a baseline survey in an agricultural setting in Kenya using mixed methods approach involving qualitative, quantitative and participatory approaches (photovoice and participatory video). The Baseline quantitative data collection involved 645 women of reproductive age (15-49 years) with children up to 12 months and 139 managers and supervisors. Qualitative data was collected through 69 group and individual discussions, four photovoice sessions and three participatory videos. The purpose of the qualitative studies was to establish views on work environment including policies and practices. Descriptive analysis of quantitative data was done in STATA software while qualitative interviews were recorded, transcribed verbatim, coded using NVIVO and analysed thematically.

Results: Results indicate poor infant feeding and childcare practices with less than a quarter of children under six months (23%) being exclusively breastfed. Workplaces were not fully supportive to enable women to successfully combine work with breastfeeding and childcare. Narratives indicate that breastfeeding limits attainment of expected performance, hence mothers may forego breastfeeding in order to achieve the targets. Mothers also reported limited viable child care options after maternity leave as one of the barriers to exclusive breastfeeding when they resume work.

Conclusions: The imperative of consolidating women's workforce participation in order to secure a demographic dividend in sub-Saharan Africa underscore an urgent need for effective solutions that enable women to successfully combine work with breastfeeding and childcare. It is expected that the learning from this research will inform workplace support initiatives in Kenya and beyond.

Keywords: Workplace support, child care options, breastfeeding, working breastfeeding mothers

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144/2077

NUTRIENT-PROFILING ANALYSIS IN PACKAGED FOODS AND BEVERAGES WITH VOLUNTARY FORTIFICATION IN CENTRAL AMERICA AND DOMINICAN REPUBLIC, 2015-2016

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Background and objectives: Voluntary fortification with micronutrients in packaged foods and beverages is growing as a marketing strategy used by food corporations. Consumption of these foods and beverages is increasing worldwide and potential links relate their intake with risk factors of non-communicable diseases. Critical nutrients added in excess may affect the human health. To our knowledge this is the first study performed combining data at regional level. This study aims to examine the nutrient profile of fortified packaged foods and beverages.

Methods: This study was carried-out in Central American countries and Dominican Republic. The nutritional content was obtained from the nutritional label and it was registered in an electronic platform. A convenience sampling technique was performed during 2015-2016. Foods groups were arranged based on the Central American food composition table. Macro and micronutrient information were determined and adequacy assessed for children less than two years old and for women of reproductive age. The WHO nutrient profile modelling was used to assess critical nutrient on each packaged food and beverage. The NutrINCAP 1.0 software was used to determine the nutrient content and Stata 14.0 for analysis. Descriptive and statistical inferences were determined. P-value < 0.05 is considered as significant.

Results: Based on INCAP's dietary recommendations from Central America, a considerable proportion of fortified foods and beverages showed adequacy levels of nutrient in children and women of reproductive age above the established recommendation. Some essential nutrients found in excess were vitamin A, zinc, folic acid, iron among other. Foods and beverages were highly energy dense reporting excess of more than one-third of the energy required in children and adults. Dehydrated soups reported the highest sodium energy density in our sample.

Conclusions: The packaged foods and beverages sample with voluntary fortification reported excess of nutrients added. Sodium was found in excess in several packaged foods and beverages. In contexts where nutritional deficiencies and nutritional excess coexist, our findings support the need for regulatory instruments regarding the level of fortified nutrient added in packaged foods and beverages.

Keywords: packaged foods and beverages, fortification, micronutrient

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144/2089

GETTING THE FOOD LIST "RIGHT": AN APPROACH FOR THE DEVELOPMENT OF A COMPREHENSIVE FOOD LIST FOR HOUSEHOLD FOOD CONSUMPTION SURVEYS

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Background and objectives: Due to under-investment in individual dietary data in many LMICs, detailed knowledge about dietary patterns is currently lacking. In an effort to fill this gap, researchers have turned to household consumption and expenditure surveys (HCES). However many HCES consumption modules do not capture sufficient detail in their food list. The objective of this paper was to use methods from nutritional epidemiology to demonstrate how quantitative 24-hour recall data can be used to generate a food list for HCES that can capture a comprehensive picture of nutrient intake.

Methods: The study analyzed dietary data from a large-scale, representative survey of rural Bangladesh. Four sequential steps commonly used in nutritional epidemiology for development of food frequency questionnaires were followed. First, similar foods were grouped; second a contribution analysis was conducted; third, stepwise regression was carried out; and finally, based on the results from the previous steps, a comprehensive food list was created.

Results: A total of 296 individual foods were grouped into 76 similar food categories and ranked based on the percent contribution of each food to total intake of pre-selected nutritional components (energy, protein, fat, calcium, iron, zinc, vitamin A). Results: **Conclusions:** This study illustrated a relatively straightforward method for developing a country-specific food list that can be used for HCES. Replicating these steps in other contexts depends on the availability of existing 24-hour dietary recall data and a sufficiently detailed food composition table to allow for accurate food to nutrient matches.

Keywords: Food list development; household consumption and expenditure surveys (HCES); food consumption data; method for food frequency questionnaire development

144/2090

MICRONUTRIENT STATUS OF STUDENTS ENROLLED IN RURAL MOROCCO

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Background and objectives: Micronutrient deficiencies are a public health problem in Morocco. The aim of this study is to evaluate the mineral and vitamin status of children enrolled in a rural area in Kingdom of Morocco

Methods: The study involved a sample of 152 randomized school-aged children (7 to 9 years), from rural schools in the province of Azilal. The collected data were analyzed by the Nutrilog software integrating the Moroccan table of food composition and were subjected to a statistical analysis by the software SPSS version 2.1.

Results: The main results of this study showed that the Iron intakes are insufficient in more than 33% of children, Iodine and Zinc intakes are insufficient in more than 90% of children, Magnesium and Potassium intakes are insufficient in more than 50% of children whereas the excess of sodium is barely perceptible at 0.7%. The calcium, vitamin D and vitamin A intakes are are insufficient in more than 80% of children

Conclusions: The eating habits of the study population are highly unbalanced. The results of this study suggest strengthening school feeding program and nutrition awareness activities for children, teachers and parents.

Keywords: Vitamins. Minerals. School children, Intake.

144/2105

COCHLEAR HOMOCYSTEINE METABOLISM AND RELATED PATHWAYS IN THE BHMT -/- MOUSE

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Background and objectives: Background: Age-related hearing loss (ARHL) is one of the most common causes of disability in older people, affecting 1/3 of the population over 65-yr. Epidemiological studies have shown correlations among the nutritional condition, increased plasma homocysteine (Hcy) and HL, suggesting that nutritional supplementation may be beneficial. Accordingly, rodent experimental models have provided the molecular basis to understand the observed effects.

Objectives: Analyze the relevance of BHMT in the cochlea using Bhmt-/- mice, whose dependence on the metabolism of folate for the remetilacion of Hcy is greater, in the development of hearing loss and study of the contribution to gene silencing to damage by noise, and the influence of this genetic background on the effects by noise.

Methods: Three-month-old Bhmt-/- mice were used to determine hearing loss after exposure to noise.

Results: We present results showing that: 1) 3 month-old mice with Bhmt gene deleted present higher threshold shift after noise exposure; 2) an increase of plasma Hcy in knockout mice respect to wild type and heterozygous mice, with significant increase in total Hcy levels to 28 days of exposure to noise; 3) Noise exposure induced a significant decrease in MTR levels and a significant increase in the expression of Bhmt2 and Mtr in Bhmt gene deleted as compared to Bhmt null without exposure noise cochleae. In contrast, Bhmt-/- mice showed CBS protein levels similar to those in Bhmt+/+.

Conclusions: Our results confirm that the lack of BHMT in the cochlea alters cochlear Hcy metabolism. Deletion of BHMT makes the cochlea more sensitive to noise and expression and protein levels suggest changes in the mRNA or protein half-lives at several levels and a need to remethylate Hcy, either because of Hcy accumulation or an increased need of methionine

144/2107

MACRONUTRIENT STATUS OF CHILDREN ATTENDING RURAL MOROCCO

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Background and objectives: In Morocco, protein-energy malnutrition has virtually disappeared in pre-school children. However, there are few studies in school-aged children. The aim of this study is to assess the nutritional status of school children in a rural area in Morocco.

Methods: The study involved a sample of 152 randomized school-aged children from 7 to 9 years, recruited in Azilal province in kingdom of Morocco. The data collected were processed by WHO Anthro and the Nutrilog software on the basis of the Moroccan food composition table and were subjected to statistical analysis by the SPSS software version 2.1.

Results: The main results of this study show that emaciation measured by the BMI / A (Body Mass index for age) indicator ($\leq$-2SD standard deviation) according to WHO standards reaches 0.7%, the mean energy intake Daily per person is 1513 $\pm$ 35 Kcal with a prevalence of insufficient daily energy intake of 56% (below the recommended nutritional intake which is 1912Kcal). These daily caloric intakes come from 55% carbohydrates, 32% lipids and 13% protein

Conclusions: This study among school-aged children living in Moroccan rural area shows that the dietary intake are lower than those recommended for this category of the population. This situation requires a sound policy in nutrition education.

Keywords: School children.Carbohydrate.lipid.protein intake.

144/2163

GLOBAL COMPARISON OF NATIONAL INDIVIDUAL FOOD CONSUMPTION SURVEYS AS A BASIS FOR HEALTH RESEARCH AND INTEGRATION IN NATIONAL HEALTH SURVEILLANCE PROGRAMS

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Background and objectives: Individual food consumption surveys (IFCS) are performed in many countries and are intended to evaluate compliance with nutrient intake requirements or exposure to potential harmful dietary contaminants/components, or to develop food based dietary guidelines. Such data could potentially be used for investigating associations between dietary factors and disease outcomes. This review aims at inventoring methods and designs used in national IFCS and discusses the methodologies applied across countries and continents. We further evaluated the potential for embedding IFCS in national health surveys.

Methods: Literature searches were performed using fixed sets of search terms in different databases. The inventory was completed with all accessible information from retrieved publications. Surveys from individual countries, originating from different continents are listed in the inventory.

Results: We identified IFCS in 39 countries from six world continents. National IFCS systems are available in most of the high-income countries/continents, while such surveys are scarce in low- and middle-income countries. Few countries (n=9) have their national IFCS incorporated into national health and nutrition examination surveys, allowing the investigation of dietary-related disease outcomes. Most of these integrated surveys have the advantage of being continuous/regular in contrary to the other IFCS that are mostly erratic.

Conclusions: This review serves as the basis to define gaps and needs in IFCS worldwide and will help in defining priorities for resource allocation. In addition it can serve as an inspiration source for countries that do not have a IFCS system in place yet and advocates for national IFCS to be incorporated into national health and nutrition examination surveys in order to create (1) more research opportunities for investigating diet-disease relationships and (2) a frame to evaluate the effect of diet-related policies (e.g. promotion of local nutrient rich foods) and of nutrition recommendations such as food based dietary guidelines. The countries that integrat-

ed their IFCS within their National Health and Nutrition examination survey can serve as proof of principle for other countries.

Keywords: Dietary surveillance, Health surveys, Food consumption surveys

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144/2252

COMPREHENSIVE PHENOTYPIC ANALYSIS OF LIVER HEPATOCYTE-SPECIFIC PHGDH DEFICIENT MICE

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Background and objectives: L-Serine (Ser), a non-essential amino acid, is synthesized from 3-phosphoglycerate via the phosphorylated pathway composed of phosphoglycerate dehydrogenase (Phgdh), phosphoserine aminotransferase 1 (Psat1) and phosphoserine phosphatese (Psph). Ser is an important metabolic component as a precursor of various biological components such as glycine, nucleotide, glutathione and sphingolipids. We have investigated the physiological role for de novo Ser synthesis using mice and fibroblasts deficient in Phgdh. Our in vivo study revealed that the targeted disruption of Phgdh resulted in embryonic lethality associated with overall growth retardation, indicating that de novo Ser synthesis via the phosphorylated pathway is indispensable for embryonic growth and survival.

Methods: In the present study, to clarify the physiological significance of de novo Ser synthesis in liver, we generated the liver hepatocyte-specific Phgdh KO (LKO) mice using albumin-Cre transgene.

Results: LKO mice were born normally and fertile. Although the expression levels of Phgdh mRNA and protein were reduced significantly in the liver, free Ser level was not decreased in the liver and serum compared to those of Floxed control mice. On the other hand, in the kidney and muscle, free Ser level were raised significantly in LKO, which was associated with increased expression of Phgdh.

These observations suggest that the loss of Phgdh in the hepatocytes was compensated by activating the synthesis of Ser in the kidney and muscle. In addition, the body weight of LKO mice were significantly increased compared to control after 23 weeks old. Further, the systemic glucose metabolism was impaired in LKO mice.

Conclusions: These findings suggested that the Phgdh-dependent de novo Ser synthesis in the liver contributes to the maintenance of systemic glucose and energy metabolism. The underlying molecular mechanism is currently under investigation.

Keywords: Serine, Phgdh, LIver, metabolic regulation

144/2343

MATERNAL SUPPLEMENTATION OF AMINO ACIDS FOR BEST FETAL OUTCOMES

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Background and objectives: Background-India has the highest number of children with birth defects. Congenital anomalies affect approximately 2-3 per 100 children across the world. In India, 1 in 33 infants are born with birth defects resulting in approximately 3.2 million birth defect-related disabilities every year (Various data bases). Supplementing nutrients to observe the long term effects helps to look at fetal growth in progress during pregnancy and thereby role of Nutrigenomics.

Objective of the study was to observe the impact of supplementation of amino acids 8-10grams a day to meet 1/3rd RDA, to the deficient mothers and observe the changes occurring biochemically. Mass spectroscopy was carried out for assessments.

Methods: Mass Spectroscopy- Amino acid profiles, Acyl transporters, Carnitine transporters

Results: Results revealed 27% mothers had IUGR, 37% had Anemia and 17% were at risk of pre-term deliveries; on US scan 14% babies had low fetal heart rate. The various amino acids and transport systems, Acylcarnitines were quantified from the blood samples obtained from the mother by Mass spectroscopy showed a prevalence of both amino acid and acyl-carnitine deficiency in the mothers with 43.33% of the pregnant mothers were deficient with amino acid profiles, 40% of the mothers were deficient in the various markers of the acyl-carnitine panel; 16.66% of the mothers were deficient in both amino acids and acyl-carnitine panel

Conclusions: Conclusion-The affected pathways may cause physiological disturbances in the body of the mother and hence also will influence the fetal growth. Moreover the child is also at risk of inheriting the defect and it may be expressed in its phenotype. It was indicative of the prevalence of some defect in the enzyme or other transport proteins; hence supplementation of amino acids may lead to some rectification at the gene level which could help the child to lead a quality life free of disease.

Keywords: Key words- Maternal nutrition, inborn errors, Metabolomes, Nutrigenomics

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144/2350

ASSOCIATION OF FTO AND APELIN GENE EXPRESSION WITH DIETARY GLYCEMIC INDEX AND GLYCEMIC LOAD AMONG MORBID OBESE AND NON-OBESE SUBJECTS

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Background and objectives: To investigate the association between the apelin and FTO gene expression in adipose tissue and dietary glycemic index (GI) and glycemic load (GL) among non-diabetic morbid obese and non-obese subjects.

Methods: Visceral and subcutaneous adipose tissues were obtained from 32 morbidly obese and 32 age- and sex-matched non-obese subjects, who underwent open abdominal surgery. All of the subjects are free of diabetes and cancers and without using anti-lipid medication. Usual dietary intake during the previous year was measured using a validated semi-quantitative food frequency questionnaire. Dietary GI and GL were calculated using International Tables of Glycemic Index and Glycemic Load Values (2008). The gene expressions of apelin and FTO in visceral and subcutaneous adipose tissue were assessed by Real-Time PCR.

Results: The mean age was 39.6 years for both groups and body mass index for morbidly obese and non-obese subjects was 45.3 and 25.6 kg/m2, respectively. Apelin gene expression in visceral adipose tissue was correlated with dietary GI (r=0.455, P=0.009) and GL (r= 0.445, P=0.011) among non-obese subjects and, with GL (r= 0.351, P=0.049) among morbid obese subjects. Apelin gene expression in subcutaneous adipose tissue was correlated with GI among morbid obese(r= 0.395, P=0.025) and non-obese (r= 0.571, P=0.001) subjects. Moreover, we found significant correlations between apelin concentration and dietary GI among morbid obese (r=0.388, P=0.028) and non-obese (r=0.566, P=0.001) subjects. In addition, a positive correlation was observed between dietary GL and apelin concentration among non-obese subjects (r= 0.420, P=0.026). There were no significant findings between FTO gene expression and dietary GI and GL.

Conclusions: It seems that the apelin concentration and mRNA expression have positive correlation with dietary GL and GI among morbid obese and non-obese subjects; suggesting an important role for insulin pathways in the regulation of apelin expression.

Keywords: apelin; FTO; gene expression; glycemic index; glycemic load

Further collaborators: The authors would like to thank Dr Mohammad-Reza Ebrahimi for surgical procedures.

144/2382

DISTINCTIVE EFFECTS OF ISOCALORIC DIETS WITH DIFFERENT CARBOHYDRATE TO FAT RATIO ON PHENOTYPIC FLEXIBILITY: A RANDOMIZED, CROSSOVER STUDY

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Background and objectives: Acute and long term consumption of either high fat or high carbohydrate diet has several consequences on general metabolic disturbances (Silva FM et al. 2015; Qian F et al. 2016). Well-orchestrated physiological machinery maintains organisms' homeostasis which able to adapt continuously changing environment in which food and lifestyle play a major role. However, this so called 'phenotypic flexibility' has limited capacity and will shift soon towards 'phenotypic inflexibility' as the chronic stress condition present (van Ommen B et al. 2014). In the present study we aimed to investigate distinctive effects of breakfast with distinct carbohydrate and fat proportion on phenotypic flexibility indicated by genes and pathways involved in acute intervention.

Methods: This study was a randomized, single-blind, placebo-controlled crossover study. Twelve subjects (5 males and 7 females) aged 26.5±1.06 years with BMI: 23.79±0.63 kg/m^2 years fall in inclusion criteria were admitted to the study. Blood samples for peripheral blood mononuclear cells (PBMC's) isolation were collected at 0 and 4h after breakfast challenge. Illumina Human-HT-12 v4 Expression BeadChip Kit microarray was used for gene expression and data were processed for downstream analysis using R Bioconductor. Pathways analysis was conducted using PathVisio.

Results: After annotation, normalization and data filtering, amount of 106 (P<0.001), 482 (P<0.01) and 1668 (P<0.05) genes in PBMC's were significantly regulated in medium fat challenge (4h vs 0h). On the other hand, high fat challenge (4h vs 0h) resulted in modulation of 73 (P<0.001), 340 (P<0.01) and 1272 (P<0.05) genes postprandially.

Conclusions: We concluded that an acute high fat or carbohydrate breakfast challenge affects 'phenotypic flexibility' as indicated by involvements of some pathways such as inflammatory and fat metabolism pathways.

Keywords: PBMC's. high and medium fat breakfast. phenotypic flexibility. pathways analysis.

Further collaborators:

References:
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A RETROSPECTIVE OBSERVATIONAL STUDY OF MAXIMAL ENTERAL NUTRITION RATES IN A BURN PATIENT POPULATION

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Background and objectives: The objective of this retrospective observational study was to establish if there was a maximum enteral feeding flow rate (MAX) that burn patients could tolerate in order to meet caloric needs during the time enteral nutrition (EN) is provided, working around frequent interruptions in EN. This study examined the hourly MAX rate received by each subject and evaluated outcomes and tolerance in an effort to determine if there is a threshold for the MAX rate. Demographics, treatment, and outcomes data were collected during the MAX rate that each subject received and were analyzed with descriptive and comparative statistics. The gastrointestinal (GI) intolerance data examined included emesis, residuals ≥500 mL, aspiration, ≥1L stool output in 24 hours, and necrotic bowel during or after MAX rate. IRB approval was obtained.

Methods: This study was conducted on an adult population admitted to a major burn center during a three year period who received EN and had ≥20% total body surface area (TBSA) burned requiring excision.

Results: Data were collected on 151 subjects with 48% ± 18% TBSA burn who were 33 ± 14 years old and met the inclusion criteria. The average MAX rate ordered and received was 154 ± 45 mL/hr. The factors that predicted mortality in this study were burn size

(p = <0.001), age (p = < .001), and the total number of GI intolerance symptoms per subject during the MAX rate (p = .011). The MAX rate had a weak correlation with mortality and with any individual type of GI intolerance (all R2 <.05). MAX rate also had a poor correlation with the total number of GI intolerance symptoms per subject during MAX rate (R2 = .01).

Conclusions: The total number of GI intolerance symptoms experienced per subject was a predictor of mortality, but the MAX rate was not associated with increased GI intolerance symptoms. The highest MAX rate without experiencing any GI intolerance symptoms was 255 mL/hr, however, there was no strong correlation between increase in MAX rate and incidence of negative outcomes, therefore a definitive MAX rate was not established.

Keywords: Enteral nutrition, burn, enteral intolerance, enteral rate

DIFFERENCE BETWEEN "VISCOSITY IN PHYSICS" AND VISCOSITY USED IN FOOD PROPERTIES OF INTESTINAL CONTENTS

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Background and objectives: Properties of viscosity of intestinal contents in pigs, chicken and rats were similar to those of fresh concrete (Takahashi et al Nutrition 2004). Properties of viscosity of fresh concrete have been studied in physics for long time, and would be one of a good example for understanding "viscosity in physics". Textbooks of physics said that main modulators of viscosity in fresh concrete are sand and stone. "Viscosity in physics" is defined as a fluid's internal resistance to flow. Sand and stone increase resistance against flow and increase "viscosity in physics" of fresh concrete. However, sand and stone don't increase viscosity used in food properties because of no sticky property. Thus, there should be differences between "viscosity in physics" and viscosity used in food properties. The present study shows differences of "viscosity in physics" and viscosity used in food properties using intestinal contents of animals. We also discussed applications of "viscosity in physics" in the intestine to understand physiology of intestine.

Methods: Viscosities of small intestinal and/or cecal contents with solid particles in rats, pig, and chicken were measured for "viscosity in physics". Viscosity of supernatant of cecal contents was measured for viscosity used in food properties.

Results: Range of "viscosity in physics" of small intestinal and cecal contents in rats, pig, and chicken was between 1 and 200 pa·s at a shear rate of 1s-1. Viscosity used in food properties of pig cecal contents (0.0015 pa·s) was 800 times smaller than "viscosity in physics" of pig cecal contents at 1 s-1. Thus, "viscosity in physics" would differ from viscosity used in food properties. "Viscosity in physics" can simulate flow behavior in intestine when contractions occur, and show behavior of nutrients in the lumen of the intestine, because of existence of equations, laws and theorems in physics.

Conclusions: "Viscosity in physics" can explain some phenomena in physiology in the intestine. However, viscosity used in food properties cannot translate to term of physics. Thus, viscosity used in food properties would not explain phenomena in intestine using equations, laws and theorems in physics.

Keywords: "viscosity in physics", digesta, intestine, animals

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THE BODY COMPOSITION AND FAT DISTRIBUTION EFFECT ON BODY MINERAL DENSITY AND BONE METABOLISM BIOMARKERS OF PERIMENOPAUSAL WOMEN. PILOT STUDY

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Background and objectives: Introduction: Bone turnover markers (BTMs) are widely used for the management of osteoporosis, and the perimenopausal women are the group where bone and fat metabolism (FM) is changing. Information about mutual relationship between BTM and FM is limited.

Objectives: The aim of this study was to asses relation between body mineral density (BMD), BTMs, fat percentage (FM%) and fat distribution in the group of perimenopausal women.

Methods: Method/Design: The study involved 52 women aged 47-56 years, BMI 24,2 kg/m2. BMD, Serum 25(OH)D3, bone turnover markers sP1NP, BcrossLabs sCTX and body composition, fat distribution included VAT (visceral adipose tissue) were examined. Biochemical markers were tested using routine laboratory methods. Fat mass, and bone mineral density were evaluated with dual-energy X-ray absorptiometry.

Results: Healthy, normal weight (BMI 24,2kg/m2; FM%: 37,7%) perimenopausal women were characterized by low serum 25(OH)D3 (28.19 ng/ml ± 7,21), normal bone mineralization (1,14 g/cm3 ± 0,10). T-score: 0,60 (-1,44 to 2,87), Z-score: 0,83 (-1,13 to 2,38). 6% of women presented T-score < -1.Level of the bone resorption marker β-CTX in the studied group was 0,190 ng/ml. We found correlation between sP1NP and VAT (r=-0,28; p<0,05). Additionally 5% presented sP1NP values <27,7 ng/ml.

Conclusions: Conclusion: Regular monitoring of bone markers included body fat distribution seems to be necessary in these patients and the early introduction of preventive strategies should be evaluated. Diet related behaviours should be analyzed in further studies.

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Keywords: Bone turnover markers, body composition, visceral fat, T-score, perimenopausal women.

144/2477

THE "COST" OF COSTING NUTRITION INTERVENTIONS: A CASE STUDY IN RURAL UGANDA

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Background and objectives: While the importance of costing nutrition interventions is recognized for budgetary and planning purposes at both programmatic and national levels, resources allocation poses a challenge to organizations wanting to allocate resources to cost their programs. This micronutrient powder (MNP) cost study in Uganda highlights two key challenges and presents modifications to the cost data collection where the research methodology was scaled back due to resource constraints. We use various programmatic elements of this costing study as a guide to construct both ideal and minimum data collection scenarios for some key cost components and give corresponding resource estimates for each.

Methods: Using the Activity-Based Costing methodology (ABC), we conducted a total cost and cost-effectiveness study comparing two distinct MNP distribution arms in Namutumba, Uganda. To collect direct cost data on the prices and quantities of all inputs into the MNP intervention, program staff filled in spreadsheets on program activity costs corresponding to the activities for which they were responsible. Indirect costs were captured through a series of time allocation surveys with various stakeholders involved in MNP distribution.

Results: The time-consuming collection of time allocation data proved a challenge to data quality. Ideal time-and-motion studies were scaled back to individual and group interviews by two part time enumerators, striking a balance between maintaining sample size and limiting measurement error. Program staff should collect program activity cost data as activities are being carried out, to avoid errors due to long recall periods and incomplete records. The tradeoff here is managing resources to infer some smaller costs and spend more resources accurately measuring big cost drivers.

Conclusions: Cost studies, while expensive to conduct, are vital contributions to the process of translating research into evidence-based policy. The tradeoffs provided in this case study provide some pitfalls to avoid when costing nutritional interventions while remaining compatible with the larger initiative to standardize costing across programs and sectors. For programs that undertake cost studies for nutritional interventions with limited resources, identification of the big program cost drivers and the big cost study costs, will help in adjusting the scope and level of detail of a costing study.

Keywords: Micronutrient powder, Cost Study, Cost-Effectiveness Study

144/2494

SLEEP, ANXIETY AND MOOD PROFILE BEFORE A MILITARY PHYSICAL APTITUDE TEST

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Background and objectives: Reduced sleep duration or impaired sleep quality are common conditions before important sport events and precompetitive anxiety is one of the main factors which affect sleep. The aim of this study was to assess sleep, anxiety and mood profile of military personnel before a Physical Aptitude Test (PAT), which evaluates whether physical performance is reached and/or maintained for purposes of fitness sufficiency assessment, and the score is considered for the military career.

Methods: Ten males, 31.4(8.3) years old, physically active, serving the Brazilian Army completed a sleep diary for six pre-PAT nights (N1 to N6), where N1-N5 were called "pre-PAT week"-PPW, and N6 "pre-PAT night"-PPN. The Sleep Quality Index of Pittsburgh-PSQI assessed their usual sleep quality on PPW. To analyze anxiety and mood, subjects answered the Brunel Mood Scale, and the short versions of the Competitive State Anxiety Inventory-CSAI-2R, and of the State-Trait Anxiety Inventory on PPN. To assess sleepiness, they answered the Epworth Sleepiness Scale on PAT morning.

Results: On the PPN participants presented state-anxiety of 11.8(2.7) and trait-anxiety of 14.9(2.7). The CSAI-2R mean scores were: self-confidence: 2.5(0.7), cognitive anxiety: 1.6(0.6), and somatic anxiety: 2.0(0.9). As for mood, vigor was the higher score factor [8.2(3.7)], but individuals presented heterogeneous results. Sleep quality was low (mean PSQI 6.5). On PAT morning, subjects showed low levels of anxiety and did not present daytime sleepiness [7.4(3.8)]. Mean PPW sleep duration was significantly different from PPN: 6.6(0.7)h and 5.4(1.2)h, respectively (p=0.01) with no significant difference in subjective sleep quality [PPW: 6.3(1.4); PPN: 5.5(2.1), p=0.09] or number of awakenings [PPW: 0.8(1.6); PPN: 0.8(1.2), p=0.9]. Most subjects slept later on PPN or woke up earlier on PAT morning.

Conclusions: Both during PPW and PPN volunteers slept less than recommended (7-9h) for individuals with the same age range. Although PPN sleep duration was lower than PPW, the low score suggests that anxiety was not the cause. The levels of anxiety and mood indicated good self-control. Sleep duration was affected by PAT, but not subjective sleep quality or number of awakenings.

Keywords: sleep, anxiety, military

Conflict of Interest Disclosure: The present study was funded by FAPESP (#2014/14276-0) and CAPES.

144/2505

DETERMINATION OF FACTORS RELATED TO MALNUTRITION IN PRE-SURGICAL ONCOLOGICAL PATIENTS

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Background and objectives: During 2012 there were 14.1 million new cases of cancer, 8.2 million cancer deaths and 32.6 million people living with this type of disease. Malnutrition is the most common secondary diagnosis in cancer patients, with an incidence between 15-40% at the time of diagnosis and 80% in advanced disease; being one of the main causes of morbi-mortality.

To determine the alteration of malnutrition related factors in pre-surgical cancer patients.

Methods: Descriptive, transversal. By direct questionnaire and pre-surgical Nutrition Assessment sheets of patients who consulted from January 2015 to August 2016, where data on age, sex, cancer location, weight, percentage of weight loss were evaluated. Biochemical determinations were analyzed, being these Albumin (g / dl), Lymphocytes/mm3, Total cholesterol (mg / dl) and Hemoglobin (g / dl). The Malnutrition´s Degree Assessment by CONUT method was used to diagnose malnutrition.

Results: The total sample was 589 patients, of which 291 presented alteration related to malnutrition (49.4%), being 86.3% (n = 251) of the female sex, and 13.7% (n = 40) male; ages ranging from 18 to 90 years (mean 52.07 years). Cancer location, endometrial or cervical 45.7% (n = 133), 27.1% breast (n = 79), head and neck 8.9% (n = 26), 5.5% ovary (n = 16), 4.8% gastrointestinal tract (n = 14), remaining 7.9% (n = 29) to other cancers. According to the Malnutrition´s Degree Assessment by CONUT method, 68.4% (n = 403) showed no malnutrition, 30.2% had mild malnutrition (n = 178) and 1.3% (n = 8) moderate malnutrition. No patient presented severe malnutrition. Regarding weight loss in the last 6 months, values ranged from 1.5% to 27%, with an average value of 8.74%.

Conclusions: Malnutrition was observed in more than 30% of the patients in the pre-surgical evaluation, predisposing to an increased risk of complications and being the major cause of morbidity and mortality in advanced cancer. An assessment of nutritional status will play a fundamental role in the pathogenesis of malnutrition risk in order to establish nutritional support strategies.

Keywords: Malnutrition - Cancer – CONUT
Further collaborators: Micaela Scuri.

144/2511

THE EFFECT OF PUNICIC ACID (POMEGRAN-ATE SEED OIL) ON METALLOPROTEINASE GENES (MMP-1, 3) IN THP-1 CELLS STIMULATED WITH LPS COMPARED WITH STEROIDAL AND NON-STEROIDAL DRUGS

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Background and objectives: Osteoarthritis is a common joint disease for which there are currently no disease-modifying drugs available. Osteoarthritis (OA) affects most of the elderly population, the main features of which are cartilage damage. Degradation of the cartilage extracellular matrix is a central feature of the disease and is widely thought to be mediated by proteinases that degrade structural components of the matrix, The matrix metalloproteinases (MMPs) are a family of 23 human zinc endopeptidases that play significant roles in inflammatory diseases such az osteoarthritis.

Methods: In this experiential laboratory study. punicic acid of pomegranate seed oil was purchased from Clarodan Kerman Co, representative of LCG Co. in Iran. K562 cells (Pasteur Institute of Iran) were cultured and were administered with densities of 8 to 100 μg/ml (in 24h, 48h, and 72h). Cellular toxicity of punicic acid against K562 leukemic cells was estimated using the MTT Method, and to measure the inhibitory effects of PA on Matrix metalloproteinase proteinase activity, ELISA and Western blot, migration and invasion was performed. Data were analyzed with using T.student and ANOVA.

Results: Western blotting and ELISA were showed inhibitory effect on the expression of MMP-1 but not in MMP-3. Punicic acid of pomegranate seed oil shows the most cellular toxicity effect at lc50=50 micrograms per milliliters and 72 hours after treatment.

Conclusions: According to effect of Punicic Acid on MMP-1 expression, this material can be used as a potential candidate for further studies on the other MMPS and its replacing the chemical drugs.

Keywords: Punicic Acid, MMP-1, 3, K562, Osteoarthritis
Conflict of Interest Disclosure: Cellular nutrion
Further collaborators: Pharmacology and nutrition

144/2534

THE EFFECT OF INGESTION OF THE AMAZON DIET ON ELDERLY NEUROPSYCHIATRIC PATIENTS

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Background and objectives: Changes in the nutritional condition of the elderly may be related to the aging process and / or pathological processes. With regard to the psychological aspect of this elderly person, the manifestation of neuropsychiatric disorders may also impair good nutrition. The fact that some also present underlying diseases reinforces the need for supply and nutrient balance, which can be found in foods of native cooking. Objective: to investigate the action of the Amazon diet during the period of home care for the elderly using psychotropic drugs.

Methods: It is an observational study in loco, to determine the effect of the food intake of the Amazonian diet on the improvement of signs and symptoms of adverse reactions to the use of psychotropics, by the elderly, with moderate and high risk for fragility.

Results: Some of the foods in the Amazon diet have natural compounds that may have activity in the fight against cardiometabolic diseases, chronic non-transmissible diseases, due to its antioxidant, anti-inflammatory, cholesterol-lowering, polyphenol-rich properties. The elderly, accompanied by the Pilot Health at Home Project and who presented neuropsychiatric disorders, were cared for by a multiprofessional team and oriented to the Amazonian diet, according to the categorization of Ribeiro and Cruz (2012) in fruits, flours and fish, and Its effects on health, quality of life, optimal amount of nutrient intake. It was verified that the elderly who started to insert in their daily food the native cuisine, have reported improvement of the symptoms related to the adverse effects of the administered psychotropics. The nutritional evaluation by

the health professionals of the team also showed improvement of nutritional standards, lipid profile, glucose, blood pressure, and self-esteem improvement.

Conclusions: Nutrition for the elderly population needs to be carefully discussed by the health team, especially when these elderly people use psychotropic drugs that are almost always associated with other medications. In view of the diversity and peculiarity of food in the Amazon region, the study also reveals the importance of the health team in the region to be bringing this information to the population and carrying out actions aimed at native nutritional education.

Keywords: Amazon diet; psychotropic drugs; elderly

144/2552

DAIRY PRODUCTS CONSUMPTION AND RISK OF COLORECTAL CANCER INCIDENCE IN AN ELDERLY MEDITERRANEAN POPULATION AT HIGH CARDIOVASCULAR RISK

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Background and objectives: The inverse association between total dairy and milk consumption and the risk of developing colorectal cancer (CRC) has been previously reported in several prospective studies. Nonetheless, evidences regarding to dairy subtypes are scarce and inconsistent.

The objective was to assess the associations between total dairy and different dairy subtype consumption and the risk of developing CRC in a Mediterranean population at high cardiovascular risk.

Methods: We prospectively analyzed data from 7216 men and women (aged 55-80 y) without CRC at baseline from the PREvención con DIeta MEDiterránea (PREDIMED) study. Individuals were recruited between October 2003 and June 2009, and the intervention lasted until December 2010. However, the present analysis was based on an expanded follow-up until 2012. At baseline and yearly thereafter, total and specific dairy subtypes were repeatedly measured by using a 137-item validated food-frequency questionnaire. Time-dependent Cox proportional hazards models were conducted.

Results: During a median [inter-quartile range] follow-up of 6.4 [5.0-7.7] years, we documented and confirmed 101 incident cases of CRC. In the multivariable-adjusted model, HRs (95% CI) of CRC for the comparison of extreme tertiles of dairy product consumption were 0.50 (0.29-0.89) for total dairy consumption, 0.53 (0.31-0.89) for low-fat dairy, 0.52 (0.31-0.89) for total milk and 0.47 (0.27-0.83) for low-fat milk. No significant associations were found with other dairy subtype consumption.

Conclusions: The higher consumption of total dairy, low-fat dairy, total milk and low-fat milk was significantly associated with a reduced risk to develop CRC in Mediterranean individuals at high cardiovascular risk. The trial was registered at controlled-trials.com as ISRCTN35739639

Keywords: Colorectal cancer, Mediterranean diet, dairy, milk, PREDIMED study

Conflict of Interest Disclosure: Dr Nancy Babio declares that she received payments from Danone S.A. for the purposes of scientific and technical consulting, but not for the preparation of this study.

Professor Jordi Salas-Salvadó declares that he is a member of Danone S.A.'s Advisory Board, a member of the Danone Institute, and that he received payments from Danone S.A. for the purposes of scientific and technical consulting, but not for the preparation of this study.

The other authors declare that they have no conflicts of interest.

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FERMENTED DAIRY, DIET QUALITY DIET AND AND CARDIO-METABOLIC PROFILE IN A MEDITERRANEAN COHORT AT HIGH CARDIOVASCULAR RISK (CVR)

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Background and objectives: Fermented dairy products, such as yoghurt and cheese are usually consumed in Mediterranean diet. Their consumption has been associated with a better diet quality and a healthier metabolic profile in healthy adults. However, the relative contributions of fermented dairy products concerning diet quality and the prevalence of metabolic syndrome (MetS) components have not been yet fully studied in a Mediterranean population at high CVR.

Objective: To determine the association between fermented dairy product intake, quality diet profile and the prevalence of MetS components in a Mediterranean population at high CVR.

Methods: Cross-sectional analyses were performed on baseline data from 4,230 Spanish adults (aged 55-75y in men; 60-75y in women) with overweight/obesity and MetS, from October 2013 to October 2016, in the PREDIMED-PLUS trial. Multivariable-adjusted Cox regressions with robust variance and constant time (given the cross-sectional design) were fitted. The highest vs. the lowest quartiles (as reference category) of total fermented dairy products consumption, yogurt and cheese were compared.

Results: Comparing the highest and the lowest of fermented dairy products showed a better quality of diet. The highest consumers scored higher in the 17-point Mediterranean Diet Adherence Questionnaire and also they reported more consumption of fruit, vegetables, fish, nuts but less alcohol, cereals, cookies. Highest vs. lowest consumers of fermented dairy products showed higher HDL-cholesterol, lower plasma triglycerides concentrations and lower systolic and diastolic blood pressure.

Comparing the highest vs. reference quartile, the total fermented dairy, total yogurt and low-fat yogurt consumption were associated with 8% [0.92(95%CI: 0.88-0.97); P-trend <0.001], 7% [0.93(95%CI: 0.87-0.98); P-trend= 0.001] and 8% [0.92(95%CI: 0.87-0.96); P-trend = 0.002] lower risk of high blood pressure, respectively. Total fermented dairy and cheese were associated with 13% [0.87(95% CI 0.76-0.98); P-trend = 0.009] and 8% [0.82(95% CI 0.73-0.92); P-trend <0.001] lower risk of hypertriglyceridemia. Individuals allocated of the highest quartile of cheese consumption were associated with 13% lower risk of low HDL-cholesterol prevalence [0.87 (95% CI 0.78-0.97); P-trend = 0.017].

Conclusions: In the context of a Mediterranean diet, fermented dairy products were inversely associated with some of the MetS components and a better quality diet in individuals at CVR.

Keywords: Fermented dairy, yogurt, cheese, metabolic syndrome, quality diet.

144/2588

NAIP EXPRESSION INCREASES IN RAT'S LIVER REGENERATION

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Background and objectives: NAIP (NLR family apoptosis inhibitory protein) belongs to the IAP (Inhibitor of Apoptosis Protein) and NLR (NOD-Like Receptor protein) families. As a receptor of pathogen/damaged associated molecular patterns (PAMPs/DAMPs), NAIP is involved in the innate immune response, and is also a fundamental component of the NLRC4 inflammasome. As such, NAIP participates in caspase-1 activation leading to inflammatory cytokine secretion. Recently, our research group has reported the implication of NAIP in cell proliferation. The aim of this study was to analyze NAIP expression in the hepatic regenerative process.

Methods: Eight female Wistar rats weighing 260 g were used. The major liver lobe of the rats was removed. Hepatectomized rats were sacrificed 3 days (n=4) and 7 days (n=4) after surgery, and pieces from both regenerated and healthy liver were taken. Total RNA and proteins were extracted and analyzed by qRT-PCR and western blotting, respectively.

Results: NAIP mRNA showed a 3-fold increase at day 3 after hepatectomy, and a 2-fold increase at day 7 after hepatectomy. NAIP protein levels exhibited a 2-fold higher expression in the re-

generating liver lobe compared with the intact lobe from the same animal 3 days after hepatectomy.

Conclusions: This study shows the implication of NAIP in liver regeneration. Further studies are needed to elucidate the role of NAIP in both cell cycle progression and liver regeneration.

Keywords: NAIP, liver, hepatectomy

144/2595

POSSIBLE EFFECT OF CHOLESTERYL-ESTER TRANSFER PROTEIN ACTIVITY ON PARAOXONASE 1 ANTIOXIDANT FUNCTION

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Background and objectives: Paraoxonase 1 (PON1) is a glycoprotein enzyme which is mainly carried by high density lipoproteins (HDL) in plasma. This enzyme has been proposed as one of the major contributors to HDL antioxidant activity. Its functionality is highly dependent on apolipoprotein (apo) A-I-mediated stabilization within the HDL particle. A previous study by our group showed a decrease in PON1 antioxidant capacity in hypertriglyceridemia. CETP is a plasma protein responsible for the exchange of cholesteryl-esters and triglycerides (TG) between HDL and apo B-containing lipoproteins, usually resulting in an increase in HDL TG content. Furthermore, TG enrichment of HDL has been shown to lead to particle remodeling and even loss of apo A-I.

Objective: To evaluate the effect of CETP activity on PON1 status.

Methods: 150 children between 7 and 14 years old were recruited from the city of Balcarce, Argentina. Anthropometric parameters were registered and body mass index was calculated (BMI). Glucose levels and lipid profile were evaluated by automatized methods. PON1 was measured employing paraoxon (PON activity) and phenylacetate (ARE activity) as substrates, given that PON activity better reflects the intrinsic antioxidant activity and ARE activity better correlates with the enzymatic concentration. CETP activity was quantified by a radiometric assay.

Results: The population as a whole was normoglycemic, normotryliceridemic and normocholesterolemic. In univariate association analysis PON1 correlated with ARE activity (r=0.4; p<0.01); ARE correlated with HDL cholesterol (HDL-C) (r=0.23; p<0.01) and total cholesterol (TC) (r=0.19; p<0.05); and CETP correlated with TG (r=0.53; p<0.01), HDL-C (r=-0.45; p<0.01) and TC (0.38; p<0.01). In multiple linear regression analysis adjusted by age, BMI-z and plasma TG levels, CETP remained as the only factor significantly associated with PON1 activity (beta=-0.19; p<0.05), whilst HDL-C (beta=0.34; p<0.01) was the only parameter associated with ARE activity.

Conclusions: CETP activity, and consequent HDL triglyceride enrichment, would lead to altered PON antioxidant function, as reflected by CETP negative association with PON activity. This alteration would be mostly independent of PON1 concentration, given the lack of CETP association with ARE activity, which would be in turn mainly dependent on HDL particle number.

Keywords: Cholesteryl-ester transfer protein, Paraoxonase 1, HDL, Triglycerides

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144/2596

APPARENT DISCORDANCE BETWEEN TWO ACTIVITIES OF THE ANTIOXIDANT PARAOXONASE 1 ENZYME AS A RESULT OF CHRONIC EXPOSURE TO HIGH ALTITUDE

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Background and objectives: High altitude exposure has been associated with hypobaric hypoxia and oxidative stress. In individuals who live under those conditions, metabolic and enzymatic alterations could occur. Among high density lipoprotein (HDL) antiatherogenic functions, its antioxidant capacity is mainly attributed to paraoxonase 1 (PON1). This enzyme is in turn susceptible to oxidation which causes an impairment of its

activity. Children living at high altitude in San Antonio de los Cobres (SAC), Argentina, were shown to have lower HDL-cholesterol (HDL-C) levels than children from Buenos Aires (BA) who live at sea level. However, no prior study has analyzed PON 1 status in children exposed to high altitude.

Objective: To compare PON-1 activities in SAC versus BA children.

Methods: A cross-sectional study compared 158 SAC versus 97 BA children (6-16 years). Anthropometric parameters, lipoprotein profile, and PON1 activities were evaluated. PON1 was measured employing paraoxon (PON activity) and phenylacetate (ARE activity) as substrates, given that PON activity better reflects the intrinsic antioxidant activity and ARE activity better correlates with the enzymatic concentration.

Results: The prevalence of overweight/obesity was significantly lower in SAC than in BA children (18.3 vs. 30.9%; p<0.01). Triglycerides (1.34 vs. 0.90 mmol/L; p<0.01), apo B (0.84 vs.0.72 g/L; p<0.01) and apo A-I (1.33 vs. 1.27 g/L; p<0.01) levels were significantly higher, while HDL-C (1.16 vs. 1.32 mmol/L; p<0.01) concentration was significantly lower in SAC than in BA children. PON activity was significantly lower (170 vs. 203 nmol.ml-1. min-1; p<0.05), ARE activity higher (100 vs. 90 µmol.ml-1min-1; p<0.01) and PON/ARE ratio lower (1.7 vs. 2.2; p<0.05) in SAC compared with BA. Separate multiple linear regression analyses showed that all the above mentioned differences persisted even after adjusting for age, gender, and BMI.

Conclusions: SAC children showed an unfavorable lipoprotein profile, except for higher apo A-I levels compared with BA children. Furthermore, they presented lower PON and higher ARE activities. The presence of higher ARE activity and apo A-I concentration in combination with lower PON activity and HDL-C levels would be indicative of unaltered HDL particle number but deficient antioxidant function and capacity to promote cell cholesterol efflux.

Keywords: Paraoxonase 1, HDL, High altitude, Apolipoprotein A-I

ent effect of protein intake on skeletal muscle hypertrophy and the role of circadian rhythm for its effect.

Methods: Six-week-old male ICR and Clock mutant mice were kept under 12h light/dark cycle (Light was turned on at ZT0 and off at ZT12). Mice were fed the 2g meal twice a day at ZT12 (the beginning of active phase) and ZT20 (the end of active phase), which were defined as breakfast and supper, respectively. The overloading of plantaris muscle was induced by unilateral surgical removal of the distal tendon of soleus and gastrocnemius muscles, while contralateral leg was sham-treated on day 7 after twice meals per day schedule. The plantaris muscles were collected on day 14. Study1: Breakfast protein group (Breakfast-P) was fed 20% casein diet at breakfast and 3% casein diet at supper. Even protein group (Even-P) was fed 11.5% casein diet at each meal. Supper protein group (Supper-P) was fed 3% casein diet at breakfast and 20% casein diet at supper. Study2: Breakfast BCAA (Breakfast-B) and supper BCAA (Supper-B) groups were fed the BCAA-containing 3% casein diet (equivalent to BCAA of 20% casein diet) at breakfast and supper, respectively. Study3: Clock mutant mice were kept under the same feeding condition as the study1 and 2.

Results: Study1: The muscle growth rate (Overloading muscle / sham-treated muscle weight) in Breakfast-P was higher than that in Even-P (P=0.09) and Supper-P (P<0.05). Study2: Breakfast-B produced higher growth rate than Supper-B. The greater effect of Breakfast-B was not observed in the intake of other amino acids. Study3: The increases of muscle growth rate in mice fed protein and BCAA at breakfast were not also observed in the clock mutant mice.

Conclusions: These results suggested that protein intake for breakfast accelerated muscle hypertrophy, and BCAA and circadian rhythm were involved in such effects.

Keywords: chrono-nutrition, skeletal muscle, protein, BCAA, circadian rhythm

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144/2626

EFFECTS OF TIME-RESTRICTED PROTEIN FEEDING ON SKELETAL MUSCLE HYPERTROPHY IN MICE

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Background and objectives: Dietary protein enhances muscle protein synthesis. It has not been fully elucidated about the effects of timing or distribution of protein intake on skeletal muscle mass, although the amount of protein intake for breakfast is known to be small in a day. We investigated the time-depend-

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144/2628

RECENT ADVANCES IN FORTIFICATION OF RICE – A REVIEW

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Background and objectives: Rice is a staple food for more than half the world's population, however, it is a poor source of micronutrients in its milled form. Iron deficiency (ID) and other micronutrient deficiencies are prevalent in many rice consuming

countries. Rice fortification is one of the remaining frontiers in food fortification and is particularly technically challenging as rice is consumed as intact grains and due to its white color. Iron fortification of rice can be an approach to combat ID in rice-consuming populations. Commonly used techniques for rice fortification are extrusion or coating with iron phosphates as iron source resulting in sensory acceptable fortified rice grains. However, iron bioavailability from those compounds is low. It is thus crucial to identify micronutrient formulations that increase human iron bioavailability while maintaining acceptable sensory properties.

Our objective is to present a narrative overview of the field of rice fortification including recent advances, identify knowledge gaps and research priorities to ensure optimal nutrient composition for rice fortification formulations.

Methods: A systematic review of the literature was conducted by searching public databases such as Pubmed, Web of Science and Scopus for relevant terms. We appraise currently used iron compounds and formulations to increase iron absorption, compare recent findings on iron bioavailability from fortified rice, evaluate fortification techniques regarding the acceptability of the fortified product and their applicability in different settings and suggest directions for further research.

Results: Fortified rice is a suitable vehicle to deliver bioavailable iron, zinc, vitamins B12 and A. Recent studies suggest optimized rice formulations containing iron chelators to substantially increase iron bioavailability, thus owning the potential to counteract ID in rice consuming populations.

Conclusions: The chosen fortification technique can affect nutrient bioavailability likely due to transformations in the starch microstructure. More data are required to further optimize the fortification technology regarding nutrient delivery and bioavailability in humans.

Keywords: Iron deficiency. Rice. Fortification. Iron. Micronutrient deficiencies.

144/2651

EFFECT OF THE YACON (SMALLANTHUS SONCHIFOLIUS) IN GLYCEMIC PROFILE OF THE WISTAR RATS

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Background and objectives: Yacon is considered a functional food, which has among its properties a hypoglycemic capacity. The aim of this study was to evaluate the modulatory effect of yacon in the glycemic profile of Wistar rats.

Methods: The experiment lasted 60 days with 32 animals. It was used the dehydrated food matrix (yacon powder / YP) added to the diet of the groups that received intervention in the dose of 7.5% of inulin type fructan (ITF). The analyzed variables were: centesimal composition and content of inulin type frutans, weight gain, relative weight of cecum (RWC), food consumption, coefficient of food efficiency and glycemia. All analyzes followed the AOAC protocols. In the statistical analysis, the following tests were used: ANOVA or Kruskal Wallis followed by comparison tests of means, t test and paired t test. The level of statistical significance was $p < 0.05$ for all analyzes. This study was approved by the Ethics Committee on the Use of Animals of the Federal University of Alfenas, protocol no. 698/2015.

Results: The results showed that the control group receiving YP had a significant reduction in glycemic values. In all groups receiving YP there was a significant increase of cecum, as expected. The development of diabetes was not observed due to the use of streptozotocin with 35% sucrose.

Conclusions: Therefore, the evaluation of the effect of yacon on hypoglycaemia has been impaired. This suggests that studies in this line are encouraged for further elucidations.

Keywords: Glycemia, Rats, FOS and Inulin.

144/2655

COMMUNITY PERCEPTIONS ON THE NEW ROLE OF TRADITIONAL BIRTH ATTENDANTS AS BIRTH COMPANIONS AND NUTRITION ADVOCATES IN KAKAMEGA COUNTY, KENYA: A QUALITATIVE STUDY

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Background and objectives: There is consensus that delivery at health facility assisted by skilled birth attendant is priority for reducing maternal mortality in areas with poor access to health facilities. Traditional Birth Attendants (TBAs) are known to conduct deliveries in such set-ups. One key intervention is the re-orientation of TBAs as birth companions for women to deliver at health facilities. The objective of this study was to explore community perceptions on the new role of TBAs as birth companions and nutrition advocates and their influence on health facility delivery.

Methods: This was qualitative component of an evaluation part of an intervention study whose aim was to reduce maternal mortality through increased health facility delivery. The study was

composed of intervention and control groups. Data was collected in both study groups through Key Informant Interviews with health workers and Focus Group Discussions with lactating and pregnant women, fathers, community leaders, Community Health Volunteers and TBAs. Data was analyzed through content analysis and was organized into sub-themes and conclusions made from each sub-theme using the Atlas ti software.

Results: In the intervention group, the re-oriented TBAs adopted their new role with ease as the majority offered companionship to mothers to deliver at health facilities. This led to increased health facility deliveries as reported by nurses and community members. The mothers and the community members were happy with the new role of the TBAs. They reported that the TBAs accompanied the women to deliver at the health facilities and offered them companionship after delivery. In contrast, TBAs did not adopt the nutrition advocacy role sufficiently. In comparison group majority of the TBAs continued with their traditional roles of delivering women at home. However, few of them were reported to advise mothers to seek skilled help after community sensitization by the health workers.

Conclusions: It is feasible and acceptable to mothers, community and the TBAs to be utilized as birth companions to increase health facility delivery. Nutrition advocacy by the TBAs should be strengthened to maximize on the opportunity provided by the close association between TBAs and mothers and the community.

Keywords: Birth Companion. Nutrition Advocate. Skilled Birth Attendant. Traditional Birth Attendant.

144/2791

EFFECT OF THE INGESTION OF VITAMIN K-DEFICIENT DIET ON GLUCOSE METABOLISM IN DIABETIC MODEL MICE

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Background and objectives: Vitamin K (VK) plays as a co-enzyme for γ-glutamylcarboxylase and regulates blood coagulation system and bone formation via γ-glutamylcarboxylation of VK dependent proteins. VK1 is found in vegetables, and VK2 significantly in fermented-food products and animal meats. Ingested VK is known to be converted to menaquinone-4 (MK-4, a kind of VK2) in several tissues including pancreas and liver. Although this conversion is effectively occurred and the large amount of MK-4 is accumulated in pancreas, the role of MK-4 has not been well elucidated. Epidemiological researches suggested that VK intake correlated with plasma glucose and insulin levels. Here we examined the effect of VK deficient diet on glucose metabolism in genetically diabetic mice.

Methods: Male KK-Ay mice (4 weeks old) were divided into two groups and fed AIN-93G based standard diet (Cont group) or VK free diet (K free group) for 60 days. During the experimental period, their body weight, food intake, and plasma glucose level were measured. We performed oral glucose tolerance test (OGTT) and insulin tolerance test (ITT) on 33rd and 41st day of feeding, respectively. Mice were sacrificed after the experimental period, and their serum and organs were obtained. The VK contents in organs were measured by fluorescent-HPLC and mRNA levels of gene involved glucose metabolism in liver and pancreas were also analyzed by quantitative RT-PCR.

Results: During the experimental period, plasma glucose level was higher in K free group compared to Cont group. Severer glucose intolerance and insufficient insulin secretion were observed in K free group in OGTT. Pancreatic VK level was significantly lower in K free group.

Conclusions: Our results suggested that feeding of VK deficient diet reduces MK-4 content in pancreas and leads to the lowering of glucose-induced insulin secretion in diabetic mice.

Keywords: Vitamin K. menaquinone-4. glucose metabolism. diabetes.

144/2802

VITAMIN K REGULATES THE GENE EXPRESSION OF DRUG-METABOLIZING GENES VIA PXR IN HUMAN COLON CANCER CELLS

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Background and objectives: Interaction between foods and drugs may inadvertently reduce or increase the effect of drug. Adverse effects of clinically relevant food-drug interactions are caused by food-induced changes in the bioavailability of the drug. The bioavailability of drug is tightly regulated by xenobiotic/drug metabolism system. The expression of genes involved in xenobiotic/drug metabolism is transcriptionally regulated by pregnane X receptor (PXR). PXR is a ligand-dependent nuclear receptor that functions as a xenobiotic sensor. PXR is activated by a diverse array of pharmaceutical agents and also nutrients. Therefore, our present study focused on vitamin K2 that is known as a PXR ligand, and investigated vitamin K2-drug interaction in cultured human colon cancer cells.

Methods: Human colon adenocarcinoma LS180 cells were treated with menaquinone-4 (MK-4), one of vitamin K2, and rifampicin (Rif), a typical ligand of PXR, and then expression levels of drug-metabolizing genes were measured by qRT-PCR and western blot analysis. The ligand-induced PXR activation was also analyzed with reporter gene assay.

Results: MK-4 significantly upregulated mRNA levels of CYP3A4 and MDR1 in dose- and time-dependent manner. Reporter activity from luciferase construct that has PXR binding element in its promoter was also increased by MK-4 treatment. These enhancements were abolished by PXR-targeted siRNA. These results indicated that MK-4 stimulates mRNA expression of CYP3A4 and MDR1 through PXR. In western blot analysis, MK-4 increased MDR1 protein levels whereas decreased CYP3A4 levels. Cotreatment with MK-4 and Rif showed synergistically enhanced mRNA expression of both genes.

Conclusions: These results suggested that MK-4 modulate drug-metabolizing genes and may cause inadvertent effects of prescribed medicines.

Keywords: Vitamin K. PXR. drug-metabolism

144/2829

A MACRO AND MICRONUTRIENT FORTIFIED COMPLEMENTARY FOOD SUPPLEMENT ENHANCES PLASMA BRANCHED-CHAIN AMINO ACID LEVELS IN GHANAIAN INFANTS

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Background and objectives: A significant association was reported between stunting and low circulating levels of essential amino acids (AA). The study objectives were to examine the effect of providing a macro-micronutrient fortified complementary food supplement (energy, fat, protein, the essential amino acid lysine and micronutrients) called KOKO Plus on plasma AA in Ghanaian infants under two years of age.

Methods: This is a secondary analysis from a single blind cluster randomized controlled trial conducted in rural Ghana to examine the effect of KOKO Plus on linear growth. Thirty-eight communities (903 infants) were randomly assigned to KOKO Plus with nutrition education (KKP) or a multiple micronutrient powder with nutrition education (MN) or nutrition education only groups (NE) (n=301/group). KKP and MN supplements were delivered weekly with one sachet used daily. Infants were enrolled at 6 months of age and graduated at 18 months of age with blood sampling at 6 (baseline), 12 (midline) and 18 (endline) months. Plasma samples were separated, deproteinized and AA was measured using the ninhydrin method. Mixed models with adjusted for baseline concentration AA and clustering as random effects examined the effect of intervention.

Results: Adjusting for baseline AA, plasma levels of total branched-chain AA (BCAA) were significantly higher at midline and endline in the KKP and NE but not the MN group. Difference in difference between groups were; KKP-MN = 30.3 μM (95% confidence interval (CI) 12.3 to 48.2), p<0.001, NE-MN = 17.9 μM (95% CI -0.1 to 36.0), p=0.052 at midline and KKP-MN = 23.6 μM (95% CI 5.7 to 41.4), p=0.005, NE-MN = 22.4 μM (95% CI 4.5 to 40.4), p=0.009 at endline. Modeling by number of supplements consumed showed increases in plasma BCAA with increase in KKP supplement but not MN.

Conclusions: Infants in the KKP group had enhanced plasma BCAA level in Ghanaian infants compared to the MN group alone. A dose response is observed with higher the consumption in the KKP group leading to a higher BCAA level. BCAA have been linked to impaired growth and neurodevelopment in neonates. Further analysis is needed to understand the nature of the relationship with linear growth in these infants.

Keywords: protein, lysine, amino acids, linear growth, stunting

Conflict of Interest Disclosure: Wataru Sato, Chie Furuta, Hitoshi Murakami are employees of Ajinomoto Co. Inc.

144/2939

GENETIC TESTING FOR WEIGHT LOSS COUNSELING

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Background and objectives: Most known dietary strategies or weight loss are aimed to reduce calories and increase physical activity. Standard treatments of dietary modification with various amounts of protein, carbohydrates and fat work for most but not all overweight patients. Obese patients are especially quick to stop treatment if they don't see an immediate response. Responses by individuals are highly variable. In addition to behavior modification, genetic evaluation based on metabolic genotypes has been found helpful in understanding which dietary and activity recommendations are a best fit for long term weight management. Individual variations in genes can affect nutrient transport and metabolism. This study

will investigate whether the inclusion of genetic information to personalize patients' diet can improve weight management after a 4 month intervention.

Methods: Twenty obese patients who have had difficulty losing weight will be offered a genotype test

screening for over 40 variants in genes that affect macro- and micro-nutrient utilization, and influence physiological response to exercise. Patients will volunteer and be selected based on a weight loss in past four months of 5 pounds or less. Gene assays will be collected by oral swab. Fasting blood sugar, lipid profile and A1c

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will be obtained for all participants along with blood pressure, waist measure and body fat composition and demographic information. Surveys on stress, self efficacy for nutrition and physical activity and binge eating will be completed. Patients will follow the diet recommended for their gene specificity. Weight loss and measures will be compared at four months with prior measurements. Outcome measures will be BMI, weight, waist measure, changes in

lipid profile, A1C, fasting blood sugar.

Results: In progress.

Conclusions: Findings will help provide support for use of genetic nutrient testing in patient assessments.

Keywords: genetic-testing, obese, nutrition, activity

144/3042

THE EFFECT OF TWO INTENSITIES OF ACUTE PHYSICAL EXERCISE ON THE PREFERENCE FOR SWEET TASTE OVER REST

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Background and objectives: At a higher intensity of physical exercise, the preference for glucose solutions will be greater with respect to rest.

- Determine the taste preference according to the intensity of the exercise

Methods: Twelve healthy subjects with the following characteristics were evaluated: 18-23 years of age, sedentary, with normal nutritional status, without drug consumption and nonsmokers; pregnant and breastfeeding mothers were excluded. Subjects were cited on three occasions. In the first session, anthropometric, residual heart rate and maximum aerobic capacity measurements were performed according to the Bruce Protocol, in addition to the application of the 24-hour Reminder ingestion survey.

In the second and third sessions, subjects underwent static exercise on two different intensities at 50% VO2max and 85% VO2max., For 20 and 10 minutes respectively, in addition to determining the preference for sweet taste before and after physical exercise. Preference for sweet taste: it was determined by the Monell Test, which consists in giving the subject pairs of glasses with alternating glucose solutions in increasing and decreasing order, this should indicates the preference for each pair of glasses. The latter had 10 cc of solution, prepared with distilled water and glucose up to 3%, 6%, 12%, 24% and 36%.

Results: The preference for sweet taste (PSD) after exercise decreased significantly in high intensity physical exercise (p 0.02). When evaluating the relationship between sweet taste preference, time (before and after exercise) and intensity of exercise (50% VO2max and 85% VO2max), no significant differences were found (p 0.93).

Conclusions: It was not possible to verify that to a greater intensity of physical exercise, there is a greater preference for sweet

solutions. Future studies on the subject should consider their performance in athletes since their physical condition allows exercise for longer periods of time and therefore the generation of greater metabolic changes that lead to significant variations of sweetness preferences.

Keywords: Excersise, intensity, nutrition, glucose test

Track 2: Nutrition Through Life Course

144/220

CARBOHYDRATES CONTENT AND GLYCAEMIC INDEX OF THREE TRADITIONAL CAMEROONIANS MEALS

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Background and objectives: Glycaemic index (GI), is an adequate tool not only for diet schedule, but also for the management of metabolic pathologies. This study aimed to determine the carbohydrates content (Cc) and GI of three Cameroonians meals commonly consumed. The studied sauces were mainly constituted of Aframomum aulacocarpos/citratum species (A.sp), Manihot esculenta leaves (LM) with Arachis hypogaea seeds, Telfairia occidentalis leaves (LT) with Citrullus colocynthis seeds. They were all associated with Manihot esculenta tuber (TM).

Methods: We included 27 healthy male volunteers aged 19-29 years old, who gave their informed consent. They were separated into groups of eight (08) for each meal. After a 10-14 hours overnight fasting, 50 g/70Kg of glucose was administered day one of the experiment to the participants, and the tested food three other days spaced from two weeks each. Their capillary finger-prick blood samples were collected at 0, 15, 30, 60, 90, and 120 minutes after consumption. The GI values were computed from the area under the glycemic-response curve of each food with glucose as reference. The Cc of each sauce and TM alone was determined.

Results: The mean GI was respectively 96.85 ± 2.04; 91.22 ± 5.20; 88.68 ± 3.47 for A.sp, LM, LT (all combined with TM). The Cc values of TM was high (p<0.05) with 62.234 ± 2.235, compared to A.sp 28.610 ± 3.214, LM 18.141 ± 4.394, and LT 19.377 ± 8.441 g/100g.

Conclusion: All the GIs of the meals were high. The sauces presented a poor carbohydrates content, so they can be proposed to people with carbohydrates metabolism disorders. However, they should be associated with less carbohydrates accompaniment to prevent a high and/or a chronic postprandial glycaemia.

Keywords: Glycaemic index, traditional meals, carbohydrates content.

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DIETARY CHOLINE INTAKES DO NOT REFLECT RECOMMENDED CONSUMPTION AMONG LACTATING WOMEN IN GUATEMALA

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Background and objectives: No information is currently available on habitual intakes of choline, in the Guatemalan population. Guatemala has the highest national prevalence of under-5 stunting in the Americas, with a frequency of 46.5% in 2015; with that for the indigenous population is 61.2%. Choline is linked to short-stature through biochemical pathways for ossification of the growth plate for the elongation of long-bones of the human extremities. We sought to assess the dietary choline intake among lactating mothers in the Western Highlands of Guatemala.

Methods: The previous-day intakes of 118 low-income women, 55 recruited at a public health clinic in the city of Quetzaltenango and 63 interviewed across 8 Mam-speaking villages in the same province served as the data-base. These were coupled with the food choline content values from the USDA food composition software to produce intake estimates in mg/day. Estimated median choline intakes were compared to the 550 mg/day Adequate Intake (AI) for lactating women, established by the US Institute of Medicine, and expressed as percentages. The critical nutrient density for choline of 183 mg/1000 kcal was calculated for lactation. The principal food sources of choline were established by geographic setting.

Results: Reported daily choline intake ranged from 0–1115 mg, with median choline intake of 256 mg: 306 mg in urban and 199 mg in rural women (p<0.05). Respective median densities were 89% and 64% of the choline critical nutrient density. Eggs, chicken and maize tamalitos were the first 3 main sources in urban, whereas maize tamalitos, eggs and chicken occupied these places in rural-areas.

Conclusions: With median maternal choline intakes ranging from 56% to 36% of the AI recommendation during lactation in Guatemala, plausibility for its contribution to poor infant/toddler growth is established. Evaluation of human milk content and breast-feeding delivery of choline are warranted.

Keywords: choline, stunting, lactation, Guatemala

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BRAZILIAN IMMIGRANT MOTHERS' BELIEFS AND PRACTICES RELATED TO INFANT FEEDING: A QUALITATIVE STUDY

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Background and objectives: Background: Exclusive breastfeeding for the first six months of life and the timely introduction of appropriate solid foods are important determinants of weight status in infancy and later life stages. Disparities in obesity rates among young children suggest that maternal feeding practices during the first two years of life may contribute to these disparities. Brazilians are a growing immigrant group in the U.S., yet little research has focused on parental beliefs and behaviors affecting health of Brazilian immigrant children living in the U.S.

Objective: Explore beliefs and infant feeding practices of Brazilian immigrant mothers in the U.S.

Methods: Focus group discussions were conducted with Brazilian immigrant mothers. Transcripts were analyzed using thematic analysis. Themes were categorized using the socioecological model.

Results: Twenty-nine immigrant Brazilian mothers participated in the study. Analyses revealed all participants breastfed their infants. The majority initiated breastfeeding soon after childbirth. However, most mothers stated that they did not exclusively breastfeed. They used breast and formula feeding concomitantly. Family and culture influenced mothers' infant feeding beliefs and practices early introduction of solid foods.

Conclusions: As the number of children in the U.S. growing up in families of immigrant parents increases, understanding influences on Brazilian immigrant mothers' infant feeding practices will be important to development of effective interventions to promote healthy infant feeding and weight status among Brazilian children. Interventions designed for Brazilian immigrant families should incorporate an understanding of social context, family and cultural factors to develop health promotion messages tailored to the needs of this ethnic group.

Keywords: Brazil, immigrant, mothers, infants, breastfeeding, complementary feeding.

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AVERAGE DAILY CONSUMPTION, NUTRIENT DENSITY AND PRINCIPAL SOURCES OF CHOLINE AMONG SEMI-RURAL SCHOOLCHILDREN IN WESTERN GUATEMALA

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Background and objectives: Choline is an essential nutrient found in varying amounts in foods of both plant and animal origin. Adequate Intakes (AI), established by the US Institute of Medicine, recommended 250 mg daily for ages 4-8 years and 375 mg for ages 9-13 years. Sub-adequate choline intakes are being documented in adult Guatemalan women across the life-span, i.e., pregnant, lactating and neither. Our objective was to determine average intake and relative adequacy as well as principal sources of choline in semi-rural school children using a pictorial registry of dietary consumption.

Methods: Predominantly Mayan-indigenous, semi-rural, public school children (n=115) from Quetzaltenango were enrolled: 57 boys and 58 girls. 40 (35%) were 8 years old and 75 (65%) were 9-11 years old. Critical nutrient-density values for choline, based AI and energy requirements on specific for age were defined as 142 and 196 mg/1000 kcal, respectively. One-day choline intake was estimated from self-drawn depictions of each meal and snack consumed over a 24-h period. Choline intake was then derived using the USDA food composition table software values. A hierarchy of food contributions to total choline intake was tabulated.

Results: The total daily choline intakes ranged from 7.5-545mg, median=231 mg and mean=233±101 mg, without significant sex differences (p=0.92). The median for 8 y/o was 224 mg, and for 9-11 y/o, 234 mg. 83.5% consumed less than their age-specific AI value, whereas in 79.1%, nutrient density was below the reference critical-nutrient-density level. The five leading sources (eggs, maize tamalito, chicken, beef and milk) cumulatively constituted 70.6% of choline intake.

Conclusions: In semi-urban schoolchildren of the Guatemalan Western Highlands, choline intake is suboptimal according to AI, strategies are required to promote its consumption due to its critical role in the children health and development.

Keywords: Choline, schoolchildren, diet, growth, Guatemala

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GUATEMALAN WOMEN CONSUME ABOUT HALF OF THE ADEQUATE INTAKE LEVEL FOR DIETARY CHOLINE, WITHOUT SIGNIFICANT CLASS OR REGIONAL VARIANCE

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Background and objectives: Choline has heretofore been an ignored essential nutrient for the Guatemalan dietary context. Daily Adequate Intakes (AI) for non-pregnant and pregnant women has been set by the US Institute of Medicine at 425 and 450 mg, respectively, increasing to 550 mg in lactation. Western Highlands (WH) rural and urban women had respective median choline intakes of 199 and 304 mg (Díaz-Jereda, elsewhere at ICN, 2017). Here, our objective was to compare choline intakes of numerically-equivalent convenience samples of non-pregnant/non-lactating (NPNL) women across six groupings of socioeconomic class and regional setting in Guatemala.

Methods: Previous-day intakes were recorded among 240 adult NPNL Guatemalan women, 40 participants each across six subgroups: G1, WH rural peasantry; G2, WH urban low-income; G3, WH urban middle-income; G4, Pacific-coastal-plain middle-income; G5, Central-Highlands, peri-urban low-income; and G6, Central-Highlands, urban middle-income. Choline contents of foods from the USDA food composition table software were applied to 1-day intake records to generate choline intakes, expressed in mg.

Results: The global choline intake for the 240 participants had (in mg) a median of 204 and mean 227±131, ranging 18-790; this was 48% of the 425 mg AI reference value. By subgroups, respective median and limits-interval data were (in mg): G1, 199 (73-609); G2, 214 (30-515); G3, 211 (23-504); G4, 148 (18-570); G5, 225 (30-790); and G6, 215 (39-567). Subgroup differences were non-significant (p=0.579). Overall, choline from eggs (37%), beef (9.5%) and black beans (8.8%) comprised over half the intake, but hierarchies of main choline sources varied greatly across subgroups.

Conclusions: NPNL women in the G2 region had 30% lower choline intakes (214 mg) than corresponding lactating peers (304 mg), whereas inter-stage intakes were identical at 199 mg in the G1 region. Current dietary patterns for a diverse cross-section of NPNL Guatemalan women do not support the habitual consumption of adequate amounts of choline.

Keywords: Choline, dietary intake, women, Guatemala

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ASSOCIATION OF RELATIVE BODY WEIGHT (BODY MASS INDEX) AND FATNESS (PERCENT BODY-WEIGHT AS FAT) IN A CONVENIENCE SAMPLE OF ADULT WOMEN IN THE SOLOLÁ PROVINCE OF GUATEMALA

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Background and objectives: Quetelet´s body-mass index (BMI) is a measure of relative weight in kg/m2. States of underweight, normal-weight, overweight and obesity have been classified by specific BMI intervals. However, "excess" in body mass is a function of increased fat (fatness as % body-weight as fat, %BF). Therefore, these two indicators should have a complementary association. As part of a protocol to classify women as "normal" or "obese" by dual criteria among Mayan-indigenous women, we sought to explore the association of BMI with %BF.

Methods: Height and clothing-adjusted body weight were measured in women aged 30-45 years, and their BMI calculated. As per the classification protocol, only women with BMI in the ranges of 18.5 to <25 kg/m2 ("normal") or >30 kg/m2 ("obese") advanced to stage 2 for %BF assessment with bioimpedance analysis (BIA). With tetrapolar placement of skin electrodes of the mBCA 525 BIA instrument (SECA, Hamburg, Germany), the gamut of 25 output variables were measured, with specific attention to the %BF value.

Results: We successfully measured all variables in 38 women (median: 34y): n=24 "normal" (median BMI: 22 kg/m2) and n=14 "obese" (median BMI: 32 kg/m2). Respective median %BF were 32% and 43%. The overall Pearson r value for BMI vs %BF (n=38) was 0.87, with partial r values of 0.74 (n=24, normal) and 0.74 (n=14, obese). BIA-measured %BF were, on average, 2.7 percentage-points higher than the theoretical association from the Deurenberg equation (1991).

Conclusions: %BF was higher than the reference criteria for non-excessive and obesity-associated fat in relation to selected confines for both "normal" and "obese" BMI status. Genetic and/or environmental factors may modify associations from the textbook standards for the upper- and lower-limits of body fatness that, along with BMI, would co-define "leanness" and "obesity".

Keywords: body-composition, women, body-fat, BMI, Guatemala

HEAD CIRCUMFERENCE IS AMONG THE LEAST AFFECTED ANTHROPOMETRIC MEASURES IN INFANCY AND AT FOLLOW-UP IN A COHORT OF RURAL, MAM-MAYAN CHILDREN IN THE 3RD AND 4TH YEARS OF LIFE

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Background and objectives: Environmentally-related short-stature or stunting is often termed "chronic undernutrition," projecting a connotation of a generalized under-nourishing process due to improper diet. This was called into question in the 1980s from observations on Negev Bedouin infants by Dagan et al. (AJCN 1983;38:747-753) examining the standard anthropometric measures of length, weight, head-circumference and skin-folds. More recently, Miller et al. (Pediatr Int Child Health 2016;36:91-101) found head-circumference z-scores (HCZ) to decline by 30% from birth to 4 years in Nepalese children. We sought to document for anthropometric measures of indigenous Guatemalans, the relative degrees of conservation versus deterioration from infancy to an average of ~4 years following initial assessment.

Methods: The same anthropometrists twice measured a cohort of 105 Mam-Mayan children: 85 enrolled before the 2nd month of life and 20 at ~5±1 months, with follow-up measurements between the 41th and 56th month (median:48.3mo). Weight, length/height and head circumference were measured, generating z-scores for HAZ, WAZ and HCZ (WHO-Anthro), with the paired t test used for statistical assessment.

Results: At baseline and at 4-y endline, respective median z-scores were (in order, n=105): HAZ, -1.15/-2.68; WAZ, +0.07/-1.51; and HCZ, -0.74/-1.06. Specifically, instances of HCZ <-2SD (microcephaly) were 19 (18.1%) in first-semester baseline and 15 (14.2%) at 4-y endline. Median z-scores differences from 1st-2nd measurements, respecting the vector sign, were: HAZ (-1.53, p<0.001); WAZ (-1.58, p<0.001), and HCZ (-0.32, p=0.135), respectively.

Conclusions: Although WAZ was best conserved among the z-scores in early infancy followed by HCZ, the latter was by far the index showing least longitudinal deterioration 4 years later, and its value was superior to the other indicators. The time-dependent status-dynamics for HCZ here differ from those reported for Nepalese children from birth through 4 years of life.

Keywords: Stunting, wasting, underweight, microcephaly, Guatemala

TWO-YEAR FOLLOW-UP OF A WEIGHT LOSS INTERVENTION AMONG POSTPARTUM WOMEN: RESULTS FROM A RANDOMIZED CONTROLLED TRIAL IN PRIMARY HEALTH CARE

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Background and objectives: Weight regain is a critical problem in obesity treatment. We recently reported that a 12-wk diet intervention among postpartum women produced a weight loss of 12% after 1 y, compared to 5% in controls. Here, we present 2-y results after 1 y of unsupervised follow-up.

Methods: A total of 110 women with a self-reported BMI of ≥27 kg/m2 at 6-15 wk postpartum were randomized to diet group (D-group) or control group (C-group). D-group (n=54) received a 12-wk diet intervention by a dietitian followed by monthly e-mails up to the 1-y follow-up. C-group (n=56) received a brochure on healthy eating at the baseline visit. No contact was provided from 1-2 y to either group. Changes in anthropometric outcome measures from 0-2 y and 1-2 y are reported.

Results: Eighty-nine women (81%) completed the 2-y follow-up. Median (1st; 3rd quartile) weight change from 0-2 y was -6.9 (-11.0; -2.2) kg in D-group and -4.3 (-8.7; -0.2) kg in C-group. There was no group by time interaction at 2 y (p=0.082); however, when women with a new pregnancy between 1-2 y were excluded the interaction became significant (-8.2 kg vs -4.6 kg, p=0.038). From 1-2 y, women in D- and C-group gained 2.5±5.0 kg and 1.1±4.4 kg, respectively (p=0.186). Women who gained weight from 1-2 y reported a decrease in self-weighing frequency compared to women who maintained or lost weight (p=0.008). Finally, percent weight change at 12 wk was positively related to percent weight change at 2 y (p<0.001).

Conclusions: Both groups achieved clinically relevant 2-y weight loss but the significant between-group-difference observed at 1 y was not maintained at 2 y in the main analysis. However, when women with a new pregnancy between 1-2 y were excluded, a significant weight loss effect was observed also at 2 y.

Keywords: Weight loss, weight loss maintenance, postpartum, RCT, overweight/obesity

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HEALTH AND NUTRITION RELATED CHALLENGES ASSOCIATED WITH PEOPLE LIVING WITH DISABILITIES IN NAKURU COUNTY, KENYA

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Background and objectives: People living with disability (PLD) are among the most vulnerable groups to health and nutrition problems mainly due to limited access to essential services. Minimal information exists on health and nutrition related challenges among PLD as they are normally excluded from many researches due to challenges in conducting assessments. This study aimed to document the health and nutrition related challenges.

Methods: The study adopted a cross-sectional analytical research design, in Nakuru municipality on a randomly selected sample of 396 adults living with various forms of disability. Data was collected using semi-structured questionnaires, focus group discussions guides and key informants interviews. Quantitative data was analyzed using SPPSS while qualitative data using Nvivo software.

Results: Physical disability (67.2%) was the main disability problem, followed by mental disability (15.2%), deafness/dumbness (10.9%), and visual impairment (5.1%). Over 68% were dependent on other people for movement and accessibility to essential services. Most of the PLD (62.1%) earned an income of <2USD daily leading to about 40% being food insecure. A majority (78.9%) of the PLD had low nutrition knowledge with (68.8%) not meeting their daily dietary requirements while 85.2% engaged in low physical activity. Prevalence of hypertension, diabetes and CVDs was 25.8%, 5.5%, and 6.3% respectively. In addition, illness like malaria, pneumonia and diarrhea were prevalent. The prevalence of overweight, obesity and underweight was 21.5%, 10.2% and 23.4%, respectively, a clear indication of dual burden of malnutrition. Over a half (53.9%) were noted to be living with stigma towards disability.

Conclusions: Due to stigma, food insecurity and low nutrition knowledge, PLD practice poor dietary practices and live with lifestyle diseases. The disability condition led to engagement in low physical activity which contributed to overweight and obesity. There exists a dual burden of malnutrition. There is thus need to train PLD on good nutrition, dietary management of lifestyle diseases and on entrepreneurship for income generation.

Keywords: People living with disability, health, nutrition, challenges, adults

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FACTORS AFFECTING NUTRITIONAL STATUS OF ELDERLY PEOPLE OF RURAL NEPAL: A COMMUNITY BASED CROSS SECTIONAL STUDY

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Background and objectives: Every country in the world is facing a demographic challenge due to drastic growth of population over 60 years. Adequate diet and nutritional status are important determinants of health in elderly populations. This study aimed to assess the nutritional status among the elderly population and factors associated with malnutrition at the community setting in rural Nepal

Methods: This is a community based cross-sectional study among elderly of age 60 years or above in the three randomly selected VDCs of Morang district in eastern Nepal, between August and November, 2016. A multi stage cluster sampling was adopted with sample size of 345 of which 339 participated in the study. Nutritional status was assessed by MNA tool and associated socio-economic, demographic, psychological and nutritional factors were checked by binary logistic regression analysis

Results: Among 339 participants, 24.8% were found to be within normal nutritional status, 49.6% were at risk of malnutrition and 24.8% were malnourished. Independent factors associated with malnutrition status among the elderly people after controlling the cofounders in the bivariate analysis were: elderly who were malnourished were those who belonged to backward caste according to traditional Hindu caste system [OR=2.69, 95% CI: 1.17-6.21), being unemployed (OR=3.23, 95% CI: 1.63-6.41),who experienced any mistreatment from caregivers (OR=4.05, 95% CI: 1.90-8.60), being not involved in physical activity (OR=4.67, 95% CI: 1.87-11.66) and those taking medication for any co-morbidities.

Conclusions: Many socio-economic, psychological and physiological factors affect nutritional status in our sample population and these issues need to be addressed for bringing improvement in elderly nutrition and health status.

Keywords: elderly, nutritional status, rural Nepal

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ASSESSMENT OF NUTRITIONAL STATUS IN OBESE CHILDREN DURING A 10 YEARS FOLLOW-UP AND CARDIO-METABOLIC RISK

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Background and objectives: Incidence of childhood obesity and its complications (cardiovascular disease, diabetes, etc.) is increasing. Aim of the study was to evaluated nutritional status of a cohort of obese children with ten years follow-up and to assessed the relationship between body composition, liver and cardiovascular function.

Methods: The cohort was 56 subjects (27 females and 29 males). The dropout was 10 subjects, 23 males and 23 females, aged respectively 10,6+/-1,8 and 9,8 +/-1,51 at time0 and 20,3+/-1.9 and 21,0+/-21.5 at 10 years follow-up.

Anamnesis and FFQ, blood pressure (DBP, SBP), blood analyses, weight, height was measured and Body Mass Index (BMI) was calculated; waist circumference (WC) and body composition (Fat, FFM, TBW, ECW, ICW, BCM) by Bioelectrical impedance analysis (BIA), epiaortic and hepatic ultrasounds was assessed.

Results: BMI, DBP, glycaemia, insulinemia, triglycerides, cholesterol, LDL, HDL, HOMA-IR and Tg/HDL was no statistical differences between males and females at the baseline and after ten years.

BMI in males was 32,55+/-6,20 and in female was 30,77+/-6,04; Fat Mass (FM) was 28,16+/-13,06 and 30,32+/-12,99 respectively; Free Fat Mass (FFM) was 68,57+/-11,19 and 49,19+/-8,36 respectively ; Total body water (TBW) was 50,20 +/-8,17 and 36,05+/- 8 respectively; Body cell Mass (BCM) was 40,76+/-5,38 and 30,16+/-8,19 respectively.

54 % of the subjects are still obese 26% overweight 20% normal weight at follow-up.

72% of patients were affected by liver steatosis (80% of obese, 83% overweight and 30% normal weight). FM (p=0,019), FFM (p=0,04), TBW (p=0,03), was significant difference between in subjects affected by steatosis and not.

A significant increment in males for SBP (p=0,001) and uric acid levels (UAL) (p=0,007), was observed. There was a significant correlation between WC and cIMT (P=0,003; R=0,441) which shows that cIMT is growing proportionally. There was a correlation between WC and UAL (p<0,001; R=0,58). 38% of these subjects have a high-moderate cardiovascular risk.

Conclusions: Results show that is necessary over the course of early life a complete evaluation of obese children and epiaortic and hepatic ultrasounds must be performed in each to established hepatic damage that can persist also after weight loss.

Keywords: Fat Mass, children, cardio-metabolic-risk, follow-up.

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IMPACT OF CHILD NUTRITION POLICY IN MEDELLÍN, COLOMBIA

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Background and objectives: Children´s Nutrition Programs are being considered a social protection strategy to guarantee the right to food. This study aimed to evaluate the "Buen Comienzo" Program of Medellin which is part of the Infant policy of the city, to establish the principles of this policy, how it is being implemented and what have been its results according to the perspective of the different actors involved.

Methods: An evaluation was carried out to the "Buen Comienzo" Program (BCP) which is targeted to children from two to six years of age; the Program seeks the integral development through pedagogical strategies and the supply of food to the children who remain eight hours daily, from Monday to Friday. The evaluation was carried out by using a methodology of multidimensional evaluation by triangulation of methods created by the School of Nutrition and Dietetics of the Universidad de Antioquia. 12 centers located in different zone of the city were evaluated. Anthropometric measures of height, weight and age were registered and semi-structured interviews to parents, educators and high level administrative officers of the Program were conducted.

Results: It was founded that children attending to the BCP have a better nutritional status as comparing with data from Colombia children as a whole and with Medellin children measured by the indicator low height to Age. (6.7% (BCP), 13% (Colombia) and 13.5% Medellin respectively. Parents and educators find positive changes in the eating habits of children, who are transformers of family habits. Related to right to food this principle supports all the infant policy guidelines and most of educators and Program Officers know it. However they state that it is implemented just because the adequate amount and quality of foods. Other aspects as universal coverage, no exclusion criteria, budget allocation are not considered in the analysis.

Conclusions: The "Buen Comienzo" Programe is a strategy to guarantee the right to food although other elements than quality and quantity of food must be added to its structure.

Keywords: Child,Preschool. Policy. Evaluation. Food. Education.

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CONSUMPTION OF SUGAR-SWEETENED BEVERAGES IS NEGATIVELY ASSOCIATED WITH ACADEMIC OUTCOMES IN THE TRANSITION FROM SECONDARY TO HIGHER EDUCATION IN YOUTHS FROM AN INFANCY CHILEAN COHORT

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Background and objectives: A high consumption of sugar-sweetened beverages (SSB), made with high-fructose corn syrup (HFCS), is associated with excessive weight gain and cardiometabolic risk. Moreover, consumption of SSB also relates with impairment in hippocampal learning and memory processes, regardless of weight status. Impairment in memory consolidation and performance is a risk factor for learning difficulties, including, poor academic progress. In Latin-America, the Global School-based Healthy Survey shows that two thirds of adolescents in Argentina, Chile and Uruguay report daily intake of SSB. We aimed to study the association between daily consumption of SSB with academic results (school-grades and high school completion) in adolescent students from Santiago, Chile.

Methods: Observational study in n=678 youths participants in a follow-up beginning in infancy. Consumption of SSB at 16y was assessed using a validated food frequency questionnaire. Academic outcomes were approached as the odds of high school (HS) completion and HS grade-point average (GPA). Multivariate logistic regressions were performed to determine independent associations of snacking with having completed HS, after controlling sex, nutritional status and parental education. ANCOVA was used to estimate differences in high school GPA by consumption of SSB after controlling other influences. The effect size (ES) for difference was estimated using Cohen's d coefficients.

Results: In the sample, 43% of participants had daily consumption of SSB. After controlling other influences, the odds of high school completion were significantly lower among participants consuming SSB once (aOR: 0.60; 95% CI: 0.38-0.95) and twice (aOR: 0.36; 95% CI: 0.19-0.66) a day compared to participant with no SSB consumption. Adolescents consuming SSB once (mean difference: -25 points, p=0.003, d=0.19) and twice (mean difference: -36 points, p=0.011, d=0.28) a day had significantly lower GPA compared to adolescents with no SSB consumption.

Conclusions: In our sample, the consumption of SSB was negatively associated with academic performance in the transition from secondary to higher education. Consumption of SSB was associated with lower GPA and reduced odds of HS completion. Our findings are consistent with previous evidence of a relationship be-

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BREASTFEEDING SELF-EFFICACY AND BREASTFEEDING PRACTICES AMONG LACTATING MOTHERS ATTENDING A MATERNITY TEACHING HOSPITAL. IBADAN. NIGERIA

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Background and objectives: Background: Breastfeeding self-efficacy is the confidence a mother has in her ability to breastfeed her infant. Mothers with low breastfeeding self-efficacy have been observed not to start early initiation of breastfeeding and not to continue exclusive breastfeeding for six months. Few studies have examined the relationship between breastfeeding self-efficacy and breastfeeding practice among lactating mothers in Nigeria. Therefore, this study assessed the relationship between breastfeeding self-efficacy and breastfeeding practices among lactating mothers in Ibadan.

Methods: The study was descriptive cross sectional in design. A total of four hundred and nineteen lactating mothers with infants aged 0-6 months were randomly selected from Adeoyo Maternity Teaching Hospital in Ibadan. A semi-structured interviewer administered questionnaire was used to obtain information on socio-demographic characteristics, breastfeeding knowledge, breastfeeding attitude, breastfeeding self-efficacy and breastfeeding practices (measured using the breastfeeding performance index). Data were analyzed using descriptive statistics such as frequencies, percentages, Mean ±SD and inferential analysis such as chi square, correlation at P < 0.05.

Results: The mean age of the mothers and infants was 28.8 ±5.3 years and 2.1 ±1.5 months respectively. Majority (76.4%) of the mothers had high breastfeeding self-efficacy. Almost all (98.8%) of the mothers had breastfed during the previous 24 hours, but despite this, 78.3% of infants were still bottle fed. The proportion of mothers who scored high breastfeeding performance index was 93.3%. There was good breastfeeding knowledge (82.8%) and positive breastfeeding attitude (23.2%) among the mothers. A significant positive correlation was observed between breastfeeding self-efficacy and breastfeeding practices; and also between breastfeeding self-efficacy and breastfeeding knowledge.

Conclusions: Breastfeeding self-efficacy was observed to positively influence breastfeeding knowledge, which was also positively associated with optimal breastfeeding practices. Mothers should be properly informed on the importance of breastfeeding to boost their confidence to breastfeed.

Keywords: Breastfeeding, Self-efficacy, Lactating mothers.

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ASSOCIATION OF HELICOBACTER PYLORI IN-FECTION WITH ANTHROPOMETRIC INDICES AND BLOOD PRESSURE AMONG UNDERGRAD-UATE STUDENTS IN SOUTHEAST OF IRAN

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Background and objectives: There are inconclusive evidence on the association of Helicobacter pylori (H.pylori) with cardiometabolic disorders such as obesity and hypertension. The aim of current study was to assess the association of H.pylori seropositivity with anthropometric indices and blood pressure among a group of young population in southeast of Iran, Zahedan.

Methods: A total of 363 undergraduate students at Zahedan University of Medical Sciences were participated in this cross-sectional study, in 2014. H.pylori positivity was examined by measuring serum anti- H.pylori IgG antibodies. Anthropometric indices including body mass index(BMI),waist circumference(WC),waist to hip ratio (WHpR),and waist to height ratio (WHtR),as well as systolic blood pressure(SBP) and diastolic blood pressure (DBP) were measured using standard protocols.

Results: H.pylori seropositivity In our study was 45.7%(166/363).H.pylori positive subjects had significantly lower mean values of BMI compared to H.pylori negative subjects.While WC,WHpR,WHtR,SBP,and DBP were not significantly different between the two groups. Also multiple regression analysis didn't show any significant association between H.pylori seropositivity and other study variables.

Conclusions: H.pylori seropositivity was significantly associated with BMI ,but not with central obesity indices and blood pressure among a group of young undergraduate students in southeast of Iran.

Keywords: Helicobacter pylori; Anthropometric indices; Blood pressure; Undergraduate students;Iran

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ASSOCIATION BETWEEN NUTRITIONAL STA-TUS AND FOOD HABITS IN SCHOOL CHILDREN FROM SANTIAGO

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Background and objectives: Environmental and social changes can alter eating behavior, which flavors the development of overweight and obesity. The National Food Consumption Survey reveals the high rates of overweight in scholar children, and the lack of accomplishment from alimentary recommendations. Investigations must be done to discover possible behaviors that favours the increase of malnutrition by excess. This study seeks to associate alimentary habits with nutritional status in children from first to fourth grade.

Hypothesis: Children from first to fourth grade with malnutrition by excess have a higher prevalence of bad alimentary habits compared with their normal-weight peers.

Methods: Application of a pre-elaborated survey that measured alimentary habits to 82 students from first to fourth grade. It was measured weight, height, waist girth, skinfold thickness and muscular strength, and nutritional status was established by BMI/Age. Associations between nutritional status, muscular strength and waist girth with alimentary habits were made.

Results: The distribution according to nutritional status shows 54.8% (n = 45) of eutrophic schoolchildren and 45% (n = 37) with excess malnutrition; Within this category, 19.5% of the subjects are overweight, 19.5% are obese and 6% are severely obese. The association between alimentary habits and nutritional status shows that 29,3% of children presents poor nutritional habits and are eutrophic, and 20,7% have poor alimentary habits and have malnutrition by excess. A 25,6% have good alimentary habits and are eutrophic, and 24,4% have good alimentary habits and malnutrition by excess. There are no differences between alimentary habits and nutritional status.

Conclusions: It is recommend to depthly analyse the alimentary habits survey applied in this study, because the results revealed inconsistencies between children´s diet and their nutritional status.

Keywords: Food habits
Obesity

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FACTORS THAT MOTIVATE YOUNG WHITE MOTHERS FROM LOW SOCIO-ECONOMIC OR DEPRIVED BACKGROUNDS TO SUCCESSFULLY BREASTFEED - A QUALITATIVE EXPLORATORY STUDY IN BIRKENHEAD, UNITED KINGDOM

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Background and objectives: Breastmilk is the gold standard for all infants in terms of infant nutrition. In view of this, WHO has recommended that breastfeeding must be initiated during the first hour of life and continued until two years or over. Breastfeeding initiation rates continue to be very low in the United Kingdom (UK) (74%) with even lower rates in the Wirral (57%). In the UK, studies have proven that white adolescent mothers from deprived backgrounds are the least likely to breastfeed and therefore require additional support to their unique developmental position. The study investigated the factors that motivate the few mothers who breastfeed at Birkenhead to successfully breastfeed for at least six weeks.

Methods: The study was an explorative and inductive qualitative study involving four mothers aged between 18 and 30 years. Data were collected using semi –structured questionnaires . Interviews were audio-recorded and analysed using thematic analysis approach.

Results: The study identified some factors that motivate young white British mothers to successfully breastfeed. The study found that one-to-one support from midwives, and family and friends could positively influence them to adopt breastfeeding practices. Further, a positive societal attitude towards breastfeeding in the public could influence breastfeeding positively. Also, knowledge about breastfeeding, a beautiful baby growth and no sickness encouraged mothers to continue breastfeeding. The study also revealed that mothers were willing to sacrifice for their babies so far as they knew of the benefits for the baby.

Conclusions: The findings of this study suggest that young British white mothers require support to motivate them to breastfeed and sustain breastfeeding practices. However, because this study was a small scale qualitative study the findings are not generalisable. A further large scale study, adopting a mixed method approach, could be useful to investigate whether this is a general need or views of the white British young women.

Keywords: Breastmilk, motivate, breastfeed, young British white mothers.

Further collaborators

This dissertation was supervised by Dr Clare Soulsby. Department of Clinical Sciences. University of Chester.

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THE CORRELATION OF OBESITY INDICES WITH BLOOD GLUCOSE AMONG A GROUP OF MEDICAL UNIVERSITY EMPLOYEES IN ZAHEDAN, SOUTH-EASTERN OF IRAN

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Background and objectives: Employees are considered as an at-risk group for obesity and its adverse outcomes particularly cardiovascular (CV) disease. The present study was conducted to assess the correlation of obesity indices with blood glucose among a group of medical university employees in Zahedan, south-eastern of Iran.

Methods: This cross-sectional study recruited 211 healthy medical employees of Zahedan University of Medical Sciences during October 2015. Obesity indices including body mass index (BMI), waist circumference (WC), waist to hip ratio (WHpR) and waist to height ratio (WHtR) were measured in accordance to standard criteria. Blood glucose was measured after a full night fasting. Data analysis was done by SPSS using descriptive statistics, bivariate analysis and Pearson correlations.

Results: Women had significantly higher values of weight, WC, WHpR and fasting blood sugar than men (p < 0.05). Bivariate analysis showed that those with BMI, WC or WHtR above the cut-off-points levels had significantly higher serum levels of blood glucose compared to normal subjects. BMI and WC had significant positive correlation with blood glucose and these correlations were slightly stronger for WC compared to BMI.

Conclusions: BMI and WC had an almost moderate correlation with blood glucose among a sample of medical university employees in south-eastern of Iran. Therefore, using WC along with BMI is suggested as the preferred method for assessment of blood glucose among this at risk group.

Keywords: Anthropocentric indices, Blood glucose, Medical employee

LOW BIRTH WEIGHT AND FEEDING PRACTICES ARE ASSOCIATED WITH CHILD WASTING AND THE CO-OCCURRENCE OF WASTING AND STUNTING IN SOUTH ASIA

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Background and objectives: Undernutrition remains a major public health and development problem in South Asia, where 15% of children <5 years of age are wasted and roughly 38% are stunted. Low birth weight (LBW) and poor infant and young child feeding (IYCF) practices are also prevalent across the region, likely contributing to undesirable child outcomes.

Methods: We examined associations between LBW and seven measures of IYCF with three anthropometric outcomes in children aged 0 to 59 months old (mo): being wasted (WHZ<-2), being severely wasted (WHZ<-3), and the co-occurrence of both wasting and stunting (HAZ<-2). Recent cross-sectional national surveys from South Asia were pooled and logistic regression accounting for the surveys' clustered designs and adjusted for a number of factors were used to examine the relationships of interest.

Results: Approximately 62,509 children from 6 countries were included in the analysis, of which 16% were wasted, 5% severely wasted and 6% were both wasted and stunted. Children with reported LBW had a higher odds of being wasted (AOR (95% CI): 1.60 (1.45, 1.76)) as well as severely wasted (1.57 (1.34, 1.83)), compared to children without reported LBW. Children 0 to 23 mo who were reportedly breastfed within the first hour postpartum, those not provided prelacteal feeds in the first three days of life, and 0 to 5 mo who were exclusively breastfed were significantly less likely to be wasted later in life (p<0.05 for all three predictors). Not meeting the minimum diet diversity was associated with the likelihood of wasting and the co-occurrence of wasting and stunting in India and not meeting the minimum acceptable diet was associated with the co-occurrence of wasting and stunting in India.

Conclusions: LBW and poor IYCF are associated with wasting, severe wasting and the co-occurrence of wasting and stunting among South Asian children. Programs to prevent LBW and promote improved IYCF need to be urgently scaled up to reduce the risk of wasting across the region.

Keywords: Wasting, low birth weight, infant and young child feeding, South Asia

IS MID UPPER ARM CIRCUMFERENCE (MUAC) CUT-OFFS BY WHO ALONE A SUFFICIENT CRITERION FOR DETECTING ACUTE MALNOURISHED PAKISTANI CHILDREN, AGED 6-59 MONTHS?

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Background and objectives: Weight for height Z score (WHZ) is a gold standard for identifying malnutrition in children <5 years of age. Whereas, mid upper arm circumference (MUAC) is a proxy for WHZ and is mostly used in Pakistan to identify malnutrition in children. Current WHO guide lines for community screening for malnutrition recommend MUAC < 11.5 cm for severe acute malnutrition (SAM), however it is abstruse how MUAC relates to WHZ to define acute malnutrition. Our aim was to estimate the cut-off values of MUAC and its sensitivity and appropriateness with WHZ scale for screening SAM in children from Sindh, Pakistan.

Methods: A cross-sectional study of 491 children < 5 years old from rural area of Adilpur village, Sind Pakistan was undertaken. Demographic information was taken from the parent/caretaker and anthropometric data was assessed according to WHO protocol. Receiver operator characteristics (ROC) curves and Youden index was constructed to present the relationship between MUAC and WHZ score for different cut-off values of MUAC for moderate acute malnutrition (MAM) and SAM. Sensitivity and specificity of MUAC < 11.5 cm was calculated in comparison with WHZ-score <-3 standard deviation (SD).

Results: The sensitivity and specificity of MUAC <11.5 cm was 25.5% and 98.6 % respectively. Using the current WHO cut-off <11.5 cm for MUAC to screen SAM, more than 74 % of children with WHZ-score < -3 were missed. The best and optimal cut-off for screening SAM was obtained at MUAC <12.8 cm with sensitivity 63.8 % and specificity 88.1 %.

Conclusions: Using the current WHO cut-off of MUAC can only capture a smaller proportion of children < 5 years of age with SAM. There is an urgent need to revise cutoff value of MUAC from <11.5 cm to 12.8 cm in the community for treatment of malnutrition in children < 5 years old or we need to apply both tools MUAC <11.5 cm and WHZ-score < -3 SD simultaneously to detect all SAM children in the community.

Keywords: Severe acute malnutrition (SAM), mid upper arm circumference (MUAC), WHZ-score, Pakistan

DIETARY DIVERSITY AND ADEQUACY OF NUTRIENTS CONSUMED BY SCHOOL CHILDREN IN NAIROBI CITY COUNTY, KENYA

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Background and objectives: School children experience changes in biological, psychological and social dimensions. Nutrition adequacy or inadequacy at this stage affects nutrition and health outcomes throughout the life cycle. The objective of the study was to analyze dietary diversity and adequacy of nutrient intake among school children in comparison with the global recommendations.

Methods: A cross sectional study design was used to collect data on a randomly selected sample of 202 children from urban day primary schools in Nairobi City County. Dietary diversity and 24-hour recall questionnaires were used to assess diversity and adequacy of the nutrients intake. Data from 24-hour recall was analyzed using Nutri-survey computer software to establish the amount of nutrients consumed in a day and compared with the reference values (FAO/WHO, 2001). The dietary diversity score (DDS) was calculated from 14 food groups. A score of ≤3 was considered as low, 4-6 was considered as moderate while a score of >6 was considered as high dietary diversity (FAO, 2008). Spearman's correlation was used to assess association between DDS and nutrients intake.

Results: The mean DDS for the children was 3.8(SD1.4) The diet was predominantly cereals, legumes and green leafy vegetables. There was inadequate consumption of vitamin A rich fruits and vegetables, organ meat, eggs, fish and flesh meat. Protein consumed was mainly from plant origin. Approximately a third of the children had inadequate consumption of crucial micronutrients such as iron (31.2%), vitamin A (28.7%), zinc (30.7%) and calcium (33.2%). Significant correlations were found between DDS and micronutrient intake and no association with energy intake. Energy intake was adequate for most (94.6%) children. Mean values for diet composition indicated that carbohydrate constituted 57.5% of the total energy, fat provided 33.1% and protein provided 9.4%.

Conclusions: The DDS of school children in Nairobi is low. Though the consumption of energy was generally adequate, the diet was devoid of protein and crucial micronutrients. This study recommends promotion of efforts to improve consumption of diversified, adequate diets by school children.

Keywords: Dietary diversity, nutrient adequacy, school children

MOTHER'S KNOWLEDGE, ATTITUDE AND PRACTICE OF INFANT NUTRITION AND HEALTH CARE STRATEGIES IN DELTA STATE, NIGERIA

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Background and objectives: Knowledge of infant nutrition and health care strategies has been found to be high in numerous studies, but the lacunae have always been in the actual practice of the knowledge received. The nutrition education strategy currently used in disseminating information to pregnant and lactating mothers at Primary Health Care Centres during antenatal clinics does not seem to have yielded significant impact in improving the nutritional health of infants in Delta State. This could be linked to the assumption that programs are not designed to achieve behavior change; only to provide information. This study seeks to gather evidence for policy advocacy on nutrition behavior change communication as a key strategy to improving infant health and nutrition in Nigeria.

Methods: A cross sectional assessment as part of formative research was conducted to review the situation and gaps in knowledge, skill or other issues related to infant nutrition and health of mothers in Delta State. A semi-structured questionnaire was used to gather information on demographic characteristics, nutritional status of mother-child pair and KAP of infant nutrition and health care strategies in 6 communities in Delta State. Knowledge, attitude and practice scores were determined by the number of correctly answered questions.

Results: A total of 260 mother-child pairs participated in this study. Only 8.8% of mother had adequate knowledge of infant nutrition and health care strategies. 61.9% did not know what exclusive breastfeeding meant. 41.2% had negative attitudes towards infant nutrition and health care strategies. Results: **Conclusions:** It is evident from this study that there needs to be an improvement in the methods used in disseminating information on infant nutrition and health care at the community levels. It is possible to bridge the difference in educational gaps through the use of behavior change communication strategies for nutrition education.

Keywords: Infant, Nutrition, Knowledge, Attitude, Practice

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NUTRITIONAL STATUS AND TREATMENT OUTCOME OF OUTPATIENTS WITH EATING DISORDERS IN AN INTERDISCIPLINARY THERAPEUTIC CENTER IN BUENOS AIRES

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Background and objectives: Eating disorders (ED) are a psychiatric problem that affect mainly young women. The multidisciplinary team approach to patients with ED is widely recognized as the best practice. The Specialized Center for Eating Disorders provides individualized treatment to children, adolescent and adults with ED. The aim of this study is to describe demographic characteristics, nutritional status and treatment drop-out and success rates.

Methods: The database used contains data on diagnosed patients (DSM-IV) in 2010-2016. For nutritional status WHO body mass index categories are used, and data statistical analysis with software R Version 3.3.1.

Results: 991 patients (84% F, 16% M). Women /man rate was 9 in anorexia nervosa (AN) and bulimia nervosa (BN), and 4 in eating disorders not otherwise specified (EDNOS). Mean age was 38.5 ± 16.6y, for AN 21.6 ± 10.9y, for BN 35 ± 14.9y and for EDNOS 43.5 ± 15.7y. The age variable was found to be significant (p< 0.001) in a logistic regression model to predict among ED. The distribution of the admitted patients was 59.0% EDNOS, 29.2% BN, 11.5% AN, and 0.3% feeding disorder of infancy. Prevalence of excess weight was 75.4 % (overweight 22.6%, obesity 44.4% and morbid obesity 8.0%); 20.2% had normal weight and 4.5% underweight; 8.7% had psychiatrics comorbidities. 932 patients started treatment; 2% were derived; 60% dropped-out (9% returned to treatment); 13% finished treatment and 25% were still in treatment at the end of the study period. Drop-out was 49% in AN, 57% BN and 66% EDNOS. Patients with EDNOS showed a tendency for higher dropout (p=0.01). Patients who dropped out on the first 3 months (40%), were 38% for personal reasons, 20% for administratively discharged, 8% for time schedule, 4% went inpatient and 30% for unknown reasons. The average length of treatment was 443 ± 220 days.

Conclusions: EDNOS showed the highest prevalence of ED. More than half of the patients had 31-60 y old. The rate of obesity of the patients studied is in line with comparable studies. The multidisciplinary treatment approach and drop-out rates results were similar to reported from other countries.

Keywords: eating disorders, nutritional status, dropout

Conflict of Interest Disclosure: Olga Ricciardi is CEDA's (Center Specializing in Eating Disorders) Managing Director.

Mariana Moretti is Medical Director in CEDA. Beatriz Grippo works as outside consultant in CEDA and Julieta Villar is Institutional relations manager in CEDA.

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NUTRITION STATUS AND ACADEMIC PERFORMANCE OF PRIMARY SCHOOL CHILDREN IN UGANDA. A CASE OF MPIGI DISTRICT, CENTRAL UGANDA

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Background and objectives: Background: The Education for All (EFA) Global Monitoring Report (UNESCO, 2011) states that more than a quarter of children below fifteen years of age in sub-Saharan Africa are underweight due to poor diet and malnutrition, making them more vulnerable to disease and less able to concentrate at school. Although studies relating schoolchildren's health and nutritional status and their learning have been conducted elsewhere, relatively little is known about the nutrition and health conditions of school aged children in Uganda and how these factors affect their learning.

Objective: To investigate the relationship between health, nutritional status and academic performance of primary school children in Mpigi district, a rural district in Central Uganda

Methods: The study was a cross-sectional comprising of total of 300 primary school children in class 4, between the ages of 7-14 years. All children sampled were from day schools. Sampling of schools was done using a modification of WHO 30x30 cluster sampling technique (using only grade one schools). The children were sampled randomly from a list of all children in the target class. Anthropometric measurements were done using standard methods. The educational performance of children was assessed using results scored for both English and Mathematics tests.

Results: The prevalence of stunting and wasting in the study group was 15.3% and 3%, respectively. Being wasted seemed to favor academic performance, as the likelihood of children scoring above cut- off increased with when the child was wasted (OR= 3.171). Stunting as expected had a negative effect on academic performance (OR=0.969). Factors that significantly affected academic performance included; feeding at school, suffering from disease, mother's education and main source of water (p<0.05)

Conclusions: Under nutrition and poor health in the primary school children in rural areas is likely to negatively affect educational performance, which could affect their quality of life in the long-term.

Keywords: Educational performance, nutritional status, school children, under nutrition.

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DIETARY INTAKES ON GROWTH DEVELOPMENT IN THE FIRST DECADE FROM A BIRTH COHORT IN TAIWAN

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Background and objectives: The purpose of this study is to examine the dietary intakes and growth development including adiposity rebound from birth to 10 years old with different birth weights.

Methods: We follow and analyze the dietary and anthropometric parameters from 1 to 10 years old children with relative high (n=87 at 1, 43 at 10), normal (n=69 at 1, 12 at 10) and low (n=73 at 1, 39 at 10) birth weights from singlet pregnancies.

Results: The average energy intakes are from 890 kcal at 1, 1360 kcal at 5 and 1759 kcal at 10 years old with 93 kcal/kg at 1, 73 kcal/kg at 5 and 52 kcal/kg at 10, respectively (p for trend <0.05). The percent of energy from fat increases (23 to 30%) and carbohydrate decreases (64 to 54%) with age until 10; however, the protein intake is constant around 13-14% throughout the 10 years. The plant sources of protein (soy products) and fat (seed oil) consumption increase with age until 10 years old and the vitamin C and calcium intake decrease with age until 6 years old. The average BMI is 16.8 at 1 and reaches the lowest value of 15.5 at 5 and 17.4 at 10 years old. Although the relative high birth weight group is still with the higher means for weight and height at 10 years old, the relative low birth weight group shows the highest energy intake per kg with the fast growth rate from birth to 2 years old and catches up growth with the relative normal birth weight group. The early adiposity rebound group has the higher energy and nutrient intakes than the late adiposity rebound group, especially for the boys. The protein intake at 2 years old is positively related to the early adiposity rebound (p<0.05). The calcium intake at 6 years old is positively related to height at 7 (p<0.05).

Conclusions: Our data demonstrate that the birth weight has time-varying latent effect on growth development in the first decade of childhood. The nutrition status including energy and protein intakes have impact on adiposity rebound indicated by BMI changes for children.

Keywords: dietary intakes, growth development, adiposity rebound, birth cohort, Taiwan

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CHANGES IN BODY COMPOSITION AND CARDIOMETABOLIC RISK AMONG BLACK SOUTH AFRICAN ADULTS

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Background and objectives: Obesity-related health risk may differ by ethnicity at the same body mass index (BMI). The objectives of this study were too determine the predictive value of the World Health Organization (WHO) overweight cut-point of BMI of 25 kg.m2 in men and women, respectively, to identify 10-year cardiometabolic risk and to determine optimal male (M) and female (F) BMI cut-points to identify 10-year cardiometabolic risk.

Methods: In the longitudinal PURE study of healthy black South Africans (n=2010), aged 30-90 years in 2005, demographic, lifestyle and anthropometric measures were taken and blood pressure, fasting serum triglycerides, high-density lipoprotein (HDL)-cholesterol and blood glucose were measured. Three or more risk factors according to international metabolic syndrome (MetS) criteria (fasting plasma glucose >5.6 mmol/L /oral hypoglycemic drugs, systolic blood pressure (SBP) >130 and/or diastolic blood pressure (DBP) >85 /anti-hypertensive drugs, serum TG >1.7 mmol/L, HDL-cholesterol <1 mmol/L M /<1.3 mmol/L F) and waist circumference (WC) above sex-specific cut-points (>94cm M/ >80cm F) in 2015 were defined as elevated cardiometabolic risk.

Results: Participants with WC above sex-specific cut-points in 2005 had significantly higher odds of having the MetS in 2015 (odds ratio, OR = 6.99, 95% CI 5.01, 9.75). Participants with BMI in the overweight/obese range (BMI > 25 kg/m2) in 2005 had significantly higher odds of having the MetS in 2015 (OR = 6.38, 95% CI 4.55, 8.94). Receiver Operating Characteristic curves to identify a sex-specific optimal BMI cut-point associated with increased 10-year risk indicated a BMI cut-point of 23.3 kg/m2 in men and 24.6 kg/m2 in women. A BMI cut-point of 30 kg/m2 had poor diagnostic performance. WC cut-points to predict 10-year risk of MetS were 78.0 cm in women and 84.0 cm in men. All cut-points were lower than international proposed cut-points for adiposity.

Conclusions: Baseline BMI and WC were significantly associated with increased cardiometabolic risk after follow-up. The predictive value of the WHO overweight cut-point of body mass index (BMI > 25 kg/m2) was similar to the new sex-specific cut-points (23.3 kg/m2 for men, 24.6 kg/m2 for women), but a BMI of 30 kg/m2 had poor diagnostic ability.

Keywords: obesity, body mass index, waist circumference, cardiometabolic risk, Africa

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REDUCED CHILD STUNTING AND BETTER COGNITION: A CONTRIBUTION BY COMMUNITY HEALTH WORKERS IN A RURAL SETTING, KENYA

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Background and objectives: Globally an estimated 139 million children are stunted with a majority living in Low and Middle-Income countries. Stunting is an indicator of chronic malnutrition and after the second year of life, it becomes irreversible. It has been associated with infections, diminished survival and impaired cognitive development. Poor child cognition can be influenced by poor nutrition, health status, genetics and environmental factors. It has been linked to delayed school enrollment, performance and decreased economic activity in later years. Trained Community Health Workers have been proved effective in improving other health outcomes however, little research has been conducted if any of their contribution in stunting and cognitive development. This study assessed the impact of Community Health workers on stunting and cognition among children aged less than two years in a rural setting in Kenya.

Methods: A Comparative study design that recruited 192 children (101 intervention and 91 comparative arms). Community Health Workers provided key nutrition messages and counseling services to caregivers of children at specific times during child's growth. Stunting was computed based on WHO height-for-age Z-scores; and cognition determined by Bayleys Scale of Infant Development and composite scores.

Results: Child mean age was 11.84 (±6.90) months and height 70.86 (±8.82) cm. The prevalence of stunting was lower in intervention than in comparative arm (5.94% and 25.27% respectively; p<0.001) while poor cognition rates were higher in the comparative compared to intervention arm (34.07% and 14.85% respectively; p<0.001). After adjusting for confounders, children whose mother's had tertiary education had 0.03 times lower relative risks of being severely stunted comapred to those whose mothers had primary education [RRR:0.033: 95% CI:0.001-0.891; p=0.042]

Conclusions: Community Health Workers have proved effective in reducing child stunting and improving child cognition. Mother's education showed to be critical in improving these outcomes. Further research on factors associated with the outcomes is recommended. Program interventions should target children aged below two years as it is the window period of opportunity

Keywords: Stunting, cognition, Community Health Workers, intervention

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EFFECT ON LEAN MASS, LINEAR GROWTH AND IRON STATUS OF IMPROVED ANIMAL SOURCE FOODS AND MICRONUTRIENTS FORTIFIED COMPLEMENTARY FOODS AMONG KENYAN YOUNG CHILDREN: A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Malnutrition from early infancy in resource limited settings may result from among others low quality complementary foods with severe consequences later in life despite the rich food resources locally available, currently neglected but potentially useful as alternatives.

Objective: To evaluate the two developed WinFood products as replacement products for the standard corn-soy blend plus (CSB+) product meant for general distribution in food aid to combat moderate malnutrition. WinFood Classic (WFC) containing grain amaranth, maize, small fish(3%) and edible termites (10%) and WinFood Lite (WFL) with only grain amaranth, maize and fortified with minerals and vitamins as in CSB+ were tested against the existing purely plant based minerals and vitamins fortified CSB+.

Methods: Design: A randomized, double blind, controlled trial in 499 Kenyan children assigned aged 6 mo. To receive one of study foods for 9 months viz WFC (energy density 423.6Kcal/100g and 12.2mg/100g Iron; n=165); WFL (energy density 407.2Kcal/100g and 12.5mg/100g Iron; n=167); CSB+ (fortified with vitamin-mineral premix; n=167). The study was designed primarily to assess increments in fat-free mass by a deuterium dilution technique, linear growth and change in plasma ferritin, body iron stores and plasma transferrin receptor (sTfR). Secondary outcomes were changes in anthropometric variables including skin folds. Data were analyzed by the intention-to-treat approach.

Results: No differences between the WinFoods(WFC and WFL) and the CSB+ with respect to changes in fat free mass(FFM), length and haemoglobin(P=0.536,0.52 and 0.078 respectively). The mean length increased by 10.0cm (95% CI: 9.6, 10.5cm) during the 9 mo. Mean weight increased by 2.2kg (95% CI: 2.0, 2.4kg).The

weight gain was due to increase in mean FFM by 2.27kg (95% CI: 2.06, 2.48kg) and loss of fat mass by -0.09kg (95% CI:-0.28, 0.10kg). There were differences in plasma ferritin and sTfR (P=0.005 and 0.008 respectively). No differences between the WinFoods and the CSB+ in the changes from secondary outcomes except for head circumference of 3.5cm (95% CI: 1.1, 5.9cm) (P=0.002).

Conclusions: Locally produced products did not differ from CSB+. The small fish and the edible termites can potentially improve the nutritional quality of locally processed complementary foods and food aid products thus need further investigation.

Keywords: body composition, iron status, fortification, edible winged termites, Kenya.

Further collaborators

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SLEEP DURATION, DIETARY INTAKE AND SEDENTARY BEHAVIOUR IN BRAZILIAN TEENS: THE LONCAAFS STUDY

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Background and objectives: Introduction. Studies suggest that the association between increased variability of hours of sleep and abdominal obesity can be explained by the energy intake, with special attention to carbohydrates and fats. Sedentary behavior linked to screen time has been strongly associated with sleep behavior disorders.

Objective. To describe the relationship between sleep duration, sedentary behavior and macronutrients dietary intake in adolescents aged 10 to 14 years old from João Pessoa, Paraíba, Brazil.

Methods: Design. Cross-sectional study developed with 1384. The data analyzed in this study are part of the first year (2014) collection of Longitudinal Study Sedentary Behavior, Physical Activity, Eating Habits and Health of Adolescents - The Loncaafs Study. Based on information of a whole week (week and weekend), sleep duration was measured as the mean difference between the time to

sleep and wake up. The time spent sited in a week represented the sedentary behavior. More than 100 minutes sited/day was considered sedentary. The consumption of macronutrients was rated by two 24hours recalls. Linear regression models were used to assess the relationship between sleep duration with diet and sedentary behavior.

Results: The sample comprised 54% of girls, with a mean age of 11.9 years old. The prevalence of sedentary behavior was 76.2%, being sited, in mean, for 243 minutes/day. The average calorie intake was 2226.90 kcal and the macronutrients were on average within the recommended for the age group studied. There was a negative association between sleep duration and the consumption of saturated fats only for girls and negative between sleep duration and sedentary behavior in both sexes.

Conclusion: Sleep duration was negatively associated with the consumption of saturated fat in girls and sedentary behavior in both sexes.

Keywords: Sleep; Diet; Adolescents.

RELATIONSHIPS BETWEEN CONSUMPTION OF ULTRA-PROCESSED FOODS, GESTATIONAL WEIGHT GAIN AND NEONATAL OUTCOMES IN A SAMPLE OF US PREGNANT WOMEN

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Background and objectives: An increasingly large share of diet comes from ultra-processed foods (UPFs), which are assemblages of food substances designed to create durable, convenient and palatable ready-to-eat products. There is increasing evidence that high UPF consumption is indicative of poor diet and is associated with obesity and metabolic disorders. This study sought to examine the relationship between percent of energy intake from ultra-processed foods (PEI-UPF) during pregnancy and maternal gestational weight gain, maternal lipids and glycemia, and neonatal body composition. We also compared the PEI-UPF indicator against the US government's Healthy Eating Index-2010 (HEI-2010).

Methods: Data were used from a longitudinal study performed from 2013-2014 at the Women's Health Center and Obstetrics &

Gynecology Clinic in St. Louis, MO, USA. Subjects were pregnant women in the normal and obese weight ranges, as well as their newborns (n=45). PEI-UPF and the Healthy Eating Index-2010 (HEI-2010) were calculated for each subject from a one-month food frequency questionnaire (FFQ). Multiple regression analysis was used to analyze the relationship between PEI-UPF or HEI-2010 and various clinical outcomes. The ability of these dietary indices to predict gestational weight gain was also compared with the predictive abilities of total energy intake and total fat intake.

Results: An average of 54.4 ± 13.2% of energy intake was derived from UPFs. A 1% point increase in PEI-UPF was associated with a 1.57 kg increase in gestational weight gain (p=0.0036). Similarly, a 1% point increase in PEI-UPF was associated with increases of 0.23 mm in thigh skinfold (p=0.030), 0.14 mm in subscapular skinfold (p=0.017), and 0.59 percentage points in total body adiposity (p=0.038) of the neonate.

Conclusions: PEI-UPF was associated with and might be a useful predictor of several maternal and neonatal clinical outcomes. PEI-UPF was a better predictor of gestational weight gain and infant body fat than either total energy or fat intake, and a better predictor of infant body fat than HEI-2010. Thus, maternal UPF consumption may also affect long-term health outcomes (such as obesity) of the child. UPF consumption should be limited during pregnancy and diet quality should be maximized in order to improve maternal and neonatal health.

Keywords: ultra-processed foods, gestational weight gain, birth outcomes, neonatal body composition, maternal nutrition

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NUTRITIONAL STATUS AND FEEDING PRACTICES OF CHILDREN AGED 2 TO 5 YEARS IN VHEMBE DISTRICT, LIMPOPO PROVINCE, SOUTH AFRICA

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Background and objectives: Appropriate feeding practices are fundamental to child survival, growth and development. Poor infant feeding practices are associated with child death as well as poor growth.

To determine the nutritional status of children and feeding practices of children aged 2 to 5 years.

Methods: A cross-sectional study design was used. Five pre-schools were randomly selected from Vhembe District. 243 children aged 2 to 5 years were randomly selected from each pre-school. Caregivers were interviewed using the local language. The children's anthropometric measurements were also taken on the same day of interview by field workers. Data was analyzed using SPSS computer software version 23.

Results: More than half of children were females while 48% were males. The age of caregivers ranged from 20 to 36 years. Very few caregivers (3.3%) had no schooling while majority had secondary education and higher. However, two thirds of caregivers were unemployed and depended on child support grant for income. Majority of children were given three meals or more per day with very few who were given less than three meals per day. Almost all children were introduced to complementary foods before the age of six months. More than half of the children stopped breastfed at the age of 13 to 18 months. Majority of children were given starchy foods and very few children were given vegetables and fruits. Few children were stunted, 16.7% were wasted while 13.3% underweight.

Conclusions: A significant number of children were stunted, wasted and underweight. In addition, poor infant feeding practices were also observed as most children were given complementary foods before the age of six months.

Keywords: Malnutrition, children, nutritional status, feeding practices

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PREVALENCE OF IRON, FOLIC ACID AND VITAMIN A DEFICIENCY IN COLOMBIAN SCHOOLCHILDREN AND ADOLESCENTS AND POSSIBLE RISK FACTORS

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Background and objectives: According to the National Survey of Nutrition Status in Colombia 2010, 1:4 children aged 6 to 59 months, 11% between 13 and 17 years old and 8% from 5 to 12 years old presented anemia; and 1:4 children aged 1 to 4 years have vitamin A deficiency. The objective is to determine the prevalence and possible risk factors of iron (Fe +), folic acid (FolAc) and vitamin A (vitA) daily intake by means of a reminder of 24 hours in Colombian children, according to the Program for the Evaluation of Diets and Management of Food (DIAL).

Methods: Study of prevalence among schoolchildren (n=1221) and adolescents (n=1650) between 8-18 years of age in the Andean zone (La Unión=476), atlantic (Cartagena=427), pacific (Cali=1220, Quilichao=356) and amazonic (Florencia=392) zone and public (n=2342) and private (n=529) school, to whom sociodemographic (age, sex), anthropometric variables (weight, height, circumference of waist) and were diagnosed of malnutrition by body mass index, low height by height/age and abdominal obesity by waist circumference. Normal daily Fe+= 9-18 mg, FolAc=300-400 µg and VitA=500-700 µg were considered according to age and sex.

Results: 2871 Colombian children were included; 52.1% male, 12.9±2.4 years old, with Fe+=81.8±77.1 mg/d, FolAc=322.9±243.7 µg/d and VitA=665.6±1252.7 µg/d. With malnutrition=28.9%, low height=5.9% and 4.4% abdominal obesity. They presented Fe+=66.3%, FolAc=77.1% and VitA=63.2% deficiency; being possible risk factors for the Atlantic zone, adolescents, malnutrition, female sex and school (p <0.05).

Conclusions: More than 2/3 of these Colombian schoolchildren and adolescents presented deficiency of daily intake of Fe+, FolAc and VitA; being possible risk factors, geographical area, school, age group, sex and nutritional status.

Keywords: Iron deficiency, Folic acid deficiency, Vitamin A deficiency, Children

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OVERWEIGHT, OBESITY, UNDERNUTRITION, ALTERED NUTRITIONAL HEIGHT AND ABDOMINAL OBESITY IN COLOMBIAN SCHOOLCHILDREN AND ADOLESCENTS

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Background and objectives: According to the National Survey of Nutrition Situation in Colombia 2010, 1:6 children and adolescents are overweight or obese; and 1:10 children and adolescents from 5 to 17 years of age present growth retardation. The objective is to determine the nutritional status in Colombian children, according to body mass index (BMI) and height for age (HA) using the WHO tables, and according to waist circumference (wc).

Methods: Prevalence study in schoolchildren (n=1235) and adolescents (n=1746) between 8-18 years of age in the Andean zone (La Unión=488), atlantic (Cartagena=489), pacific (Cali=1254, Quilichao=357) and socioeconomic variables (age, sex), anthropometric variables [weight (W), height (H), wc) and socio-demographic variables (age, sex), from public (n=2433) and private (n=548) schools. Were diagnosed by BMI in malnutrition (obesity, overweight, undernutrition and severe undernutrition), altered height (low height and severe low height) and abdominal obesity by wc (> p90%).

Results: 2981 Colombian children were included; 52.0% male, 12.9±2.3 years old, with W=48.0±13.3 kg, H=153.3±12.9 cm and wc=71.1±9.4 cm. They presented malnutrition=28.8%, altered heigth=6.0% and 4.2% abdominal obesity; being possible risk factors for malnutrition=the pacific zone, the private school and the adolescents (p<0.05), for the altered height=the public school, and for abdominal obesity=the pacific zone, the public school, the female sex, and the school children.

Conclusions: About 1/3 of these Colombian schoolchildren and adolescents presented malnutrition (undernutrition=2.3%, overweight and obesity=26.5%), and few had low height and abdominal obesity; being possible risk factors, the geographical area, the school, the age group and the sex.

Keywords: Overweight, Obesity, Undernutrition, Abdominal obesity, Children

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DAILY CONSUMPTION OF ENERGY, MACRONUTRIENTS AND DIETARY FIBER IN COLOMBIAN SCHOOLCHILDREN AND ADOLESCENTS

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Background and objectives: In assessing the nutritional status of children, the daily consumption of ingested foods makes it possible to assess whether their diet is complete, balanced, adequate and adequate. The objective is to determine the prevalence and possible risk factors of the daily consumption of kilocalories (kcal), carbohydrates (CH), proteins (Prot), fats (Fat) and dietary fiber (Fib) in Colombians children, according to the Program for the Evaluation of Diets and Management of Food (DIAL).

Methods: Study of prevalence among schoolchildren (n=1221) and adolescents (n=1650) between 8-18 years of age in the Colombian andean (La Unión=476), atlantic (Cartagena=427), pacific (Cali=1220, Quilichao=356) and amazonic (Florencia=392) zone, from public (n=2342) and private (n=529) school, to whom socio-demographic (age, sex), anthropometric variables (weight, height, circumference of waist) and were diagnosed of malnutrition by body mass index, low height by height/age and abdominal obesity by waist circumference. Normal daily consumption of kcal=1750-2250 kcal/m2, CH=50-55% total caloric value (TCV), Prot=10-15% TCV, Fat=30-35% TCV and Fib=Age + 5 grams.

Results: 2871 Colombian children were included; 52.1% male, 12.9±2.4 years old, with kcal=1950.4±672.2 kcal/m2/d, CH=259.8±113.0 g/d, Prot=360.8±304.0 g/d, Fat=354.9±311.7 g/d and Fib=20.7±15.1 g/d, with malnutrition=28.9%, low height=5.9% and 4.4% abdominal obesity. They presented a hypocaloric daily consumption=75.0%, hypoglycemic=42.5%, hyperprotein=71.5%, hyperlipid=44.9% low in Fib=53.6%; being possible risk factors in the Atlantic and Andean zone, adolescents, malnutrition, female sex and private school (p <0.05).

Conclusions: The daily consumption of these Colombian schoolchildren and adolescents was hypocaloric, hypoglycemic, hyperprotein, hyperfat and low in fiber; being possible risk factors, geographical area, school, age group, sex and nutritional status.

Keywords: Daily consumption, Energy, Macronutrients, Dietary fiber, Children

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DIETARY DIVERSITY WAS NOT ASSOCIATED WITH SERUM CONCENTRATIONS OF VITAMIN B12, IRON AND FOLATE IN A COHORT OF PREGNANT GHANAIAN ADOLESCENT GIRLS

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Background and objectives: Previous studies have suggested that good dietary diversity in the diet has an impact on micronutrient intakes and could be used as reliable measures for assessing nutrient adequacy. The objective of this study was to assess dietary diversity and determine its association with serum concentrations of iron, folate and vitamin B12.

Methods: A cross sectional study involving 203 pregnant adolescent girls was carried out. The minimum women dietary diversity score tool was assessed based on a 3-day 24-hour recall. Serum concentrations of vitamin B12, folate and iron were also measured

Results: The mean minimum dietary diversity score was 5.26±1.37. Z-test for proportions showed significant differences between the proportion of women who had good and poor diversities (41.3% vs 58.7%; P=0.013). Serum concentrations of iron, vitamin B12 and folate were 20.62±13.09μmol/L; 552.09±348.43ng/L and 3.72±ng/L respectively. Minimum dietary diversity score did not show any correlations with serum indices

Conclusions: Minimum dietary diversity score did not show any association with serum concentrations of iron, vitamin B12 and folate.

Keywords: Pregnant. Dietary diversity. Iron. Folate. Vitamin B12.

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PREGNANT WOMEN'S FOOD IN TAKE DURING PREGNANCY – A CASE STUDY IN TESHIE, A SUBURB OF ACCRA

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Background and objectives: The "Life Course Perspective" proposes that environmental exposures, such as, social, physical, biological, and behavioral factors, as well as life experiences, throughout the entire life span, influence health outcomes in current and future generations. Nutrition, from preconception to adulthood, encompasses all of these factors and has the potential to positively or negatively shape the individual or population health trajectories and their intergenerational differences. It is not just about eating food but it is about eating a well-balanced meal which has all the nutrients available to grow. A well-balanced diet is important for adequate nutrition to address common nutrient deficiencies among pregnant women that include iodine, iron, vitamin A and zinc. In settings where the prevalence of anaemia among women of reproductive age is 20% or higher, intermittent iron and folic acid supplementation is recommended as a public health intervention in menstruating women, to improve haemoglobin concentrations, iron status and reduce anaemia.

Methods: Study methods:
The study adopted a phenomenological case study approach. Using this qualitative methodology, this study fills a gap in the literature on pregnant women's experience in what to eat and why to eat that kind of foods during pregnancy. The voices of pregnant women were used in a form of narratives in the selected town. The kind of foods these women eat, during pregnancy forms the basis of this study.

Results: The research findings revealed different foods eaten by these pregnant women during pregnancy. Almost 75 percent of women between the ages of 18 – 25 years were eating what they were able to buy in terms of affordability, whilst the remaining 25 percent were following the prescribed menu from the antenatal clinics. Other findings were the social-cultural practices.

Conclusions: Poverty plays an important role in food intake and that it is not that awareness is not created or pregnant women have not been educated during antenatal about the kind of foods to eat during pregnancy but it is because they lack what it takes to buy the food. Majority confirmed that, they didn't have access to affordable healthy foods.

Keywords: Life course, nutrition, food security and deficiency

144/574

DIETARY STUDY IN CUBAN ELDERLY WITH ALZHEIMER'S DISEASE (AD) OR MILD COGNITIVE IMPAIRMENT (MCI)

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Background and objectives: Background: Alzheimer's Disease, the most common form of dementia, is increasing at a rhythm without precedents at worldwide. Some epidemiological

studies have explored the relation between the diet and AD, some foods have been relationed with dementia, while others no.

Objectives: To evaluate the association between the food intake with MCI and AD with in Cuban elderly.

Methods: Cross sectional study in 424 subjects older than 65 years; 43 with AD, 131 with Mild Cognitive Impairment (MCI) and 250 normal subjects from Havana City. Dementia was diagnosed using the 10/66 Dementia and DSM-IV criteria and MCI with the Petersen criteria. Diet was evaluated using a weekly food-frequency questionnaire. Pearson's Chi square and prevalence ratios were used for data analysis.

Results: Food intake was not different between studied groups, with exception that cereals and tubers, intake was lowest in AD group. Fish, grains+fruits, vegetables, fats intake was inadequate in 80%, 60%, 50%, 50 % respectively, in the subjects of the three groups. It was not found any association between inadequate intake of different foods with the prevalence MCI and AD, only the inadequate intake of cereals and tubers was associated significantly with the prevalence of AD.

Conclusions: High frequency of older adults of three groups had insufficient intake of fish, grains+fruits, vegetables and fats. Only the insufficient intake the cereals and tubers was associated significantly with the prevalence of AD.

Keywords: Diet, Alzheimer's Disease, Cognitive Impairment.

144/623

DAILY CONSUMPTION OF CHOLESTEROL, SATURATED, MONO-UNSATURATED AND POLY-UNSATURATED FATTY ACIDS IN COLOMBIAN SCHOOLCHILDREN AND ADOLESCENTS

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Background and objectives: A diet that achieves a healthy lifestyle from the point of view of cardiovascular prevention corresponds to a prudent diet recommended for the whole pediatric healthy population. The objective is to determine the daily consumption of cholesterol (Cholest), saturated fatty acids (SFA), mono-unsaturated fatty acids (MFA) and polyunsaturated fatty acids (PUFAs) through a 24-hour reminder in Colombian children, according to the Program For the Evaluation of Diets and Food Data Management (DIAL)

Methods: Study of prevalence among schoolchildren (n=1221) and adolescents (n=1650) between 8-18 years of age in the Andean (La Unión=476), atlantic (Cartagena=427), pacific (Cali=1220, Quilichao=356) and amazonic (Florencia=392) zone, from public (n=2342) and private (n=529) school, to whom sociodemographic (age, sex) and anthropometric (weight, height, circumference of waist) variables and were diagnosed of malnutrition by body mass index, low height by height/age and abdominal obesity by waist circumference. Normal daily intake of Colest=300 mg/d, SAF=≤10% total caloric value (TCV), MFA=≤15% TCV and PUGAs=<10% TCV were considered according to age and sex

Results: 2871 Colombian children were included; 52.1% males; 12.9±2.4 years old; with kcal=1950.4±672.2 kcal/m2/d, Cholest=346.0±205.6 mg/d, SFA=149.6±129.7 mgr/d, MFA=165.5±145.0 mgr/d and PUFAs=144.4±142.8 mgr/d, with malnutrition=28.9%, low height=5.9% and 4.4% abdominal obesity. They presented a high daily consumption in Cholest=46.4%, SFA=49.3%, MFA=11.6% and PUFAs=43.7%; being possible risk factors for the consumption of Cholest, SFA and PUFAs, geographical area, school, sex and malnutrition (p <0.05)

Conclusions: The daily consumption of these Colombian schoolchildren and adolescents for Cholest, SFA and PUFAs is higher than 43.7%; being possible risk factors, geographical area, school, sex and nutritional status

Keywords: Cholesterol, Saturated fatty acids, Mono-unsaturated fatty acids, Polyunsaturated fatty acids, Children

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144/636

THE INFLUENCE OF BREASTFEEDING HOSPITAL INITIATIVE ON NUTRITION KNOWLEDGE OF MOTHERS AND FEEDING PRACTICES OF CHILDREN IN LIMPOPO PROVINCE, SOUTH AFRICA

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Background and objectives: Baby Friendly Hospital initiative (BFHI) provides a vital contribution to achieving and sustaining the behaviours and practices necessary to enable every mother to give every child the best start in life by creating sustainable change beyond the hospital (WHO, 2008). The main aim was to evaluate the influence of BFHl on nutrition knowledge of mothers, breast feeding and feeding practices for children under two.

Methods: Cross sectional and exploratory with an analytical component. The target population was mothers with a new baby following their delivery either at the BHFI or Non-BFHI hospital. Mothers were purposefully recruited from randomly selected primary health care clinics located in the district. Data was collected by nutritionists using a validated questionnaire which had four sections namely demographic and environment factors, Nutrition knowledge on infant feeding, infant feeding practices, eating habits of children and mothers and a section for anthropometric data recording. Data was analyzed using SPSS, version 24. Descriptive statistics will percentiles, chi-square and Pearson's correlation with a p-value of >0.005.

Results: The final sample was 169 mothers and 169 children under two years. Data was analysed for 157 mother-child pairs with full data sets. 36.7% of mothers were from a BFHI status

hospital while 56.2% were from a Non-BFHI hospital. Mothers (61.7%) were aged between 21 – 30 years while children were between 7 – 24 months (91.5%).

Knowledge: 18.5% from BFHI status and 27.2% from Non-BFHI were taught on nutrition during pregnancy; 14.8% from BFHI status and 40.8% from Non-BFHI (p= 0.000) were taught on nutrition during breastfeeding; 15.4% from BFHI status and 35.4% from Non-BFHI (p = 0.009) were taught on nutrition during lactation.

Practices: 8.8% from BFHI status and 17.0% Non-BFHI exclusively breastfed their babies up to six months. 35.5% of all had already been started on formula with 24.3% having done so by 2 months. Many of the children had already been introduced to complementary feeds by 6 months with maizemeal porridge (65.1%) being the first food.

Conclusions: The level of knowledge was higher with mothers from the Non-BFHI hospitals and the feeding practices were also better.

Keywords: Breastfeeding hospital initiative; mothers; feeding practices of children

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144/683

LEVEL OF KNOWLEDGE AND TEACHING OF INFANT AND YOUNG CHILD FEEDING (IYCF) PRACTICES AMONG HEALTH WORKERS IN DELTA STATE

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Background and objectives: Background: Infant and young child nutrition can be improved if health workers (Nurses and Community Health Extension Workers) with adequate nutrition knowledge provide nutrition education to pregnant/lactating mothers who attend Ante-Natal/IYCF Welfare clinics.

Objectives: To determine the Level of knowledge and teaching of Infant and Young Child Feeding (IYCF) practices among Health Workers in Delta State.

Methods: 235 Primary Health Centres (PHCs) were randomly selected from 445 functioning PHCs in Delta State. The most senior health workers: 198 Nurses and 37 Community Health Extension Workers (CHEWs); one from each Centre were used for the study in May, 2015. The survey instrument was a structured and validated questionnaire. Data obtained were on the subjects` knowledge and teaching of early initiation, exclusive breastfeeding, complementary feeding, etc. The data was analyzed using Epi-info 7. Frequencies and percentages were the statistical methods adopted to separate and compare mean values.

Results: 98.7% of the subjects give nutrition education to pregnant/lactating mothers during Ante-Natal/IYCF welfare clinics.

31.9% teach mothers to initiate breastfeeding within 30 minutes of delivery, 1.3% could mention two signs of good attachment, 80% inform the mothers to request their babies weight any time they come to infant welfare clinics, 48.1% agreed that exclusive breastfeeding plus ARV drugs (for babies and positive mothers) is allowed respectively.

Conclusion: There is need to improve health workers` knowledge and counseling skills on IYCF practices through training and supportive supervision so as to enhancing the nutritional status of infants and young children.

Keywords: Knowledge, health workers, infant, young child, Delta state.

144/693

EFFECT OF PERICONCEPTIONAL MULTI MICRONUTRIENT SUPPLEMENTATION ON THE LEVEL OF TOTAL ANTIOXIDANT STATUS

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Background and objectives: Antioxidant plays pivotal role to prevent abnormal pregnancy outcome that have correlation with oxidatif stress. This research aims to evaluate the effect of multiple (MMN) micronutrient supplementation in periconception period on the level of total antioxidant status (TAS).

Methods: Research was conducted in four sub-districts of the city of Makassar from January 2013 to October 2014 using a double-blind, randomized, controlled trial design. A total of 240 preconception women were recruited; 32 of these women became pregnant. The participants were randomly assigned into an intervention group (n=18) and a control group (n=14). The intervention group received (MMN) capsules, while the control group received iron/folic acid (IFA) capsules. The groups were instructed to take the capsules every day until a urine pregnancy test showed positive results for pregnancy. TAS eximinized using colorimetric tecnique. Statistical analysis was performed using the Wilcoxon and Mann-Whitney U tests.

Results: The results showed that the average level of TAS decreased in both the intervention (-0.09 ± 0.1 mmol/l; p=0.009) and control groups (-0.09 ± 0.1 mmol/l; p=0.01). However, these changes were not significant. Furthermore, the mean difference between the two groups was also not significant (p=0.76).

Conclusions: These findings suggest that periconceptional MMN supplementation can't prevent reduction of TAS in preg-

nant women. Future studies are needed to measure levels of vitamin A, C, and E as well as Iron, Zink, Selenium, and Copper to test their correlation with TAS in order to analyze the effect of multi micronutrient accurately.

Keywords: MMN, TAS, Periconception

Further collaborators

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144/715

NUTRITIONAL STATUS OF AUTISTIC AND NON-AUTISTIC SCHOOL GOING CHILDREN AGED 3-5 YEARS IN DHAKA CITY

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Background and objectives: Early childhood (3-5 years) is very important for physical growth and nutritional development. Autistic children are one of the most vulnerable groups, so it is important to measure their growth & nutritional development. Their nutritional status is still unknown as no data about their nutritional status was found from previous studies in Bangladesh. So, the study objective was to observe and compare nutritional status of 3-5 years school going children with and without autism in Dhaka city, Bangladesh.

Methods: A cross-sectional study was conducted from April to December, 2016 among children aged 3-5 years with autism (n=53) and normal children (n=53), were selected from four schools in urban Dhaka city, Bangladesh.

Anthropometric data (height, weight & MUAC) were collected by following the standard method of WHO. Data was entered by WHO Anthro software and Z score classification was used to classify their nutritional status.

Results: The prevalence of stunting (<-2 HAZ) among autistic and normal children were 3.8% vs.1.9%. About 7.5 % wasting (<-2 WHZ) was seen in both groups of children. However, weight for age was significantly different in both groups of children. Among autistic and normal children underweight (<-2 WAZ) was found 1.9% vs. 7.5% and overweight (>2 WAZ) was 35.8% vs. 28.3%. According to MUAC reference value (>13.5) about 98.1% children of both groups had normal nutritional status.

Conclusions: It was seen that overweight percentage was found more among autistic and normal children. Many reasons

could be responsible for this condition such as lack of consciousness of parents about their children's dietary habit, inappropriate food intake, preference of fast foods, physical impairment of autistic children, less physical activity and so on. Awareness should be raised to pay attention to this vulnerable group for improving their situation. More future study on this field is now compulsory in Bangladesh to overcome the situation and reveal more about this area to add new knowledge and information.

Keywords: Nutritional status, autistic, children.

144/718

COMPARATIVE STUDY ON FOOD PREFERENCE OF SCHOOL GOING CHILDREN AGED 3-5 YEARS WITH AND WITHOUT AUTISM IN DHAKA CITY

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Background and objectives: Food consumption pattern is one of the major contributors for optimal nutritional status of among children. A food consumption pattern varies due to food preference, acceptance and rejection behavior. It is therefore needed to explore the food preference, acceptance and refusal among the autistic children. The children with autism are most vulnerable who are disregarded from evidence. So, we considered autistic and non-autistic children of 3-5 years aged to compare their food preference, acceptance and rejection to understand their eating behavior. To the author's knowledge, such studies have not been conducted yet in Bangladesh. This research objective was to observe and compare food preference, acceptance and refusal of 3-5 years school going children with and without autism in Dhaka city, Bangladesh.

Methods: A cross-sectional study was conducted from April to December, 2016 among 3-5 years old children in four selected schools in urban Dhaka city, Bangladesh. Both normal and autistic groups contained 53 samples (n=53) each. The data was collected by a structured questionnaire to the parents of children about their children's food preferences, acceptance and refusal. The data was entered by IBM SPSS software (version 20.0) and analyzed by Chi-square test.

Results: There was a difference between the food preferences of two groups of children. However, both the group had special preferences. Homemade food was most accepted to the autistic children (58.5%), where the percentage for normal children was 52.8%; on the other hand 60.4 % normal children preferred fast food where the percentage for autistic was 56.6%. Soft drinks were

also more preferred by normal children (73.6%) than autistic children (58.5%). Street food was less preferred to the autistic children (22.6%), than normal children (15.1%).

Conclusions: The total amount and variety of consumed food by the autistic children was lower than children without autism. The reason could be their physical disability, chewing problem, carbohydrate intolerance, lack of caring practice etc.

Keywords: Food preferences, most preferred food, autistic children, and normal children.

144/732

DIET AND SEMEN QUALITY AMONG HEALTHY POLISH MEN

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Background and objectives: It is estimated that in Central and Eastern Europe 8-12% of men are infertile, and in the case of 20% of infertile couples in the region, indicates a 56% part of the male factor in the occurrence of infertility [1]. Numerous studies have shown that a healthy diet with a high intake of fish and seafood, poultry, vegetables, fruits, legumes, through the high content of antioxidants are associated with better parameters of semen quality and reduced risk of asthenozoospermia [2].

To explore association between the frequency of intake of food groups and quality parameters of semen.

Methods: A study included 81men attending an infertility clinic. Diet was assessed using validated food frequency questionnaire (FFQ). Sperm concentration, progressive motility and morphology were evaluated by computer-aided semen analysis (CASA) according WHO criteria. Additionally evaluated weight and height, BMI and physical activity levels (IPAQ). Differences between tertiles of quality parameters of semen and the frequency of intake of food groups were assessed.

Results: We observed significant differences only between tertiles of sperm concentration and BMI (T2=25.0±2.0 vs. T3=25.4±2.3 times/day), progressive motility and processed meat (T1=0,22±0.32 vs. T3=0.43±0.46 times/day) and beer (T1=0.17±0.16 vs. T2=0.36±0.57 times/day). We also found differences in tertiles of sperm morphology and plant oils (T1=1.09±2.0 vs. T2=0.57±0.45 times/day), cottage cheese (T1=0.26±0.29 vs. T3=0.69±0.63 times/day), fresh legumes (T2=0.05±0.11 vs. T3=0.14±0.21 times/day), cruciferous vegetables (T2=0.29±0.24 vs. T3=0.59±0.48 times/day) vegetables rich on vitamin C or β-carotene (T2=1.15±0.81 vs. T3=2.20±1.86 times/day), and yellow-orange vegetables (T2=0.26±0.27 vs. T3=0.59±0.61 times/day). No relationship between physical activity and sperm parameters were identified.

Conclusions: Our findings suggest that a higher frequency of intake of cottage cheese, fresh legumes and various kind of vegetables may be associated with quality of semen. This positive associ-

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ation support the importance of preconception tailored nutritional counselling.

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Keywords: food frequency, vegetables and fruits, semen quality

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144/733

DIETARY PATTERNS AND PRE-SARCOPENIA AMONG POLISH WOMEN

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Background and objectives: Pre-sarcopenia is a significant association factor for functional impairment among older adults [1]. Low muscle mass could be associated with increased morbi-mortality and should be identified for optimizing preventive and therapeutic nutritional strategies [2]. The aim of the present evaluation was describe association of the nutrients intake in dietary patterns and the risk of pre-sarcopenia in perimenopausal women.

Methods: A study included 530 women aged 32 - 63 years in Warmia and Mazury province in Poland. Low muscle mass was defined by Appendicular Lean Mass index based on Newman's equatation on the basis of total fat tissue mass and body height assuming the cut-off points for the Polish population. The nutrients intake evaluation was performed by a 24-hour recall repeated sevenfold at irregular intervals was taken into account. Dietary patterns were defined by principal component analysis with varimax rotation. Dietary patterns were included variables with loading vector > 0.7. The risk of pre-sarcopenia was assessed using logistic regression model.

Results: The Varied dietary pattern the risk of pre-sarcopenia decreased with the intake of total protein (OR=0.92, 95%CI=0.86-0.98), animal protein (OR=0.89, 95%CI=0.81-0.98), carbohydrates (OR=0.98, 95%CI=0.97-0.99), fiber (OR=0.85, 95%CI=0.72-1.00), calcium (OR=0.99, 95%CI=0.99-1.00), magnesium (OR=0.98, 95%CI=0.97-0.99), iron (OR=0.74, 95%CI=0.56-0.97), zinc (OR=0.61, 95%CI=0.41-0.90), vitamin A (OR=0.99, 95%CI=0.99-0.99), niacin (OR=0.78, 95%CI=0.63-0.97) and vitamin B6 (OR=0.17, 95%CI=0.02-0.83). There was no association between risk of pre-sarcopenia and nutrient intake in Fatty dietary pattern. In both dietary patterns, the risk of pre-sarcopenia decreased with increasing BMI and body fat content.

Conclusions: The identification of dietary patterns in pre-sarcopenia has important implications for dietary interventions that

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might delay age-associated loss of skeletal muscle mass. It will allow to setting dietary recommendations to improve the quality of life of the elderly.

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Keywords: pre-sarcopenia, low muscle mass, dietary patterns, women

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144/738

CHARACTERIZATION OF MEDITERRANEAN DIET PATTERN AND THEIR ADHERENCE IN A PREPUBERAL POPULATION OF METABOLICALLY HEALTHY OBESE

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Background and objectives: The prevalence of child obesity is increasing rapidly worldwide. It is associated with several risk factors for later heart disease and other chronic diseases including hyperlipidaemia, hyperinsulinaemia, hypertension, and early atherosclerosis. A subgroup of obese subjects classified as "metabolically healthy obese" (MHO) present a favorable metabolic profile despite having excess body adiposity. The aims of this study were to study the obesity prevalence in our environment and analyzed how is the characteristics of their Mediterranean Diet (MedDiet) of a population of prepuberal MHO.

Methods: Seventy-eight prepuberal obese with a body mass index (BMI) ≥95 of 25.1±3.4 kg/m2 and aged 7.8±1.3 years. They present ≤1 of the following criteria: abdominal circumference and blood pressure, ≥90 percentile, impaired fasting glucose, HDL-C <40 mg/dL and triglycerides >90 mg/dL were included in this study. Food consumption was evaluated with a validated food-frequency questionnaire, exploring the consumption of carbohydrates, meat, milk derives, fish, fruit, vegetables, and olive oil. Adherence to the traditional MedDiet was assessed by a 13-point MedDiet scale that incorporated the main characteristics of this diet. Physical activity was evaluated by accelerometry (Actigraph TM GT3X).

Results: All population showed discrete levels of adherence to the MedDiet (7.1±1.8 points). On the other hand, we observed in baseline conditions an important energy intake in all subjects (2041.0±353 kcal), intake of total carbohydrate (217.0±44.2%), total proteins (85.2±15.1%), total fat (93.3±22.0%), saturated fatty acids (29.8±8.3), monounsaturated fatty acids (40.0±8.5), polyunsaturated fatty acids (14.6±5.7), cholesterol (336.8 ± 87.2 mg/d), fiber intake (12.7±4.0 g/d) and lastly, vitamin D intake was 1.6±1.2 g/d, without significant differences by gender. On the other hand, physical activity showed the high prevalence of sedentarism (866.1±284.3 min/d), and discrete physical exercise with light to moderate (94.5±52.6 min/d), moderate to vigorous (18.6±15.0 min/d) and total physical activity (367.7±148.8 counts/min*d).

Conclusions: A healthy lifestyle, adequate eating habits, and physical activity should be encouraged. A lack of physical activity has been reported to be a major predicting factor of childhood obesity, superseding compliance with a MedDiet.

Keywords: childhood, physical activity, nutrition, questionnaire.

Further collaborators

144/742

KETOGENIC DIET (KD) FOR THE TREATMENT OF REFRACTORY EPILEPSY AND OTHER DISEASES IN CHILDREN AND ADOLESCENTS

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Background and objectives: KD is a high fat, low carbohydrate diet, which controls refractory epilepsy when efficacy of antiepileptic drugs (AED) is limited. The aim of this study is analyze

efficacy, tolerability (T), and adverse effects (AE) of the KD on patients attended in KD program at Hospital of Clinics.

Methods: We used data of patients in KD between 2013-2017. Efficacy was measured by seizure frequency (SF) decrease and AED reduction. SF was evaluated according to parents´ chart SF per month prior to KD, and were compared with data obtained at baseline. Response to KD was measured after 6 months. T of diet acceptance by patients was evaluated as presence of nauseas or vomits. AE and reasons for diet discontinuation were registered. Response to KD was effective if was free of seizure from the start or if were seizure control >50%.

Results: The patients were 9 boys (82%) and 2 girls (18%). The ages, ranged from 18 months to 18 years and 10 months. Diet duration ranged from 3 months to 31 months. By the 6 month on diet, 7 patients (64 %) presented more than 50% decrease in SF, 3 of them (27%) were seizure free (one from the start; the others at 3 and 8 months, respectively). AED have been reduced, one patient (9%) cut drugs in half. All patients experienced cognitive improvement in life quality and cognitive skills. During the KD none patient refused the diet by its palatable characteristics, and none presented nauseas or vomiting. Adverse effects were observed in four patients (36%) that presented hypertriglyceridemia, symptomatic hypoglycemia, heartburn, selenium deficiency and hypocalcemia. The only reason for diet interruption was in one patient (9%) that presented psychiatrics symptoms.

Conclusions: KD has proven to be an effective clinical treatment for children with difficult- to-control seizures, often allowing medication reduction. All patients accepted KD very well. Adverse effects occurred, but none of patients needed discount the diet.

Keywords: ketogenic diet, efficacy, adverse effects

MODIFICATION OF DOCOSAHEXAENOIC ACID COMPOSITION OF MILK FROM WOMEN WHO RECEIVED DHA FROM A MILK FORMULA DURING THE PREGNANCY AND BREASTFEEDING PERIOD

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Background and objectives: Background: Docosahexaenoic acid (DHA, 22:6, n-3) is a LCPUFA fundamental for brain and visual function in humans. Western diet provides low DHA, which is reflected in low DHA in maternal milk. "Purita mama" is a milk formula distributed by the Chilean government as part of a social nutrition program (no cost by the beneficiary) for the women during of pregnancy and breastfeeding period. The formula provides 60 mg of DHA and 19 mg of eicosapentaenoic acid (EPA, 20:5, n-3)/ in 200 mL of formula when the product is reconstituted. The product was formulated as an alternative to provide n-3 PUFA with the aim to reduce deficit in the intake of DHA during the pregnancy and breastfeeding period.

Methods: Forty three healthy pregnant women (22-33 year-old), were randomly separated into two groups: control group (CG) with normal feeding (n = 21) and "Purita mama" group (PG) (n = 22), which received 400 mL/day of the formula from the third trimester of pregnancy until the first six months of nursing. The fatty acid profile of erythrocyte phospholipids, measured at six months of pregnancy, at the time of delivery and at six months of nursing, and the fatty acid profile of the milk collected during the first six months of breastfeeding period were assessed by gas-chromatography.

Results: PG, compared to the CG showed (i) a significant increase in DHA and EPA ingestion, no showing modification for ALA, linoleic acid (LA, 18:2, n-6) and arachidonic acid (AA, 20:4, n-6); (ii) a significant increase of erythrocyte DHA and EPA, whereas ALA, LA and AA were not modified; (iii) an increased milk content of DHA during the six months of breastfeeding period. ALA, LA, AA and EPA were not modified in breast milk in this period.

Conclusions: Consumption of "Purita mama" during the last trimester of pregnancy and the six months of breastfeeding increases the DHA content in breast milk. Acknowledgment: Supported by Grant 11140174 from FONDECYT (Initiation Program).

Keywords: Docosahexaenoic acid (DHA); pregnancy and breastfeeding period; milk formula "Purita mama"; breast milk.

INFANT FEEDING PRACTICES OF MOTHERS/CAREGIVERS AND ANTHROPOMETRIC INDICES OF INFANTS (0-12 MONTHS) IN ETCHE LOCAL GOVERNMENT AREA, RIVERS STATE, NIGERIA

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Background and objectives: Infant nutrition is an integral part of infant health. The infant is more sensitive to abnormal nutritional situations and less adaptable than in later life to different types, forms, proportions and quantities of food (Ekpunobi, 2007). The study aims at assessing the infant feeding practices of mothers/caregivers and the Anthropometric Indices of infants (0-12 months) in Etche Local Government Area, Rivers State, Nigeria.

Methods: 207 infants (0-12 months) and their mothers were randomly selected from five communities in Etche by method of balloting without replacement. Information on infant feeding practices, demographic data, socio-economic data of the infants were obtained from the mothers using a structured and pre-tested questionnaire. Anthropometric measurement of the infants were carried out using standard methods and datas obtained were

converted to WHO standard using Anthro-Software. Information gathered from questionnaires were analyzed using the Statistical Package for Social Sciences (SPSS) Version 20. Results were presented in frequencies and percentages and categorized using (WHO) anthro software. Comparison was done using Chi- square test for statistics and variables were categorized using Anova.

Results: The study showed that 85% of mothers/caregivers practiced breastfeeding and put their infants to breast in less than one hour after delivery while 1.7% delayed till after 7days of delivery. 17% discarded the first milk after delivery, due to ignorance and lack of encouragement from the family. 49.1% of infants were breastfed for 5-10minutes at each feeding, 74.9% were given water and other foods apart from breastmilk. 44.5% were given complementary food, like pap. and 44.4% practiced bottle feeding.

The study depicted high rate of stunting as 39.1% and 8.7% of infants were severely and moderately stunted, 27.6% and 8% were severely and moderately wasted and 23.6% and 10.9% were severely and moderately overweight.

Conclusions: Poor infant feeding practices majorely resulted in high rate of stunting among the infants as observed in this study. Adaptation of appropriate infant and child feeding practices and Nutrition Education could remedy the situation and reduce the prevalence of malnutrition in children.

Keywords: Infant feeding practices, Caregivers, Anthropometric indices, Malnutrition.

MATERNAL DISSATISFACTION WITH CHILDREN'S BODY SIZE IN PRIVATE SCHOOLS IN THE FEDERAL DISTRICT, BRAZIL

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Background and objectives: The presence of maternal dissatisfaction with the child's body size may affect maternal attitudes and practices related to child's food consumption. The aim of this study was to investigate the prevalence of maternal dissatisfaction with children's body size and its associated factors among mothers of first- to-third-grade elementary school students of private schools in the Federal District, Brazil.

Methods: A cross-sectional study with 554 mother-school-children pairs was conducted. Children had their weight and height measured and mothers completed an online questionnaire that evaluated sociodemographic data, maternal nutritional status (self-reported weight and height), maternal dissatisfaction with her own body size and maternal dissatisfaction with child's body size (using silhouette scales). Mothers identified the silhouettes that best represented them and their child's current and desired body. Disagreements were identified as dissatisfaction. Descriptive analyses, chi-square test, logistic regression and Spearman's corre-

lation were performed. This study was approved by the Research Ethics Committee of the University of Brasilia.

Results: Most mothers (50.9%) were dissatisfied with child's body size, 27.1% of those desired child weight gain and 23.8% child weight loss. 39.1% of mothers of normal weight children would like the child to gain weight. Regarding mothers of overweight and obese children, 48.7% and 83.1% wanted their child to loose weight, respectively. Mothers of boys and younger children were more likely to want their child to gain weight. Mothers of girls and overweight children were more likely to want their child to lose weight. A positive correlation was observed between maternal dissatisfaction with her own body size and with child's body size.

Conclusions: It was found that most mothers were dissatisfied with their child's body size and that mothers tend to transfer dissatisfaction with their own body size to their child's body size. Given this, it is important to control the silhouettes conveyed by the media, seeking to idealize a healthy silhouette as a pattern of beauty. In addition, it is also necessary to raise the awareness of families, so that, if dissatisfied with the child's body size, they seek qualified health professionals who can guide them.

Keywords: nutritional status; body size; children; mother-child relations.

PREVALENCE OF MALNUTRITION AND ASSOCIATED FACTORS IN ELDERLY IN GUALACEO TOWN, ECUADOR

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Background and objectives: BACKGROUND
The progressive aging of the population brings with it several health problems; mainly nutritional. Malnutrition and factors that determine them are a worldwide concern; for this reason, the identification of these is fundamental because many of them could be modified, impacting in favor of a healthy aging.
OBJECTIVE
To determine the prevalence of malnutrition and associated factors in elderly in Gualaceo town, Ecuador.

Methods: Analytical cross-sectional study that involved 250 senior citizens. Sampling was probabilistic, stratified and randomized in 9 parishes of Gualaceo town, from the Azuay Province, in Ecuador. Nutritional status was assessed using the Mini Nutritional Assessment (MNA); associated factors such as depression, with the Yesavage Geriatric Depression Scale; physical activity with the International Physical Activity Questionnaire (IPAQ), socioeconomic level with the Survey Of Stratification of the Socioeconomic Level of the National Institute of Statistics and Censuses (INEC), and laboratory parameters: (hemoglobin, lymphocytes,

cholesterol and albumin). The analysis was performed using descriptive statistics and the association was measured with prevalence ratio (PR) and its 95% confidence interval (CI). A multivariate analysis was performed to corroborate this association.

Results: The prevalence of malnutrition was 20.4%, the risk of malnutrition was 47.2%, and 32.4% presented a satisfactory nutritional status. The mean age was 76.31 years (± 8.19). Factors with statistical association were: PR depression = 4.90 (95% CI: 3.08 - 7.79, p = 0.000); Sedentary lifestyle RP = 4.52 (95% CI: 2.81 - 7.28, p = 0.000); Low socioeconomic status RP = 4.04 (95% CI: 1.51-10.7, p = 0.001); Anemia in men and women PR = 2.43 (95% CI: 1.23 - 4.77, p = 0.018) and PR = 4.02 (95% CI: 2.17 - 7.63, p = 0.000) respectively. Hypoalbuminemia RP = 2.87 (95% CI: 1.08 - 4.58 p = 0.000). Multivariate analysis corroborated this association except for hypoalbuminemia.

Conclusions: One-fifth of the adult population of the Gualaceo town is malnourished and it is associated with: depression, sedentary lifestyle, low socioeconomic status and anemia.

Keywords: Older adults, elderly, malnutrition, associated factors

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DIETARY PATTERNS AND BLOOD LIPIDS IN ADOLESCENTS AT 18 YEARS: CROSS-SECTIONAL ANALYSIS NESTED IN THE 1993 PELOTAS (BRAZIL) BIRTH COHORT

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Background and objectives: Dyslipidemia in youth population indicates the need to understand its factors and the need to implement prevention measures. Dietary pattern analyses have emerged as a practical application to delivery information to the population. Here we aimed to establish dietary patterns and to examine whether these dietary patterns are associated with blood lipids at 18 years.

Methods: Cross-sectional analysis of 3,616 participants of the 1993 Pelotas (Brazil) Cohort Study followed up at 18th year. Semi-quantitative food frequency questionnaire was administered, and dietary patterns were established using principal component analysis. Total cholesterol, HDL-cholesterol, LDL-cholesterol and triglycerides were determined using an automatic enzymatic colorimetric method. Dietary pattern scores were analyzed by tertiles

of factor scores, and the independent association of each tertile on lipids was tested using crude and adjusted linear regression models stratified by sex. Triglycerides were log-transformed due to their asymmetric distribution.

Results: Meat and Fast Foods, Fruit and Vegetables, Candies, Sodas, and Dairies and Common-Brazilian patterns were derived. In the adjusted models in which the highest and lowest tertiles of DP scores were compared, we observed that for girls: 1) the third tertile of the Meat and Fast Food pattern presented 1.7 mg/dl (95%CI -3.21;-0.28) lower HDL-cholesterol; 2) the third tertile of the Candies, Soda and Diaries pattern presented triglycerides 5% higher; 3) the second (Beta -4.08, 95%CI -7.47;-0.68) and the third (Beta -4.46, 95%CI -8.41;-0.51) tertiles of the Common-Brazilian pattern presented 4 mg/dl lower total cholesterol, and 6% lower triglycerides; for boys 4) the third tertile of the Common-Brazilian presented 4.6 mg/dl (95%CI -7.91;-1.37) lower total cholesterol. The Fruit and Vegetables pattern was not associated with blood lipids.

Conclusions: Dietary patterns were associated with blood lipids in adolescents at the age of 18. Higher scores for the Common-Brazilian pattern were associated with lower total cholesterol in both sexes. Our results emphasize the importance in understanding the perception of eating patterns among adolescents and the efforts to maintain traditional foods in their diets.

Keywords: Food consumption; Dietary patterns; Adolescents; Lipid profile; 1993 Pelotas Birth Cohort

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CORRELATION OF PARENTAL ECONOMIC STATUS WITH LUNCH INTAKE AND LIFESTYLE BEHAVIORS IN PRESCHOOL CHILDREN IN JAPAN

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Background and objectives: In Japan, concerns about childhood poverty have recently increased, and the "Measures to Counter Child Poverty Law" was enacted in 2014. Various support initiatives have also been introduced at the community level; for example, cafeterias called "kodomo shokudo" have been established where local children and parents can gather for a low-priced meal and food banks. This reflects the fact that childhood poverty is a serious social problem in Japan, and that measures to combat it are urgently needed. In this context, there is concern that the eating and lifestyle behaviors of children who are raised in economically deprived households will negatively affect their health and subsequent development. Nevertheless, very few reports exist on these issues. Similarly, few studies have been published on the effects of poverty on childhood lifestyle behaviors, which can affect eating habits and health in japan. Thus, by focusing on the lunchbox that each child brings to preschool, this study aimed to investigate the relationship of parental economic status with children's lunch intake and lifestyle behaviors.

Methods: This study was conducted at a public kindergarten in Tokyo in November 2016, and it included 67 children and their parents. The study surveyed lifestyle behaviors and food intake (in weight) at lunchtime. For the survey on food intake, the lunchbox was weighed before and after the meal for 4 days, and the average was calculated. For the survey on lifestyle behaviors, a questionnaire was distributed for anonymous completion by parents. Data were collected on the child's physical activity, sleep, eating habits, and parental economic status.

Results: With body mass index as the control variable, the results showed a weak correlation (r=0.308, p=0.014) with lunch intake. By dividing economic status into two groups and using Fisher's exact test, a significant correlation was found between bedtime (p=0.014) on school nights and bedtime on non-school nights(p=0.043).

Conclusions: The results of this survey showed several links between economic status, food intake at lunchtime, and lifestyle behaviors; however, due to the small number of participants, further study with a larger numbers of test subjects is required.

Keywords: toddler, child, lifestyle, box lunch

THE BABY-FRIENDLY HOSPITAL INITIATIVE AND BREASTFEEDING AT BIRTH IN BRAZIL: A CROSS SECTIONAL STUDY

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Background and objectives: Breastfeeding in the first hour after birth is important for the success of breastfeeding and in reducing neonatal mortality. Government policies are being developed in this direction, highlighting the accreditation of hospitals in the Baby-Friendly Hospital (BFH) initiative. The aim of this study was to analyze the association between delivery in a BFH (main exposure), compared to non BFH, and timely initiation of breastfeeding (outcome).

Methods: Data came from the "Birth in Brazil" survey, a nationwide hospital-based study of postpartum women and their newborns, coordinated by the Oswaldo Cruz Foundation. A sample of 22,035 mothers/babies was analyzed through a hierarchical theoretical model on three levels, and all analyzes considered the complex sample design. Odds ratios were obtained by logistic regression, with a 99 % CI.

Results: Among all births, 40 % occurred in hospitals accredited or in accreditation process for the BFHI and 52 % of women underwent caesarean section. In the final model, at the distal level, mothers less than 35 years old, and those who lived in the North Region, had a higher chance of timely initiation of breastfeeding. At the intermediate level, prenatal care in the public sector and advice on breastfeeding during pregnancy were directly associated with the outcome. At the proximal level, being born in a Baby-Friendly Hospital and vaginal delivery increased the chance of

timely initiation of breastfeeding, while prematurity and low birth weight reduced the chance of the outcome.

Conclusions: The studied proximal factors were the most strongly associated with timely breastfeeding, bringing evidence about the importance of adopting Baby-Friendly Hospital Initiative to improve perinatal practices and timely breastfeeding initiation. Special attention should be given to the negative association found between caesarean section delivery without clinical indication and breastfeeding in the first hour after birth, bringing more evidence to the ongoing government efforts to diminish this harmful practice in Brazil. We recommend the reinforcement of BFHI implementation, extending this initiative to the private sector. This measure could contribute not only to improve timely breastfeeding rates, but also reducing unnecessary caesarean section delivery.

Keywords: Breastfeeding, Maternal-Child Health Services, Cross-Sectional Studies, Postpartum Period, Baby-Friendly Hospital Initiative

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THE INFLUENCE OF PRENATAL EXPOSURE TO TRANS-FATTY ACIDS FOR DEVELOPMENT OF CHILDHOOD LEUKEMIA

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Background and objectives: Industrial trans-fatty-acids (TFA) can be found in fried and industrially-processed baked foods and have been associated with negative health outcomes including cancers in adults. Neonates with high umbilical TFA levels have shown less favorable neurodevelopment and increased risk for metabolic diseases. TFA has pro-inflammatory properties and can inhibit metabolism of essential fatty-acids which might be the mechanisms behind the observed associations with cancer risk. Despite the alarming evidence and the fact that millions of Europeans have high TFA intake, currently no EU legislation regulates TFA in foods. In Denmark, a maximum TFA content of 2g/100g is allowed in all Danish produced and imported food since 2004. We aimed to investigate if low gestational TFA exposure, due to the TFA legislation in Denmark, decreased the offspring's childhood leukemia risk.

Methods: In this national, registry-based study, onset of leukemia before the age of 8 years was compared between the trans-

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fat exposed cohorts born between January 1st 2000 – August 31st 2004, and the non-exposed cohorts born between September 1st 2004 – December 1st 2007. The incidence trends were evaluated using piecewise linear splines in a Cox proportional hazard model.

Results: Among all 305,220 children born in Denmark in the defined cohort before the TFA-legislation in 2004, 176 were diagnosed with leukemia before their 8th birthday, compared to 125 among 215,216 children born after the TFA-legislation. The hazard ratios and 95% confidence intervals were 1.10 (0.99,1.23) and 0.97 (0.84,1.04), respectively. This corresponds to an increase of 10% in leukemia rates per year before the TFA-legislation and a decrease of 3% per year after the legislation (p=0.38).

Conclusions: The small, albeit statistically non-significant, decrease in leukemia incidence after the legislation supports the need for further analysis including additional birth cohorts. Additional analysis of biomarkers of neonatal TFA in cases and matched controls on individual level will help to separate the TFA effect from other risk factors.

Keywords: Trans fatty acids, childhood leukemia, childhood cancer, in utero, prenatal, haematopoietic neoplasms

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CONCENTRATIONS OF CAROTENOIDS AND TO-COPHEROLS IN BREAST MILK FROM URBAN CHINESE MOTHERS AND THEIR ASSOCIATIONS WITH MATERNAL CHARACTERISTICS

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Background and objectives: This cross-sectional study aims to quantify of carotenoids (β-carotene, β-cryptoxanthin, lutein, lycopene and zeaxanthin) and tocopherols (α-tocopherol and γ-tocopherol) in human milk from healthy Chinese women, to compare their concentrations between different regions and lactation stages, and to identify maternal socio-economic and obstetric factors that may affect these concentrations.

Methods: Human milk was obtained from 509 healthy nursing mothers from Beijing (n = 151), Suzhou (n = 180) and Guangzhou (n = 178) cities. The compounds of interest (β-carotene, β-cryptoxanthin, lutein, lycopene, zeaxanthin and vitamin E as α-tocopherol and γ-tocopherol) were analyzed by high-performance liquid chromatography after mild saponification and solvent extraction. Socio-economic and obstetric characteristics of the mothers and their dietary intakes through a single 24-hour dietary recall were evaluated.

Results: The concentration of the studied compounds in human milk varied greatly among individuals. The median contents of each component [microgram per 100 mL, median (interquartile range)] in colostrum and mature milk was, respectively, β-carotene 8.0 (4.7-15.2) and 1.8 (1.4-2.7), β cryptoxanthin 6.2 (2.4-12.9) and 1.8 (1.1-3.4), lutein 5.7 (2.9-10.2) and 3.4 (1.5-6.0), lycopene 6.3

(4.0-9.9) and 1.4 (1.1-2.0), zeaxanthin 1.0 (0.6-1.5) and 1.0 (0.6-1.4), α-tocopherol 645 (388-1176) and 211 (131-321), γ-tocopherol 68 (48-121) and 77 (45-120). The levels of all those vitamins presented regional differences, and decreased as lactation stage increased except for zeaxanthin and γ-tocopherol. Associations of carotenoid contents with maternal education, delivery mode, and present body mass index were found in multivariate analyses.

Conclusions: These results suggest that some regional, obstetric, and socio-economic factors have an effect on human milk concentrations of carotenoids and vitamin E in healthy Chinese mothers. Thus, it is necessary to continue research to provide biological significance of such results and improve knowledge on the unique composition of human milk.

Keywords: Breast milk; carotenoids; tocopherols; cross-sectional study

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ADHERENCE TO DIETARY RECOMMENDATIONS MODIFIES GUT MICROBIOTA RICHNESS AND COMPOSITION DURING PREGNANCY

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Background and objectives: Pregnant women, particularly those with manifest overweight or obesity, are encouraged to follow dietary recommendations to advance the health of both mother and child. The extent to which diet composition influences gut microbiota during pregnancy is not known. This regardless the increasing knowledge of the importance of gut microbiota in regulating host metabolism and health. The objective was to explore the impact of the adherence to the dietary reference values on gut microbiota in pregnant women.

Methods: Overweight and obese women (n=100) were studied at early pregnancy (<17 weeks). Intakes of nutrients were calculated from 3-day food diaries, and the subjects were grouped according to adherence to the dietary recommendations. Faecal microbiota composition was analysed using 16S rRNA gene sequencing. Chao1 index was defined as a measure of species richness. Differences in microbiota among dietary groups were tested by Mann-Whitney U-tests using Bonferroni corrections following significant Kruskal-Wallis tests.

Results: The recommended dietary intake of fibre and fat was related to higher gut microbiota richness: Chao1 index was higher in the high-fibre/moderate-fat group compared to the low-fibre/high-fat group (mean 406.2 vs. 341.0, P=0.006), whilst low-fibre/moderate-fat group did not differ from the other groups (Chao 1 index: 380.0). Moreover, the relative abundance of specific microbial phyla, families and genera were significantly different among the three dietary groups, the most evident difference being in the Bacteroidaceae.

Conclusions: Adherence to the recommended dietary intake, particularly that of fibre intake, was linked to a richer gut microbiota. Dietary manipulation could be an effective means for improving the gut microbiota balance during pregnancy with potential health benefits.

Keywords: diet, dietary recommendations, pregnancy, microbiota, microbiota richness

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THE RELATIVE IMPORTANCE OF WASTING AS A PREDICTOR OF LATER STUNTING OR DEATH

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Background and objectives: It is generally assumed that wasting occurs early in the malnourished state and then progresses onto stunting, but most studies lack the repeated measurements needed to establish this sequence. our objective was to combine longitudinal growth datasets to describe pathways through different nutritional states to later stunting or death and how this varies by age.

Methods: Existing longitudinal datasets from Malawi, South Africa and 4 socio-economically distinct Pakistani communities were combined and the 6907 individuals classified at ages 3, 6, 9 and 12 months as normal, wasted (BMI <-2SD;2-5%), stunted (Length <-2SD; 17-26%) or wasted&stunted (3-4%). In total 20% had died by 12 months.

Results: Up to 14% of all wasted&stunted children went on to die in the next 3 months, with relative risks (95%CI) compared to normal children at 3-6, 6-9 and 9-12 months of 11.1 (6.4, 19.1), 10.0 (1.7, 59.7) and 5.4 (2.6, 11.0). Wasted children also had higher mortality and had the highest risk between 9-12 months (11.5, 1.9 to 68.1). Stunted children were also significantly more likely to die between 3-6 months (3.0, 1.7 to 5.2) and 9-12 months (4.8; 1.2 to 18.5) but not 6-9 months (1.0, 0.5 to 2.1).

Children who were wasted were only significantly more likely than normal children to move into a stunted state between 3-6 months (1.75, 1.21 to 2.53). Over 3-6-9 months only 0.9% of children moved from normal to stunted via wasted, while 17% moved directly from normal to stunted. Once stunted 59-80% remained so, while 39-40% of wasted children reverted to normal.

Conclusions: Most children become stunted without prior wasting. Wasting is a major risk factor for death in infancy, but those wasted children who survive are likely to revert to normal rather than become stunted.

Keywords: Child, malnutrition, stunting, wasting, mortality

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FACTORS ASSOCIATED WITH EARLY INITIATION OF BREASTFEEDING AND COMPLEMENTARY FEEDING PRACTICES IN INFANTS AND YOUNG CHILDREN IN RURAL AREA OF SENEGAL

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Background and objectives: Breastfeeding and complementary feeding practices in developing counties are influenced by variety of demographic, socio-cultural, and health-related factors. This study aimed to assess breastfeeding and complementary feeding practices and associated factors among mother-child pairs 0-23 months living in Mbadakhoune, a rural area of Senegal where malnutrition is still prevalent.

Methods: A total of 202 mother-child pairs (102 aged 0-5 months, and 100 aged 6-23 months) were interviewed using socio-demographic and child feeding questionnaire including Early Initiation of Breastfeeding (EIBF), Minimum Dietary Diversity (MDD). Weight and height were measured and WHZ and HAZ calculated. Descriptive statistics and multivariable logistic regression analysis were used to identify factors associated with EIBF and MDD.

Results: Stunting and wasting affected 12.7% and 13.7% of the children 6-23 months old, respectively. Among the 0-5 months old infants, 91% (n=96) have received the colostrum after birth but only 32% of the mothers have practiced EIBF. EIBF was associated with mother's occupation [odds ratio (OR) =2.7, p=0.02], breastmilk given as first food between 2-24 hrs after delivery (OR=3.0, p=0.01), and positive view about EIBF of the father (OR=4.1, p=0.005), and the family members or neighbours (OR=3.2, p=0.008). Among the 6-23 months old children, 59% (n=59) met MDD (score ≥ 4). MDD was significantly associated with consumption of family meal that contains at least 4 food groups (OR=7.2, p=0.004), number of meals consumed (OR=14.9, p<0.001), and age group (OR=3.0, p=0.01).

Conclusions: Breastfeeding practice is still low in this rural area of Senegal. EIBF was strongly influenced by socio-cultural factors particularly those related to family decision-makers. The prevalence of MDD in the children > 6 months old was more related to family meals consumed as complementary food rather than dietary diversity. Availability of nutrient-rich foods, along with new communication strategies targeting key decision-makers, are urgently need to improve infant and young child feeding.

Keywords: Early initiation of breastfeeding, minimum dietary diversity, rural area, Senegal

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DETERMINANTS OF ANEMIA AMONGST GERIATRIC SUBJECTS LIVING IN HIGH ALTITUDE REGIONS OF INDIA

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Background and objectives: Anemia has been identified as a risk factor for increased morbidity and mortality amongst geriatric subjects. There is lack of scientific evidence on the prevalence of anemia amongst the geriatric population living in high altitude regions of India. Hence, we conducted the present study to fill the gap in the existing knowledge.

Methods: A community based cross-sectional study was conducted during 2015-2016 in District Nainital, Uttarakhand state, India. A total of 958 geriatric subjects were enrolled from 30 clusters (villages) identified by using population proportionate to size sampling methodology. Hemoglobin was estimated amongst the subjects using cyanmethemoglobin method. The Hemoglobin values were adjusted for smoking and altitude. Data was also collected on dietary pattern using 24hr recall, food frequency questionnaire from all the geriatric subjects.

Results: We found that all the geriatric subjects living at high altitude regions had anemia. The prevalence of moderate anemia (Hb 8-10g/dl) was 85% (n=814) and severe anemia (Hb <8g/dl) was observed in 15% (n=144) of the subjects. Female subjects (6.9±0.8g/dl) had significantly lower hemoglobin level than the male subjects (7.45±1.0g/dl) (p<0.001).

Majority of the geriatric subjects did not consume the recommended daily intake for nutrients such as energy (78%), protein (78%), iron (72%), folic acid (72%) and vitamin C (42%). Food groups rich in micronutrients such as pulses, green leafy vegetables, fruits, nonvegetarian food items, and were consumed irregularly (less than once a week) by the subjects. Subjects with severe anemia had significantly lower dietary intake of iron (16.8 ±12.3mg) (p<0.01), folic acid (161.3 ±87.7µg) (p<0.01) and vitamin C (57.9 ± 52.2 mg) (p<0.001) in the diet as compared to the subjects with moderate anemia for iron (23.8 ±16.3mg), folic acid (224.3 ± 125.6 µg) and vitamin C (97.0 ± 75.6mg).

Presence of fatigue was reported to be significantly higher in subjects with severe anemia (29.4%) as compared to subjects with moderate anemia (20.2%) (p<0.05).

Conclusions: The present study suggests that anemia is a major public health problem in the geriatric population residing in high altitude region of India, possibly due to less intake of total quantity of food with poor micronutrient quality.

Keywords: Anemia, geriatric, elderly, dietary pattern

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DIET QUALITY, MEDITERRANEAN DIET AND BONE HEALTH IN ADOLESCENTS: THE HELENA STUDY

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Background and objectives: Among other predisposing factors, diet determines peak bone mass during adolescence. Describing and quantifying diet through dietary scores enables the study of the entire diet, rather than individual foods and nutrients. The aim of the present study was to assess the associations between different dietary scores and the bone mineral content (BMC) measured with dual-energy X-ray absorptiometry (DXA) at the whole body (WB), lumbar spine (LS), femoral neck (FN) and hip sites among Spanish adolescents.

Methods: 197 participants (48% males), 12.5-17.5 y, from the HELENA study were included. The Mediterranean diet score for Adolescents (MDS-A), and the Diet Quality Index for Adolescents (DQI-A) were calculated based on two 24h dietary recalls obtained with the HELENA DIAT software. The relationship between dietary patterns and bone outcomes was analyzed using logistic regression models taking into account different covariates as follows: model 1 included sex, Tanner, mother education and family affluent scale index and model 2 included model 1 + physical activity and lean mass.

Results: DQI-diversity was positively associated with WB BMC (1.089; 1.014-1.168). According to the MDS-A, fruits and nuts intake was positively associated with WB (3.613; 1.508-8.653) and FN (3.937; 2.003-18.652) BMC. Cereals and roots intake was positively associated with hip BMC (3.033; 1.436-6.406). According to the DQI-A, fruit equilibrium (1.018; 1.002-1.034) and adequacy (1.020; 1.004-1.037) were positively associated with WB BMC. Vegetable adequacy was inversely associated with WB (0.984; 0.969-0.997) and hip (0.986; 0.972-0.999).

Conclusions: A specific dietary score is not associated with bone health in European adolescents. Some dietary components, like diet diversity or fruit and nuts intake may be associated with an increased likelihood of having an adequate BMC during adolescence.

Keywords: Keywords Fruit intake. Diet quality index. Dietary Patterns. Dietary scores. Mediterranean diet.

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PREVALENCE, AND CO-OCCURRENCE OF CARDIO-METABOLIC DISEASE IN THE CONTEXT OF THE NUTRITION TRANSITION IN THE PHILIPPINES: THE CEBU LONGITUDINAL HEALTH AND NUTRITION SURVEY

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Background and objectives: The nutrition transition, marked by changes in dietary patterns and physical activity, is associated with increases in obesity, hypertension, and diabetes in many low and middle income countries. Despite their contribution to mortality, the patterns and changes in co-occurrence of these conditions change with age and over time has not been studied in LMICs. We examine predictors of prevalence, and patterns of co-occurrence of overweight and obesity [OW=BMI>25 kg/m2], high waist circumference [WC>80 cm], diabetes, and hypertension from 1998-2016 among Filipino women participating in the Cebu Longitudinal Health and Nutrition Survey [CLHNS].

Methods: The CLHNS is a community-based study that recruited >3000 pregnant women in 1983-84, and has followed them in multiple survey rounds across > 30 years. Data from the 5 most recent survey rounds (1998-2016) also included blood pressure measured by trained interviewers, and diabetes status (self-reported in 1998 and 2002, fasting glucose in 2005, and HbA1c in 2012 and 2016). Hypertension and diabetes were defined according to International Diabetes Federation cutpoints. Women, who ranged in age from 29 to 62 in 1998, were grouped in each year according to the presence/absence of OW, high WC, Hypertension and diabetes, and we used multinomial logistic regression to identify factors associated with membership in each group

Results: Comparing 1998 to 2016: The occurrence of having none of these conditions declined from 50% to 20%; being "metabolically healthy" (OW or high WC but no hypertension or diabetes) declined from 26% to 17 %, hypertension increased from 21% to 59%, and diabetes increased from 2% to 14%. On average across all years, only about half of women with hypertension were OW or had high WC. In general, women in groups that included OW or high WC were older, taller, from more urbanized communities, and households with higher assets. The lowest prevalence of these adverse conditions was in rural, more disadvantaged women. Further analyses will explore the role of diet and other lifestyle factors.

Conclusions: Urbanization and increasing socioeconomic status are strongly related to rising prevalence and co-occurrence of cardio-metabolic diseases as women move from middle to older adulthood.

Keywords: nutrition transition, aging, cardiometabolic disease, Philippines

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144/886

MATERNAL PERCEPTION OF CHILDREN'S NUTRITIONAL STATUS IN THE FEDERAL DISTRICT, BRAZIL

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Background and objectives: Maternal perception of child's nutritional status can influence child's feeding, maternal controlling feeding practices and the prevention and treatment of childhood overweight. Thus, the aim of this study was to evaluate the prevalence of misperception and factors associated with maternal perception of the nutritional status of first- to third-grade elementary school students from private schools in the Federal District, Brazil.

Methods: This cross-sectional study was conducted with 554 mother-child pairs. Children's nutritional status was assessed by anthropometric measures. Mothers completed an online questionnaire about sociodemographic data, mother's self-reported weight and height and maternal perception of child's nutritional status (silhouette scale for children). Mothers identified the silhouette that best represented the current body of their child, and it was verified the agreement between this and the real silhouette of the child, measured by anthropometry. If the chosen silhouette was smaller than the real silhouette, it was considered that the mother underestimated the child's nutritional status, and if it was larger, it was considered that the mother overestimated the child's nutritional status. Descriptive analyses, chi-square test and logistic regression were performed. This study was approved by the Research Ethics Committee of the University of Brasilia.

Results: Only 30.0% of the mothers chose the appropriate silhouette to represent child's nutritional status, whereas 28.0% overestimated and 42.0% underestimated it. Regarding mothers of normal and overweight children, 46.2% and 39.3% underestimated the nutritional status of their child, respectively. About a quarter (25.3%) of the mothers of obese children, underestimated the nutritional status of their child, whereas almost half overestimated it (47.9%). Highly educated mothers and mothers of male children or of non-overweight children were more likely to underestimate child's nutritional status. Conversely, mothers below 35 years of age and mothers of female children or of overweight children were more likely to overestimate child's nutritional status.

Conclusions: There was a high prevalence of misperception, with most of the normal weight and overweight children having

their nutritional status underestimated. However, for obese children, almost half of mothers overestimated their nutritional status. This situation is worrying, since maternal distortion influences child feeding and can lead mothers to controlling feeding practices.

is a cause or a consequence of their malnutrition, but it does not seem to be a result of maternal feeding behaviour. A better understanding of the role of force-feeding and factors that motivate eating is required to design effective feeding interventions.

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EATING AND FEEDING BEHAVIOURS IN HEALTHY AND MALNOURISHED CHILDREN AGED 6-24 MONTHS IN URBAN SLUMS IN NAIROBI

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Background and objectives: Feeding practices influence nutrient intake but few studies assess how child eating and maternal feeding behaviour relate to child malnutrition. This study aimed to describe eating and feeding behaviour in healthy and malnourished infants aged 6-24 months in Nairobi, Kenya.

Methods: We recruited 415 infants from child welfare clinics and outpatient therapeutic programs in urban slums in Nairobi, of whom 172 (41.4%) were healthy (weight for age >-2 Z scores) and 243 malnourished (weight for age or weight for length <- 2 Z scores or length for age <-3 Z scores) using WHO growth standards. A structured interview guide was used to collect information on breastfeeding, meal frequency and dietary diversity and generate scores for child interest in food and food refusal, maternal force-feeding and anxiety.

Results: Compared to healthy children, malnourished children were more likely not to be breastfeeding (malnourished 11.5%; healthy 5.2% P=0.002) but there was no association between meal frequency, dietary diversity and child nutritional status.

They also had lower interest in food (malnourished 34.2%; healthy 14.0% P=<0.001) and higher food refusal (malnourished 30.9%; healthy 10.5% P=<0.001); and their mothers were more likely to be anxious about feeding them (malnourished 20.6%; healthy 6.4% P=<0.001). Within the malnourished group, 49.4% had either low interest in food or high food refusal compared to 19.8% in the healthy group (P<0.001).

Force-feeding was common in both groups, with a non-significant trend towards more force-feeding in the malnourished infants (malnourished 41.4%; healthy 34.5% P=0.087). Children with low interest in food odds ratio [95% CI] 3.72 [1.93 to 7.15] P<0.001 and high food refusal 4.83 [2.38 to 9.78] P <0.001 were more likely to be force-fed, after controlling for maternal anxiety and child nutritional status.

Conclusions: This study shows that many malnourished children had a low interest in food and ate poorly. It is not clear if this

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PROSPECTIVE ASSOCIATIONS OF MATERNAL CHOLINE STATUS WITH OFFSPRING GROWTH AND BODY COMPOSITION IN THE FIRST FIVE YEARS OF LIFE IN TWO LARGE BIRTH COHORTS: THE SWS AND THE GUSTO COHORTS

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Background and objectives: Choline has been positively associated with weight and fat mass in animal and human studies. As evidence examining maternal choline status and offspring body composition in human infants/children is lacking, we investigated this in two cohorts.

Methods: Maternal plasma choline concentrations were assessed in the UK SWS (n=1002, 11 weeks gestation) and in Singapore GUSTO (n=970, 26-28 weeks gestation) mother-offspring cohorts. Infant anthropometry was measured from birth until 5 years of age at regular intervals. Total body fat mass was determined using DXA for SWS, and using air displacement plethysmography for GUSTO. Linear regression models were performed adjusting for confounders.

Results: Mean (SD) plasma choline concentrations were 6.03 (0.86) μmol/L for SWS and 9.2 (1.6) μmol/L for GUSTO. In SWS, higher maternal choline concentrations were associated with higher neonatal total body fat mass [β=0.60 SD/5 μmol/L maternal choline (95% CI 0.04-1.16)] and higher subscapular skinfold thickness [β=0.55 mm/5 μmol/L (0.12-1.00)] at birth. In GUSTO, higher maternal choline concentrations were associated with higher neonatal BMI-for-age z-score [β=0.31 SD/5 μmol/L (0.10-

0.51)], higher triceps [β=0.38 mm/5 μmol/L (0.11-0.65)] and sub-scapular skinfold thicknesses [β=0.26 mm/5 μmol/L (0.01-0.50)] at birth. No clear trends were observed between maternal choline and offspring growth in BMI-for-age, skinfolds, abdominal circumference, weight-for-age, length/height-for-age, and adiposity measures in later infancy and childhood.

Conclusions: Our study provides evidence that maternal choline concentrations status during pregnancy are positively associated with offspring BMI, skinfolds and adiposity at birth, but not with growth in the first 5 years of life.

Keywords: Choline, pregnancy, offspring, body composition, growth

Conflict of Interest Disclosure: YS Lee, KM Godfrey, and Y-S Chong have received reimbursement for speaking at conferences sponsored by companies selling nutritional products. These authors are part of an academic consortium that has received research funding from Abbott Nutrition, Nestec, and Danone. The other authors have no conflict of interests.

Further collaborators

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SLEEP QUALITY AND DURATION ON DIET AND BEHAVIOURS DURING PREGNANCY: THE GUS-TO STUDY

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Background and objectives: Evidence on the association between sleep, diet and dietary behaviours in pregnant women is lacking. We examined this in a cohort of pregnant women in Singapore.

Methods: Pregnant women at 26-28 weeks gestation (n=719) from the GUSTO cohort completed the Pittsburgh sleep quality index to assess sleep quality (score 0-21; higher scores represent poorer sleep), sleep duration (hours), dietary intake and behaviours were assessed. Diet quality was defined by the Healthy Eating Index for pregnant women in Singapore (HEI-SGP) on a 0-100 scale and three dietary patterns were derived from principal component analysis of food records: fruit-vegetables-rice, seafood-noodles, and pasta-cheese-meat. Dietary behaviours examined included longest fasting duration during night- (19:00-06:59), meal frequency, breakfast skipping, and predominantly night-time eating. Multivariate linear regression and Poisson regression were used to examine the relationship.

Results: Mean (SD) sleep quality score was 5.5 (2.9) and sleep duration 7.2 hours (1.5). Poorer sleep quality was associated with lower HEI-SGP sores [β -0.04 (95%CI -0.07, 0.00)], lower adherence to the fruit-vegetables-rice pattern [β -0.02 (-0.02, 0.00)], shorter night-time fasting intervals [β -0.05 hours (-0.09, -0.01)] and higher likelihood of skipping breakfast [prevalence ratio 1.06 (95% CI 1.01-1.10)]. Longer sleep duration was only associated with a longer night-time fasting interval [β 0.08 hours (95%CI 0.00, 0.16)].

Conclusions: Poorer sleep quality was associated with unhealthier diets and dietary behaviours, while longer sleep duration was associated with longer night-time fasting. Prospective studies are warranted to investigate the direction of causality.

Keywords: dietary patterns, diet quality, sleep quality, sleep duration, dietary behaviours

Conflict of Interest Disclosure: KM Godfrey, and Y-S Chong have received reimbursement for speaking at conferences sponsored by companies selling nutritional products. These authors are part of an academic consortium that has received research funding from Abbott Nutrition, Nestec, and Danone. The other authors have no conflict of interests.

Further collaborators

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POTENTIAL STRATEGIES TO DECREASE THE HIGH SUGAR INTAKE IN ARGENTINIAN YOUNG CHILDREN TO GENERATE HEALTHIER EATING HABITS

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Background and objectives: In Argentinian young children aged 6–23 months, table sugar and sodas alone represent 12% of the Total Energy Intake (TEI), which exceeds the 10% upper limit

for free sugar intake recommended by WHO. The present study aimed to evaluate a relevant and realistic dietary lever to reduce free sugar intakes, based on actual consumption practices.

Methods: The diets of 220 Argentinian 12-36 months toddlers were captured in a 7-day food diary. A probability-based statistical tool, which evaluates the potential of one food category to be substituted by another using actual dietary data, was applied. Potential nutritional effects of estimated switches were evaluated by simulation modeling.

Results: The main food categories contributing to sugar intake were cow's milk (18.3%), fruits (16.4%) -both containing mainly intrinsic sugars- and powdered juices and sodas (11.4%) containing exclusively free sugar. Powdered juices and sodas were consumed by 82% of the studied population (90% of the 24-36 mo population) at an average frequency of 1.21 times/day/individual, predominantly at lunch and dinner. In analyzing consumption dynamics, water was identified as the most probable, realistic substitution alternative (far above all other food and drinks categories), with a potential to substitute an estimated 0.97 and 1.02 consumption acts/individual/week during lunch and dinner, respectively. Considering this realistic switching scenario at lunch and dinner, simulation modeling estimated a reduction of free sugar intake of 18.5 g/individual/week (2.64 g/individual/day), based on only this one dietary modification.

Conclusions: This probability-based statistical tool has shown, through actual practices, that a few simple food replacements in young children's diet can be a successful strategy, not only to help achieve WHO recommendations, but also to accomplish a gradual development of healthier early eating habits.

Keywords: sweet drinks, free sugars, switch, simulation, substitution alternatives

Conflict of Interest Disclosure: CDM, IO, LvdM and FD are employed by Danone Nutricia Research. BK and GO are employed by Danone Nutricia.

GLUCOSE METABOLISM IN NORMAL WEIGHT AND OVERWEIGHT/OBESE CHILDREN AGED 1-5 YEARS

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Background and objectives: The metabolic complications of overweight and obesity are widely studied in children above 6 years and adolescents. However, little is known about such complications in children less than six years.

Aim

To compare glucose metabolism in children aged 1-5 years with normal weight and overweight/obesity.

Methods: A prospective, analytical, cross-sectional study was conducted in 2011 on children aged 1-5 years attending primary health care units from the cities of Berisso and Arturo Segui, province of Buenos Aires, Argentina.

Anthropometric assessments included weight, height and waist circumference (WC). Fasting blood tests were taken in all children to determine blood glucose and insulin, insulin resistance by the homeostasis assessment model for insulin resistance (HOMA-IR) and the blood glucose/insulin (G/I) ratio. Comparisons between groups were analyzed with Mann-Whitney test.

Results: We evaluated 795 children aged 1-5 years. Sixty-six percent of children were normal weight, whereas 34% were overweight (24%) and obese (10%). Mean age was 3.35 ± 1.56 years (49.6% male, 50.4% female).

Mean blood glucose levels were similar in normal weight as compared with overweight/obese children. Blood insulin results were higher in overweight/obese (2.21 μU/ml; 1.39-3.95) compared with normal weight children (1.96 μU/ml; 1.32-3.18) (p=0.016). HOMA-IR was higher in overweight/obese (0.43; 0.25-0.80) than in normal weight children (0.37; 0.23-0.60) (p=0.011). The G/I ratio was lower in overweight/obese 35.9 (20.6; 54.0) compared with normal weight children 38.7 (24.9; 58.0) (p=0.039).

The analysis of differences according to sex showed that they remained the same in normal weight and overweight/obese girls, but disappeared in boys.

We found correlation between WC and blood insulin, WC and HOMA-IR and WC and G/I ratio in the whole study sample. Again, when analyzing by sex, such correlations remained only

in girls (WC- blood insulin rho0.32 p<0.0001; WC-HOMA-IR rho0.34 p<0.0001 ; WC-G/I ratio rho-0.16 p=0.046).

Conclusions: We found differences in glucose metabolism parameters in overweight/obese children aged 1-5 years as compared with those of normal weight children. Analysis according to sex showed that such differences remained in girls, but were not significant among boys.

Keywords: Overweight - Obesity – Insulin Resistance - Pre-school-aged children –

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IMPROVING AWARENESS ABOUT EXCLUSIVE BREAST FEEDING AMONG MOTHERS ATTENDING POST-NATAL CLINICS IN HEALTH CENTERS OF KAMPALA CITY, UGANDA

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Background and objectives: Background:

According to findings from the recent Lancet breastfeeding series, improving breastfeeding practices worldwide will be a fundamental driver in achieving the Sustainable Development Goals by 2030 (Meara, 2015). Among the 17 proposed sustainable goals, breastfeeding; a simple, smart and cost effective practice contributes to the realization of four of these specific goals that is; 1) ending hunger and improving nutrition; 2) ensuring healthy lives and promoting well-being; 3) ensuring equitable education and 4) ensuring sustainable agricultural production and consumption (Meara, 2015). However in Uganda, less than 20 health facilities are designated as "baby friendly" where mothers can safely and readily practice breastfeeding. Objectives: To increase awareness about the benefits of exclusive breastfeeding (EBF), advocate for breast feeding corners in Mulago Hospital and establish factors influencing adherence to EBF by the mothers.

Methods: Behavioral change communication using Information, Education and Communication (IEC) materials and nutrition education counselling of 150 participants. Pre and post semi-structured questionnaires were used to determine adherence of the mothers to EBF as well as factors for adherence before and after the intervention.

Results: Out of 150 breastfeeding mothers, 64% reported adhering to exclusive breast feeding before nutrition education and counselling was done. 87% were willing to exclusively breastfeed their children after improving their awareness about EBF and its advantages. The following factors significantly influenced adherence to EBF positively (p< 0.05): 1) accessibility of antenatal care

clinic p= 0.002); 2) attending Anti-Retroviral therapy (ART) clinics for ARV's (p= 0.001), 3) knowledge on risk of MTCT of HIV during mixed feeding (p=0.000).

Conclusions: Nutrition education and counselling improved the mother's willingness to exclusively breastfeed their children. Therefore this should be routinely done in health facilities to improve adherence to EBF. While infant and young child feeding regulations are in place, enforcement of the practices needs to be strengthened to increase access to nutrition for the poorest and most vulnerable urban communities.

Keywords: Exclusive breast feeding, health centers, breast feeding corners

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CONSUMPTION OF FOOD, FOOD DISORDERS AND PHYSICAL ACTIVITY IN ADOLESCENTS OF URBAN AND RURAL AREAS OF THE SIERRA REGION OF ECUADOR

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Background and objectives: In Ecuador, adolescents represent 19.3% of the population INEC-Ecuador (2010). This period is characterized by a stage of physical, psychological and psychological changes in which a child becomes an adult. This transition requires an adaptation of the factors that allow the adolescent to develop all the normal functions with normality. Aims: To evaluate the dietary intake, eating disorders and physical activity of adolescents from a population of the Andean region of Ecuador and their difference between urban and rural areas.

Methods: Cross-sectional study (n = 131). It was applied: a 24-hour reminder and food consumption frequency questionnaire; It was evaluated anthropometry, physical activity and risk of eating disorder.

Results: 19.1% of the population presented short stature by age and 17.6% risk of overweight according to BMI//Age. Macronutrient adequacy percentages throughout the population were low (66.5% carbohydrate, 60.5% protein and 79.8% fat).

Statistically significant differences were found between protein (p = 0.012), fats (p <0.001) carbohydrates (p = 0.013) and energy

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(p <0.001) according to the zones; (Urban areas showed higher consumption compared to rural areas).

Statistically significant differences were found between the levels of physical activity of adolescents in urban areas (less activity) compared to adolescents in rural areas (greater activity). According to the Scoff questionnaire, 32.3% of adolescents were classified as having an Eating Disorder Risk, clinical differences were found by sex being greater in women than in men. However differences between sex and area were not statistically significant.

Conclusions: The adolescents' diet differs according to the geographical area, showing worse consumption in the rural area.

Keywords: Diet, Teens, Ecuador, Urban, Rural

Further collaborators

High schools "Chap. Edmundo Chiriboga "and" San Andres " High School for the facilities and opening for data collection and the" Vicente Anda Aguirre " High School for the facilities for the pilot study.

FREQUENCY OF PRIMARY SARCOPENIA IN INSTITUTIONALIZED ADULTS OF ASUNCIÓN-PARAGUAY

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Background and objectives: In old age, sarcopenia is a frequent condition, characterized by the gradual and widespread loss of skeletal muscle mass and strength. Older adults with sarcopenia have an unfavorable clinical prognosis and evidence suggests that older adults that are in nursing homes would have a worse prognosis. Therefore, we aimed to determine the frequency of primary sarcopenia in older adults in nursing homes in the peri-urban area of Asunción during the month of January, 2014.

Methods: We performed a descriptive cross-sectional study in which we evaluated demographic characteristics, nutritional status using Body Mass Index (BMI) and the Mini Nutritional Assessment (MNA) screening tool. In addition, we evaluated the presence or absence of sarcopenia according to bioimpedanciometry and muscle strength levels, based on the dynamometric grip force.

Results: In 41 elderly people living in three institutions for elderly people, the average age was 73 ± 10 years. We found that mean BMI was 25.8 ± 4.4 kg/m2 and that 24% of the elderly had malnutrition (underweight), 20% overweight and 15% obese.

However, according to the overall MNA score, 49% had normal nutritional status, 39% had a risk of malnutrition and 12% had malnutrition. The median Muscular Mass Index (MMI) was 7.62 kg/m2. Severe sarcopenia was observed in 54% of the elderly and this percentage was higher in men than in women. The mean right and left hand pressure force was 19.20 ± 9.53 and 18.85 ± 9.79 kg, respectively. Of the total of elderly 61% presented very bad pressure force in the left hand and 54% in the right hand.

Conclusions: In older adults that are in nursing homes in the peri-urban area of Asunción, the malnutrition is frecuent, the force of hand pressure is very poor and sarcopenia affects half of the population.

Keywords: older adults, sarcopenia, muscle strength, nutritional status

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ESTABLISHING THE RELATIONSHIP BETWEEN DIETARY PRACTICES, ATTITUDES AND NUTRITION KNOWLEDGE OF ADOLESCENTS AGED 15-19 YEARS IN NANSANA MUNICIPALITY, CENTRAL REGION, UGANDA

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Background and objectives: Background: During the period of adolescence, individuals undergo major psychological and physical changes as well as changes in social interactions and relationships (WHO, 2009). Health related behaviors around food, physical activity and alcohol use are also formed (Sawyer, et al., 2012). There is an epidemic of overweight and obesity among adolescents in the world today with adolescents developing obesity related conditions previously mostly confined to adults (Carroquino, 2009). Despite majority of fruits and vegetables being transported to central region from other regions of the country, their consumption among adolescents in this region is really low. However, the adolescence period is a window of opportunity through which healthy dietary practices such as intake of fruits and vegetables can be adopted. Objectives: To assess the nutritional knowledge of adolescents in Nansana Municipality, identify their common dietary practices and determine the factors responsible for the observed dietary practices.

Methods: A cross-sectional study was done. Simple Random Sampling and snowball sampling techniques were used to select school going and non-school going adolescents respectively.

Semi-structured questionnaires were used to collect data on 363 adolescents (120 non-school going, 109 boarding scholars and 122 day scholars) in a cross-sectional survey. Data was analyzed using SPPS version 20.0.

Results: Out of the 363 participants, 81.8% snacked frequently with majority snacking on salted snacks (40.4%) and confectionery (23.7%). Only 6.1% of them snacked on fruits and vegetables while 88.7% consumed fast foods frequently. Significant influences of adolescent dietary practices were taste and preference, lack of appetite, lack of money, readily available fast foods and snacks and busy schedule (p< 0.05). Nutritional knowledge of the adolescents positively influenced their frequency of supper consumption (r= 0.120, p= 0.022) and frequency of breakfast consumption (r= 0.127, p= 0.016) while it negatively influenced their fast food consumption(r= -0.134, p= 0.010).

Conclusions: Majority of the adolescents had unhealthy dietary practices and lacked nutrition knowledge. Nutrition education should be widely done to improve the adolescents' nutrition knowledge and hence influence their dietary practices.

Keywords: Adolescents, Dietary practices, Attitudes, Nutritional knowledge

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ANTHROPOMETRIC NUTRITIONAL RISK FACTORS AND NUTRITIONAL STATUS OF NEWBORN

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Background and objectives: Maternal anthropometry taken before and during pregnancy has a close relationship with fetal growth and birth weight, therefore a descriptive observational research with analytical component was designed to determine the maternal anthropometric risk factors and nutritional status of children of women treated Hospital de Clínicas, Department of Gynecology and Obstetrics, during the months of May 2016.

Methods: The pre-gestational nutritional status by BMI, gestational by Atalah et al and weight gain as Casanueva et al evaluated. The nutritional status of the child was assessed according to the current WHO growth curves. The data were extracted from the records of patients.

Results: The women began their pregnancies overweight (25.6±5,6kg/m2), they earned on average 13.25 ± 6,17kg, as recommended greater (p <0.05). 73.7% were children and the highest percentage AEG presented adequate nutritional status by anthropometric indicators (weight, length and head circumference). Women with excess nutritional status and gestational weight gain excessive weight who had a higher proportion GEG children (p <0.05), respectively). The children of obese women and earning pesos excessively during pregnancy was significantly higher (p<0.05).

Conclusions: the results indicate that maternal anthropometric risk factors would be one gestational nutritional status of overweight and excessive weight gain with the birth weight of the newborn

Keywords: Maternal and child nutrition, anthropometry, newborn

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ANTHROPOMETRY, INSULIN RESISTANCE INDEX, LIPID PROFILE AND PHYSICAL ACTIVITY IN A GROUP OF CHEERLEADERS OF CALI, COLOMBIA

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Background and objectives: The assessment of nutritional status in children is part of the main objective of the Obesity and Overweight Monitoring Program of the Pediatric Gastroenterology, Hepatology and Pediatric Research Group of the University of Valle del Cali, Colombia. The objective is to determine body mass index, height for age, insulin resistance index (HOMA), lipid profile and physical activity in a group of cheerleaders from Cali, Colombia

Methods: Non-experimental descriptive observational study type prevalence in schoolchildren (n=3) and adolescents (n=14) who were given socio-demographic (age, sex), nutritional (weight, height, waist circumference), biochemical (glycemia, insulin, lipid profile) variables and physical activity (strength/endurance and aerobic tests)

Results: A total of 17 girls, 14.7±27 years (range=9-18), weight=50.3±12.4 kg (range=32.4-74.2), height=157.7±7.9 cm (range=141.6-169.7), circumference (range=57.0-94.5), blood glucose=85.7±6.8 g/dl (range=71-99), insulin=13.4±8.1 g/dl (range=3.6-36.0), cholesterol=155.4±25.4 (range=107-208), triglycerides=119.7±151.9 g/dl (range=49-704), arterial index=2.8±0.5 (range=2.2-4.5), HOMA=2.7±1.6 (range=0.6-6.6) and physical activity=4.6±0.2 (range=4.1-5.0). They presented 11.8% of malnutrition and overweight, respectively; 5.9% hypercholesterolemia, 11.8% hypoglycemia and elevated insulin, respectively; 29.4% HOMA altered and 100.0% good physical activity

Conclusions: Despite good physical activity, about 1/3 of this group of cheerleaders presented altered HOMA; 24% altered lipid profile, and 12% malnutrition, overweight, hypoglycemia and altered insulin

Keywords: Anthropometry, Insulin resistance index, Lipid profile, Physical activity, Children

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THE MEDIA INFLUENCE ON BODY IMAGE AND DISORDERED EATING ATTITUDES OF BRAZILIAN FEMALE TEENAGERS

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Background and objectives: Between the many sources of influence, the media exerts an impact on eating behaviors and body image, being pointed as an important factor for Eating Disorders (ED) development. The Disordered eating, which are unhealthy attitudes to lose or control weight, although less severe than the ED are more frequent, highlighting the female and adolescent public as the most vulnerable group to this behavior due to quick body modifications and body image dissatisfaction. In this way, the objective of the present study was to evaluate the media influence in the body image in the disordered eating with age, nutritional status, body image perception and dissatisfaction, income and maternal schooling level in Brazilian teenagers.

Methods: 212 female adolescents of São Paulo State from Brazil answered to the Kakeshita Silhouettes Scale and the subscale 1 of the Internalization-general of the Sociocultural Attitudes Towards Appearance Scale (SATAQ-3), and the Disordered Eating Attitude Scale (EAAT). It was measured the anthropometric variables, such as BMI/age and sociademographics informations were collected. Student's t-test and Anova followed by the Bonferroni post-hoc were used to compare the SATAQ means. Meanwhile, for EAAT, the Mann-whitney and Kruskall-Wallis tests were used. It was adopted the significance of p <0.05.

Results: It was noted statistically major values in SATAQ subscale of teenagers who showed body image dissatisfaction, who desire to lose weight compared to satisfied with body image. Indeed, the EAAT score, which evaluated the eating atitudes associated to disordered eating behavior, was significantly elevated in overweight and obese compared to eutrophic adolescents, as well as, in female tennagers with body image distortion and dissatisfaction with desire to lose weight. Age, family income and maternal schooling appear to have not influenced the disordered eating.

Conclusions: The media can influence body image dissatisfaction of adolescents, which can be considered an important fator, as well as the nutritional status, to disordered eating development.

Keywords: adolescence; nutrition; eating attitudes; media influence; disordered eating.

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CONSUMPTION OF COW'S MILK, MILK PRODUCTS AND DAIRY SUBSTITUTES: FINDINGS FROM THE FEEDING INFANTS AND TODDLERS STUDY (FITS) 2016

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Background and objectives: Introduction of cow's milk is inappropriate for infants <1-year of age. Whole cow's milk is recommended for children from 12-23.9 months. There is little information on the introduction and patterns of cow's milk and milk product consumption in the first few years of life. The aim of this study is to describe the consumption patterns of cow's milk, milk products and plant milks/dairy substitutes, including both prevalence and amounts consumed, amongst U.S. children aged 0-3.9y, using data from the Feeding Infants and Toddlers Study (FITS) 2016.

Methods: The FITS 2016 is a cross-sectional, nationwide survey of caregivers of children aged 0-3.9y in the US. Data about respondent and child characteristics, feeding practices and health-behaviours were collected using a recruitment questionnaire (n=4380). A 24-h dietary recall was used to collect details on food, beverage and supplement intake (n=3428). Each item was assigned to a food group designed for FITS; one-day intakes were used to calculate the percentage of children consuming specific food groups on a given day, along with the amount consumed (g).

Results: Among 0-5.9 month olds and 6.11.9 month olds, infant formula was consumed by 62.2% and 64.8%, while breast milk was consumed by 53.5% and 39.2%, respectively. Breast milk consumption was more prevalent that infant formula amongst 12-17.9 month olds (18.4% vs. 7.3%). Only 1.4% of 0-5.9 month olds and 5.8% of 6-11.9 month olds consumed ~480g of whole cow's milk. Plant milk/dairy substitute consumption was very low (0.5% of 6-11.9 month olds), and amount consumed was ~316g. Prevalence of whole milk consumption was 69.3% at 12 months but was only 26.9% at 2y when children began consuming reduced-fat milk. The prevalence and amount of low-fat, non-fat and flavored milk consumed was higher with increasing age, however, only 23% of preschool children consumed low-fat milk. Prevalence of cheese and yogurt consumption, and the amounts consumed, was higher with increasing age.

Conclusions: Opportunities exist to improve the prevalence of breastfeeding, to reduce cow's milk consumption before 12 months of age, and to promote reduced-fat milk consumption beyond 24 months of age in line with dietary recommendations.

Keywords: Milk, infant nutrition, breast milk, infant formula, dairy substitutes.

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MILD SEX DISPARITIES ARE SUGGESTIVE IN ANTHROPOMETRIC INDICES AND INDICATORS AMONG PRESCHOOL CHILDREN FROM THE WESTERN HIGHLANDS OF GUATEMALA

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Background and objectives: CeSSIAM has an interest in the origins and biology of acquired linear growth retardation, also referred to as "stunting" or "chronic undernutrition." A photographic approach has been developed to estimate differential body-segment lengths (trunk vs legs) to accompany conventional anthropometric indicators. The purpose of this study was to ascertain whether any sexual dimorphism was evident in comparisons across sexes in preschool children from the Western Highlands of Guatemala.

Methods: We measured the height, clothing-adjusted weight, and head and waist circumferences of 212 individuals between 4–7 y from zones of established high stunting prevalence comprising La Estancia, Quetzaltenango and Santa María Chiquimula, Totonicapán. We further generated height-for-age (HAZ); weight-for-age (WAZ); body-mass-index for age (BAZ); and head-circumference (HCZ) Z-scores along with waist-to-height ratio (WHtR). Sagittal photographs were taken with a digital camera with the children in an erect posture with the Frankfort gaze standing on a stadiometer platform. After printing out the photo, the lengths of the trunk and the legs were measured in mm, allowing the generation of trunk-to-stature ratios. Assorted indicators or ratios are consistently presented in the order of female vs male, along with the probability-value in parenthesis.

Results: Comparisons of median indicators or ratios across sexes were: HAZ: -2.36 vs -2.29 (p=0.94); WAZ: -1.51 vs -1.64 (p=0.40); BAZ: -0.16 vs -0.14 (p=0.79); HCZ: -0.53 vs -0.73 (p=0.002); and WHtR: 0.49 vs 0.49 (p=0.08)(n=212). The overall trunk-to-stature median ratios were 0.46 for girls and 0.45 for boys (p=0.001).

Conclusions: In every situation in which values were numerically different, males were in quantitative disadvantage; but it was only with HCZ that a statistically-significant diminution was seen for the male participants. With respect to trunk-to-stature ratio, there was high statistical significance. As girls had a slightly higher trunk-to-stature ratio, they are in disadvantage.

Keywords: stunting, anthropometric Z-scores, body-segments, Guatemala

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MATERNAL CHARACTERISTICS ASSOCIATED WITH BIRTH LENGTH IN A SAMPLE OF ARGENTINIAN WOMEN

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Background and objectives: Prenatal growth has been related to risk factors for chronic disease in adult life, specifically, small body size at birth was associated with elevated blood pressure, insulin resistance and metabolic syndrome. The knowledge of maternal characteristics associated with birth length can be useful information for programming public health interventions focusing in prenatal care. The objectives of this research were to evaluate the relationship between maternal nutritional status and birth length in a sample of Argentinian women.

Methods: A sample of 760 healthy pregnant women was selected from antenatal clinics in six different urban regions in Argentina. Height and initial weight were determined in the first control (before 12 weeks of gestation), BMI and weight increments were calculated in the last prenatal control. Infant birth weight, height and gestational age were recorded from the neonate clinical history. Descriptive statistics and adjusted lineal regression models were fitted using R-program, version 3.1.0.

Results: Most women were primiparous (43.9%) and attended the public health sector (56.6%). Maternal and neonatal characteristics were: (Mean ± SD): age (years) 26.6 ± 5.7; maternal height (m) 1.58 ± 0.06; initial BMI (kg/m2) 24.08 ± 4.5; BMI increment (kg/m2) 4.7 ± 0.4; birth weight (g) 3284 ± 509; gestational age (weeks) 38.7 ± 1.7; length (cm) 48.8 ± 2.4. According to gestational age, birth length was 44.9 ± 3.9 cm (mean ± SD) in preterm and 49.1 ± 2.0 cm in term newborns.

After adjusting for gestational age, gender of the newborn, mother's age, province, type of care and income level, variables associated with length at birth were (Coefficient; p-Value): parity (0.137; 0.043), maternal height (2.881;0.014), BMI at the beginning of pregnancy (0.065;0.000) and BMI increment (0.101;0.009)

Conclusions: Although parity and maternal height can not be influenced by health interventions, the relationship of maternal BMI and its increment during pregnancy with length at birth emphasize the need to recognize prenatal care as a valuable opportunity to promote adequate prenatal growth.

Keywords: prenatal care, pregnancy weight gain, birth length

DETERMINANTS OF ANEMIA AMONG CHILDREN 6 TO 12 MONTHS OF AGE IN EASTERN BURKINA FASO

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Background and objectives: Anemia is nearly universal (92%) among young Burkinabe children, yet scant evidence on its determinants exists for this population. To better understand these predictors, we used structural equation modeling to test a theoretical model of anemia among young Burkinabe children.

Methods: We used baseline data on 930 children aged 6-12 mo, their mothers and households from a cluster-randomized trial of Helen Keller International's Creating Homestead Agriculture for Nutrition and Gender Equity program. We tested model fit and examined predictors of anemia (hemoglobin concentration<11 g/dL) considering direct and indirect relationships. Child-level predictors included age, sex, malaria infection, iron deficiency (ID) (plasma ferritin< 12ug/L or transferrin receptor> 8.3 mg/L), inflammation (C-reactive protein> 5 mg/L or alpha-1-acid glycoprotein>1 g/L), and diet. Maternal predictors were knowledge, anemia, stress, age and education. Lastly, household-level predictors included diet, wealth, size, food security, and bednet ownership.

Results: Anemia (88%) and ID (90%) prevalence was high. Malaria was also common (21%). The model fit the data well (standard root mean square residual 0.08, coefficient of determination, 0.14). ID (standardized total effect (STE) 0.17, P=0.00), malaria (STE 0.11, P=0.00), inflammation (STE 0.06, P=0.01), maternal anemia (STE 0.04, P=0.06) and child age (STE 0.02, P=0.00) significantly predicted anemia. Malaria directly and indirectly predicted anemia (direct, 0.09 (P=0.00); indirect, 0.02 (P=0.00)). Twenty-two percent of the child age effect on anemia was indirect through ID and malaria. Bednet ownership marginally predicted anemia through its effect on malaria (indirect -0.02, P=0.05). Additionally, maternal knowledge directly predicted lower malaria prevalence (STE -0.01, P=0.02) and higher child consumption of animal-source foods (STE 0.01, P=0.03). Similar results were seen for hemoglobin.

Conclusions: This analysis confirms the contributions of ID, malaria and inflammation to anemia among young Burkinabe children. However, the current set of predictors only accounts for 45% of anemia and thus the contribution of predictors such as intestinal helminth infections, genetic factors and other micronutrient deficiencies (e.g. folate and vitamin B-12) should be considered. Programs that aim to reduce anemia among young Burkinabe children should address at least ID and malaria, but should also consider ways to address the other potential predictors of anemia.

Keywords: Burkina Faso, child anemia, malaria, iron deficiency, maternal anemia

THE SOCIO-ECONOMIC AND GEOGRAPHIC FACTORS ASSOCIATED WITH ULTRA-PROCESSED FOOD CONSUMPTION IN COLOMBIA

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Background and objectives: Understanding the socio-economic and geographic inequities in the intake of ultra-processed food (UPF) is important to effectively address their consumption and associated health consequences. This study examined variations in UPF consumption in Colombia by sex, age, socio-economic status (SES), and place of residence.

Methods: Secondary analysis of nationally representative data from the 2005 Colombian National Nutrition Survey (ENSIN) and National Demographic and Health Survey (ENDS) was conducted. Diet from individuals aged 2 – 64 years was measured using a 24-hour food recall. Food consumption was categorized into the 4 NOVA groups. Individual sample weights were applied to all adjusted regression analysis of SES and geographic variables and their association with mean percentage calories from UPF.

Results: The mean age within this weighted sample (n = 39,232) was 26 years. Over 50% of the sample were female, urban residents, with low SES. Mean percentage total calorie intake from UPF for the total sample was 16.7%. Sex, age, SES, geographic regions and areas of residence were all significantly associated with mean percentage calories from UPF in the unadjusted analysis (p<0.05). Multivariate adjusted analysis demonstrated that mean percentage calories from UPF was significantly higher for women than men (16.3% vs 15.4%, p<0.00), highest among individuals <10 years of age and least in those over 50 years of age (20.5% vs 11.2%, p<0.00). Additionally, participants within the highest SES group reported higher UPF consumption compared to those in the lowest group (22.1% vs 12.8%, p<0.00). Significantly high UPF intake was also found among urban residents compared to those in rural areas (17.1% vs 11.3%, p<0.00) and among residents in the Bogota region (21.5%). Lowest consumption was reported among participants in the Atlantic region (12.5%).

Conclusions: While overall UPF consumption in Colombia is lower than those in high income countries, marked differences in consumption patterns by SES and geographic factors were evident

within this representative sample. The highest UPF intake was reported among the young, urban-dwelling, high SES residents. This trend may be reflective of the high purchasing power, access to UPFs and susceptibility to marketing, within these segments of the population.

Keywords: Ultra-processed foods, Socio-economic factors, Geographic factors, Colombia.

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DIETARY SOURCES OF SODIUM INTAKE IN ADOLESCENTS FROM A PUBLIC SCHOOL IN NITERÓI - RJ, BRAZIL

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Background and objectives: Sodium intake among adolescents is above the recommendations. The objective of this study is to identify the major sources of sodium intake among adolescent students.

Methods: The data is from PAPPAS study, which stands for "Parents, students and teachers for healthy eating" in Portuguese, conducted in a public school from Niterói-Rio de Janeiro, Brazil, in 2015, with students from 5th to 9th grade. Daily sodium intake was estimated by the mean of two 24-hour dietary recall. The food items mentioned was classified into 31 groups. Contribution to total daily sodium intake (%) and sodium density (mg sodium/100g of food items from the group) for each food group were estimated. The software SAS v.9.3 was used to data analysis.

Results: A total of 347 adolescents participated in the study and 51% were male. The average age was 12.7 years old. The average daily intake of sodium was 3777.5mg, over the maximum tolerable level (2200mg/d for 9-13 years and 2300 mg/d for 14-18 years). The ten major sources of sodium intake were rice (11.2%), beans (10.2%), sugar-sweetened beverages (9.9%), sweets (6.8%), milk and dairy products (6.3%), bread (6.2%), soft drinks (6.1%), meat (4.8%), poultry (3.7%) and processed meat (3.7%). Among them, processed meat (950mg/100g), bread (642mg/100g) and meat (414mg/100g) presented the highest sodium density. The groups were mostly consumed at home. However, savory biscuits (11th position in the contribution) were mostly consumed at school.

Conclusions: Total daily sodium intake among students was over the recommended and high at home. Despite the important contribution of ultra-processed foods, major sources included groups which comprise part of the traditional Brazilian diet. Particular attention should be directed toward educational strategies focused on reducing ultra-processed foods intake, as well as the reduction in voluntary use of salt in food preparation.

Keywords: food intake, adolescents, students, sodium.

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FRUIT AND VEGETABLE INTAKE BEHAVIOUR AMONG ELDERLY PATIENTS ATTENDING ROUTINE OUT-PATIENT CLINIC: A CROSS-SECTIONAL STUDY

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Background and objectives: As human body gets older, it's nutritional and health needs change due to increasing susceptibility to degenerative diseases. The elderly population is one demographic group at risk of inadequate dietary intake and micro-nutrient deficiencies, due to physiological changes such as reduce efficiency of the gastrointestinal tract and loss of appetite due to decline sensory perception. Fruits and vegetables provide essential nutrients and nutritive compounds, considered vital for healthy as it improves micro-nutrient status. Failure to meet daily recommended intakes may result in micro-nutrient deficiencies, hence the need for this assessment in this important population of Ghanaian. The study sought to investigate and collect data on fruits and vegetable intake among elderly patients attending routine out-patient clinic in a teaching hospital in Accra, Ghana.

Methods: A cross sectional study, involving one hundred and fifty (150) ≥60+ year old subjects purposely sampled. Old and fragile subjects with complicated medical conditions with severe nutritional consequences/implications and with severe memory and cognitive impairments were excluded. A validated FFQ and two day 24hr dietary recall (a weekday and a weekend) were used to assess frequency and nutrient adequacy of fruits and vegetables intake respectively. Dietary data was analyzed using FAO infood composition database and MICRODIET software version 3.0 (Downlee, UK). Pearson correlation and ANOVA were used to test for associations of variables of interest using SPSS version 20.0.All data were two-tail and statistically significant set at $p \leq 0.05$.

Results: Though majority alluded to fruits (83.9%) and vegetables (83.2%) intake because of their health benefits, mean daily servings of fruits and vegetables consumed were 1.49 ± 1.66 and 2.22 ± 1.17 respectively. Mean total daily caloric (1331.53 ± 663.77 Kcal), fibre (9.03 ± 7.25 g) and most micro-nutrient intakes were low. Educational level was significantly associated with fruit and vegetable intake ($p \leq 0.04$), as subject disease conditions significantly correlated with their vegetable intake (F=0.55; P< 0.01)

Conclusions: Most participants did not meet WHO recommended daily intake of 5 servings of fruits and vegetables and this may result in micro-nutrient deficiencies. Therefore, health facilities must aim at educating patients on the benefits of fruits and

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vegetables via health promotion out-patient daily talks in order to promote frequent and adequate intakes.

Keywords: Micro-nutrient deficiency, Elderly, Fruits and vegetable intake, Ghana, Nutrition education

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MATERNAL DIET DURING PREGNANCY AND LACTATION: CURRENT EVIDENCE AND IMPLICATIONS FOR PROGRAMS

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Background and objectives: Background and Objective: Adequate maternal nutrition during the "first 1000 days" window is critical from conception through the first 6 months of life to improve nutritional status and reduce the risk of poor birth outcomes, such as low birth weight and pre term birth. Unfortunately, many programs have focused implementation and evaluation efforts on outcomes of nutrition interventions for infants and young children and not maternal dietary consumption during pregnancy and lactation. A literature review was conducted to identify factors that influence women's food choice and consumption during pregnancy and lactation and to examine how low and middle income countries (LMIC) countries have addressed maternal nutrition in programs.

Methods: Literature review of peer-reviewed and grey literature was conducted and titles and abstracts reviewed by authors. Twenty-four studies were included in this review.

Results: Barriers to adequate nutrition during pregnancy included cultural beliefs related to knowledge of quantity of food to eat during pregnancy, amount of weight to gain during pregnancy, and "eating down" during pregnancy for fear of delivering a large baby. Foods considered inappropriate for consumption during pregnancy or lactation contributed to food restriction. Drivers of food choice were influenced by food aversions, economic constraints, and household food availability. Counseling on maternal diet and weight gain during pregnancy was seldom carried out.

Conclusions: Programming to support healthy maternal diet and gestational weight gain during pregnancy are scant, in light of this evidence and recently released World Health Organization antenatal care guidelines. Nutrition education and counseling on diet during pregnancy and lactation and optimal weight gain during pregnancy is an area of needed attention.

Keywords: maternal diet, gestational weight gain, pregnancy, lactation, barriers

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144/1047

CAN PEER COUNSELLORS INFLUENCE BREASTFEEDING PRACTICES OF WOMEN EMPLOYED IN FACTORIES? A PRELIMINARY REPORT FROM BANGLADESH

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Background and objectives: Women in the workforce in Bangladesh are mainly employed in readymade garments and other manufacturing industries. Inadequate access to health care, lack of correct information, and long working hours reportedly contribute to their poor breastfeeding practices. A project trained seven female peer counsellors to provide home-based counselling and skills to encourage factory workers to breastfeed optimally. An end line survey was conducted to assess whether the peer counsellors had influenced these workers' breastfeeding practices.

Methods: A cross-sectional survey was conducted among factory mothers with children aged 0-18 months of age in the counselled Intervention areas and neighbouring uncounselled Comparison areas during two weeks in March 2017 in Chittagong. Six external female interviewers trained over 3 days by experienced trainers, interviewed mothers after they returned from work. Data collected was checked, entered into computer and analysed using SPSS.

Results: A total of 382 working mothers with children aged 0-18 months were interviewed in Intervention areas (n=188) and neighbouring Comparison areas (n=194). Preliminary analysis shows 167 (89%) of Intervention mothers initiated breastfeeding within one hour of birth versus 42 (22%) of mothers in Comparison areas. Exclusive breastfeeding on 24-hour recall in infants below 6 months of age was 73/75 (97%) in Intervention areas, versus 3/83 (4%) in Comparison areas. Among mothers of older infants, 96/113 (85%) those in the Intervention areas reported having breastfed exclusively from birth for complete 6 months, versus 10/111 (9%) mothers in the Comparison areas. Whereas 182/194 (94%) of the Comparison area infants were bottle fed in the past 24 hours, only 16/188 (8%) of Intervention area infants had done so.

Conclusions: With peer counsellors encouragement and support, it seems most of the counselled factory workers could practice 6 months of exclusive breastfeeding compared to those who did not receive such services. These preliminary results highlight an urgent need for establishing and sustaining community-based support systems to improve breastfeeding practices of factory workers.

Keywords: Breastfeeding, peer counsellors, factory, workers

144/1050

RELATIONSHIP BETWEEN FOOD INTAKE AND AGE VALUE IN FEMALE UNIVERSITY STUDENTS

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Background and objectives: Advance Glycation End-Products (AGE) are a harmful substances formed through an excess of protein and sugar in human body. Excessive accumulation of these substances has been reported to accelerate the aging process and contribute to multiple diseases such as arteriosclerosis and diabetes. It has also been reported that AGE accumulation is related to food intake. However, AGE data from younger populations has been sparse compared to data collected from older ones, which come with a higher risk of lifestyle-related diseases. This experiment was designed to determine the relationship between food intake and AGE value by researching the food intake of female university students and then measuring their AGE values.

Methods: The AGE values presented here are measured with a TruAge scanner, and the measurement is taken from front part of left forearm. This nonintrusive method measures in vivo AGE accumulation by exposing and exciting accumulated AGE to light (mild ultraviolet exposure). The specific fluorescence of AGE is used to measure the amount of AGE accumulation under the skin. The food intake survey was created based on Food Frequency Questionnaire (FFQg).

Results: The younger population shows no AGE value differences compared to food intake, and, instead, the AGE values correspond with subjects' ages. Food intake does not appear to have any impact on the subjects' AGE values, either.

Conclusions: Further data is necessary, as data from a younger population can be a useful comparison against that collected from middle-age or elderly populations, who tend to show higher AGE accumulation values.

Keywords: Advance Glycation End-Products, FFQg

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ERYTHROCYTE FATTY ACID COMPOSITION IN GUATEMALAN PRESCHOOLERS FROM THREE DIFFERENT SETTINGS OF THE WESTERN HIGHLANDS WITH A COMMON INSTITUTIONAL DIET

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Background and objectives: Polyunsaturated fatty acids (PUFA) are important for normal brain development and immune function. Low levels of n-3 fatty acids (FA) have been previously reported for children living in the Pacific coast of Guatemala. This work is aimed to describe the fatty acids status in children from 3 settings of the Western Highlands of Guatemala with a mutually similar dietary intake.

Methods: 79 preschoolers (36 girls and 43 boys), beneficiaries of the Guatemalan government's "community homes" system attending one semi-urban (n=19), one marginal-urban (n=23) and one rural center (n=37) delivered a blood sample, fatty acids concentrations in erythrocytes were analyzed using gas-liquid chromatography. Descriptive statistics are presented as mean ± SD. Student t-test, Mann-Whitney U-test, one-way ANOVA or Kruskal-Wallis were used to compare between sexes and among settings.

Results: Erythrocyte percentages of selected fatty acids, for the total sample, expressed in weight percentage were arachidonic acid (ARA) 13.03 ± 1.7, eicosapentaenoic acid (EPA) 0.12 ± 0.2, docosahexaenoic acid (DHA) 1.7 ± 0.4, long-chain PUFA n-6 29.7 ± 3.1, long-chain PUFA n-3 2.5 ± 0.5, unsaturation index (UI) 2.4 ± 0.3, and omega-3 Index (EPA+DHA) 1.9 ± 0.4, respectively. Semi-urban center presented significantly lower concentrations of ARA than the rural center. DHA concentration was significantly lower in the marginal-urban center, whereas long-chain PUFA n-3 and n-3 index were significantly higher in the semi-urban center. EPA, long-chain PUFA n-6, and UI did not present any significant difference among settings. No significant differences were found between sexes.

Conclusions: Even when low omega-3 biomarkers are consistently found in Guatemalan subjects, children from the Western Highlands presented half of the concentration values for DHA and EPA than those reported in the Pacific Coast. Even with such low values, differences among settings are still present for some variables.

Keywords: omega-3, omega-6, omega-3 index, unsaturation index, Guatemalan children

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CARBOHYDRATES FROM SOURCES WITH A HIGHER GLYCAEMIC INDEX DURING ADOLESCENCE: EVENING INTAKE IS RELEVANT FOR RISK MARKERS OF TYPE 2 DIABETES IN YOUNG ADULTHOOD

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Background and objectives: A higher dietary glycaemic index (GI) and carbohydrates from higher GI food sources consumed during adolescence may affect subsequent type 2 diabetes risk. This study investigated whether morning or evening intakes during adolescence are relevant for insulin sensitivity, hepatic steatosis or low-grade inflammation in young adulthood.

Methods: Analyses were based on data from participants of an open cohort study (DONALD study) who had provided at least two 3-day weighed dietary records during adolescence (♀:9-15y, ♂:10-16y) and one blood sample in young adulthood (18-39y). Day-time specific data were used to estimate morning (before 11am) and evening (after 6pm) GI and glycaemic load (GL) as well as carbohydrate intake from low and higher GI sources [low-GI-CHO (GI<55) and higher-GI-CHO (GI≥55) in En%]. Multivariable linear regression models were used to analyse associations with insulin sensitivity (HOMA2%S in %) (N=252), hepatic steatosis index (HSI), fatty liver index (FLI) (both N=253), and a pro-inflammatory-score (N=249).

Results: Morning intakes during adolescence were not related to adult risk markers. In contrast, a higher evening intake of higher-GI-CHO (p=0.046) and GL (p=0.07) were related to lower levels of insulin sensitivity (adjusted means of HOMA2%S [95%-CI] in tertiles of higher-GI-CHO: T1: 84.1 [77.8;90.8], T2: 81.9 [75.9;88.0], T3: 76.7 [70.7;82.9]). A higher evening GI (p=0.003) and a higher evening intake of higher-GI-CHO (p=0.006) were associated with a higher HSI (adjusted means of HSI in tertiles of GI: T1: 29.3 [28.6;30.0], T2: 30.4 [29.7;31.2], T3: 30.6 [29.9;31.4]), while a higher evening intake of low-GI-CHO was related to lower indices (p=0.009). No prospective associations were observed with FLI or the pro-inflammatory-score in young adulthood.

Conclusions: Our data suggest that young adult insulin sensitivity and hepatic steatosis index are responsive to evening, but not morning adolescent intakes of higher-GI-carbohydrates

Keywords: glycaemic index, glycaemic load, daytime, adolescence, type 2 diabetes mellitus

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GLUCOSE AND INSULIN RESPONSES TO DIFFERENT INFANT FORMULAS AND BREAST MILK

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Background and objectives: Different infant formulas are available for infants who are not exclusively breastfed. The impact of such formulas on postprandial insulinemia and glycaemia is not known. As repeated blood sampling required for such studies is not feasible in infants, this study compared cow's milk-based formulas containing either intact (INTACT) or partially hydrolyzed (PH) protein, as well as a PH preterm formula (preterm infants ≥ 1.8-2.1 kg when discharged from hospital, DISCH), on postprandial glucose/insulin responses in healthy adults. A breast milk (BM) reference was studied in a subgroup.

Methods: Randomized, double blind, cross-over study in healthy volunteers consuming 600ml of 3 different infant formulas: INTACT (whey/casein ratio of 70/30, 1.9 g protein/100 kcal; 63 kcal/100 ml), PH whey (PHw, 1.96 g protein/100 kcal; 63 kcal/100 ml) and DISCH (PHw, 2.8 g/100 kcal; 73 kcal/100 ml) (n=34); and a BM subgroup (n=10). Formulas had similar fat and total carbohydrate (g/100 kcal): 5.1-5.2 and 10.5-11.6 (3.15 as maltodextrin in DISCH), respectively. Insulin and glucose were measured in venous blood collected after overnight fast, and at different intervals for 2 hr following a meal.

Results: INTACT and PHw groups had similar postprandial insulinaemia or glycaemia (Cmax and IAUC) that were not different from those of the BM group. The DISCH group had a higher (p<0.05) insulin response than all other groups, and a glucose response which was higher than those of INTACT and PHw groups (P>0.05), but not different from that of the BM group.

Conclusions: This study indicates that glucose and insulin responses to infant formulas with INTACT and PHw proteins are similar and not different from BM in adult subjects. Higher insulin and glucose responses to DISCH formula might be desirable for catch-up growth in low-birth weight infants. There is a

need to gain knowledge on the consequence of insulin and glucose responses to early diet and later metabolic health (i.e., metabolic programming)

Keywords: Protein, infant formula, glucose, insulin

Conflict of Interest Disclosure: All authors are employees of Nestec Ltd.

144/1114

DIET EVALUATION IN YOUNGER COMPARED TO OLDER GREEK ELDERLY

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Background and objectives: Given the rapid increase of older people, especially of the older elderly, the investigation of modifiable factors that can affect healthy ageing, including diet, is of paramount importance. The aim of the present study was to explore the adherence to an a priori defined Mediterranean dietary pattern, as well as the consumption of specific food groups, in younger elderly compared to older elderly adults in a large population-representative sample in Greece.

Methods: Participants from the Hellenic Longitudinal Investigation of Ageing and Diet (HELIAD) were included. The sample consisted of adults ≥65 years old, and was stratified by age, i.e. those aged ≤75 years old and those aged >75 years old, representing the younger and the older elderly, respectively. Habitual diet during the previous month was assessed using a validated semi-quantitative food frequency questionnaire whereas adherence to the Mediterranean Diet was assessed by an a priori score, the MedDietScore.

Results: Among 1835 individuals, 1249 participants were ≤75 years old and 586 >75 years old. Energy and macronutrient intake did not differ by age group. The younger elderly consumed more fruits, vegetables, fish as well as coffee/tea and fewer refined cereals compared to the older elderly. However, when total energy intake, sex and years of education were entered as covariates, the association remained significant only for fruits, vegetables and coffee/tea (B=-0.098, p=0.023, B=-0.094, p<0.001 and B=-0.079, p=0.001, respectively). Furthermore, the younger elderly adhered more closely to the Mediterranean diet compared to the older elderly even when covariates were entered (B=-0.092, p<0.001).

Conclusions: Our results suggest that the younger elderly adhere more closely to the Mediterranean diet than the older elderly. Although additional studies are needed, the results are valuable in order to design tailored interventions in terms of public health policy that take into account the special characteristics and needs of the different age groups among older people.

Keywords: elderly, Mediterranean diet, oldest old

144/1127

BABY FRIENDLY COMMUNITY INITIATIVE (BFCI): FROM GUIDELINES TO IMPLEMENTATION – DEMONSTRATED RESULTS FROM WESTERN KENYA

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Background and objectives: According to Kenya Demographic and Health Surveys (KDHS), a two-fold increase in exclusive breastfeeding (EBF) was documented from 2008/9 to 2014 in Kenya. Yet, according to KDHS, only 22% of children 6 -23 months are fed a minimum acceptable diet. Misconceptions and myths which impede exclusive breastfeeding, inadequate capacity of health workers & community health volunteers (CHVs) to support optimal maternal, IYCF and limited scale-up of community support groups (CSGs) are key challenges facing the country. Working hand-in hand with Ministry of Health, United States Agency for International Development Maternal and Child Survival program (MCSP), an integrated maternal, newborn child health and nutrition program, introduces high-impact interventions with the goal of ending preventable child and maternal deaths in Kisumu and Migori counties. MCSP rolled out Baby Friendly Community Initiative (BFCI), to address these challenges at the community level. The objective of this presentation is to share program experience of BFCI roll-out using recently developed national Ministry of Health guidelines.

Methods: The Ministry of Health BFCI implementation package (Implementation Guidelines, Training Package, Communication & Advocacy Material, External Assessment protocols) was developed with technical leadership and support from MCSP, UNICEF and other partners. Using the BFCI implementation guidelines, MCSP held sensitizations meetings, BFCI trainings, and formed mother to mother support groups (M2MGs),

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and community support groups. Agriculture was incorporated through the establishment of kitchen gardens.

Results: Eighty BFCI M2MSGs were created, and offered an opportunity for community health volunteers taught mothers on one topic from the national MIYCN counseling cards (i.e. initiation, importance of colostrum, positioning and attachment, resolving breastfeeding problems, and maternal nutrition), cooking demonstrations on complementary feeding using locally developed recipes and income generating activities. These mothers were taught to establish household kitchen gardens which were used to improve complementary feeding practices. MIYCN knowledge and skills of health workers and CHVs improved. Monitoring using the newly developed BFCI tools demonstrated improvement in IYCF indicators.

Conclusions: BFCI is a successful approach to improve MIYCN at the community level.

Keywords: community, baby friendly, breastfeeding, complementary feeding, agriculture

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PARADOXES OF WAIST CIRCUMFERENCE IN SHORT-STATURE AND STUNTED GUATEMALAN WOMEN

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Background and objectives: With decreasing stature, anatomical alterations affecting waist circumference (WC) and derivative indices may modify conventional relationships and associations with intra-abdominal visceral adipose tissue. This is of interest to Guatemala, with the highest prevalence of childhood stunting in the Americas.

Methods: Anthropometric measures of clothing-adjusted weight, standing-height (without shoes) and WC (with skin contact) were recorded, 156 adult women aged >35 years, residents of the municipality of Nahualá in the Province of Sololá in the western highlands of Guatemala. The WC "action-levels" classification as normal (0), elevated (1) and excessive (2) from international reference were, respectively: <80, 80-88, and >88 cm. Conventional WHO cut-offs for body-mass index (BMI, weight (kg)/height (cm)^2) for not-elevated, overweight and obesity were used. The criterion of <0.5 for "healthy" WC-to-height ratio (WHtR), as proposed by M. H. was adopted.

Results: Median stature women was 141 cm, with a range of 126-156 cm, with 78.2% stunted, and the respective values for BMI were 24.9 kg/m^2, range 16.8–40.7 kg/m^2. The median WC was

81 cm, range 57–101 cm. WC assorted by action-level as 46.8% (0); 22.4% (1) and 30.8% (2), compared to BMI classification as 51.3% (non-elevated), 32.7% (overweight), and 16.0% (obese). For WHtR, the median ratio was 0.58, range 0.41–0.73, with of 20 values (12.8%) of <0.5.

Conclusions: Severe low stature influences WC and WHtR in relation to international references. The median WC would have to be <71 cm for approaching the reference "healthy" WHtR of <0.5. Correspondence of WC action-levels and BMI categories was overdistributed toward higher WC at lesser BMI. Thus, the degree to which abdominal girth dimensions relate to visceral fat and metabolic risk in low-stature women merits further examination with ancillary measures.

Keywords: height, stunting, waist circumference, waist-to-height ratio, Guatemala

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FEEDING BEHAVIOURS AS RISK FACTORS FOR UNDERNUTRITION IN INFANTS LIVING IN SEMI-URBAN COMMUNITIES OF THE VOLTA REGION, GHANA

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Background and objectives: Infant malnutrition is a continuing concern in middle-income countries like Ghana but it is still not clear why some infants become malnourished and others do not. Feeding behaviour could be a contributing factor. Therefore we aimed to determine the association between child and maternal feeding behaviour and nutritional status of infants 6-24 months in the Volta Region of Ghana.

Methods: A convenience sample of caregiver-infant pairs (n=153, mean age 14 months) were recruited from Child Welfare Clinics in eight semi-urban communities in Ho, the Volta Region's capital. A structured interview was used to collect information on feeding behaviours (force-feeding, food interest and food refusal) and socioeconomic status. Height and weight were measured and converted into Z-scores using WHO reference data. Underweight, stunting and wasting were defined as weight-for-age (WAZ), height-for-age (HAZ) and weight-for-height (WHZ) <-2 standard deviations respectively.

Results: Prevalence of underweight, wasting and stunting were 15%, 11.1% and 13.8% respectively. HAZ decreased with age (Mean (SD) 6-9 months -0.04 (1.5), 9-12 months, -0.43 (0.76), 12-24 months -0.86 (1.2), p=0.001). However, there was no association between socioeconomic status and infants' nutritional status. Moderate to high food refusal was reported for 30.6% and the food refusal scores were significantly correlated with force feed-

ing (spearman's r=0.2, p=0.01) and strongly inversely correlated with interest in food (r=-0.638, p<0.001). Over half of the mothers (54%) used some force feeding; the amount of force feeding was significantly inversely associated with WAZ (β=-0.19, p=0.004) and WHZ (β=-0.18, p=0.03). In a multivariable linear regression model including all behavioural variables adjusted for age, food refusal was significantly inversely associated with WAZ (β=-0.21, p=0.04), while both interest in food (β=-0.20, p=0.06) and force feeding (β=-0.19, p=0.06) showed borderline associations respectively, with similar findings for WHZ.

Conclusions: Child eating behaviour and the caregiver's response may be important factors in an infant's nutrition. In order to clarify whether force-feeding is a cause or a response to low weight, better measures of infant feeding behaviour are needed as well as trials of interventions to train mothers to feed responsively.

Keywords: feeding behaviour, nutritional status, force-feeding, malnutrition

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CHANGES IN LEAN MASS IS CORRELATED WITH CHANGES IN MUSCLE FUNCTION ONLY IN POSTMENOPAUSAL WOMEN WHO CONSUMED HIGHER AMOUNTS OF PROTEIN DURING RESISTANCE TRAINING PROTOCOL

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Background and objectives: The correlation between changes in lean mass and changes in muscle function after resistance exercise intervention is not well stablished. Additionally, the effect of protein intake on these correlations is not known. Therefore, the aim of this study was to correlate the changes in lean mass with changes in muscle function (strength and functional capacity) according to protein intake in postmenopausal women after resistance training protocol.

Methods: Twenty-three postmenopausal women (63.2±7.8 years) were randomized in two groups: normal protein (NP) (n=12), who received a dietary plan with ~0.8 g protein·kg-1·d-1, and high protein (HP) (n=11), being recommended ~1.2 g protein·kg-1·d-1. Resistance training was performed 3 times/week and the intervention lasted 10 weeks. Muscle strength was assessed by handgrip strength (HGS) and one repetition maximum test. Func-

tional capacity was measured by the Short Physical Performance Battery, 6-minute walk test, 400-meter walk, 10-meter walk and time up and go test. Lean mass (total, arm and leg) was assessed by dual energy x-ray absorptiometry scanning and dietary intake was assessed by nine 24-hour food recall. Pearson's correlation was performed with delta (Δ) of lean mass (total, arm and leg) and Δ of the strength and functional capacity tests.

Results: Both groups increased similarly the total lean mass, arm lean mass, leg lean mass, strength and functional capacities tests after intervention. In HP group, Δ total lean mass correlated positively with Δ right HGS (r=0.64; p=0.033) and negatively with Δ time of 400-meter walk test (r=-0.61; p=0.046). In addition, Δ leg lean mass correlated negatively with Δ 400-meter walk test (r=-0.63; p=0.038), also in HP group. There were no significant correlations for NP group.

Conclusions: Changes in lean mass correlated with changes in strength and functional capacity tests only in postmenopausal women who consumed higher amounts of protein.

Keywords: Diet Intervention, Resistance Training, Muscle Function, Lean Mass.

144/1142

APOE RS429358 AND RS7412 POLYMORPHISM AND GENDER DIFFERENCES OF SERUM LIPID PROFILE AND COGNITION IN AGING CHINESE POPULATION

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Background and objectives: ApoE gene polymorphism has been reportedly associated with serum lipids and cognition. However, very few studies have explored the combined effects of ApoE gene polymorphism and gender on serum lipid profile with subsequent impacts on cognition in Chinese population.

Methods: A total of 1000 Chinese community dwellers aged 55 years and above were recruited in this cross-sectional study. Demographic information of the participants was collected using well designed self-administered questionnaires. The Montreal Cognitive Assessment (MoCA) test was employed to evaluate the cognitive status of the participants. Semi-quantitative food frequency questionnaire (FFQ) was used to obtain the dietary intake information. Fasting venous blood samples were taken for ApoE genotyping and serum lipid measurements.

Results: Significant gender differences in cognition, serum lipid profile and dietary fat-rich foods consumption were observed (p < 0.05). Cognition of the subjects was found to be associated with ApoE genotypes (p < 0.05). ApoE rs429358 and rs7412 variants demonstrated a significant effect on cognitive performance in the male subjects; especially within the attention and language ability domains as well as the total MoCA score (p < 0.05) respectively.

Conclusions: Serum lipid profile and cognition of Chinese adults are significantly linked with gender and ApoE genetic polymorphism. The ApoE variant rs429358 is found to be notably associated with cognition in aging male Chinese population.

Keywords: Apolipoprotein E, Polymorphism, Gender, Lipid Profile, Cognitive Function, Geriatrics

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144/1148

NUTRITIONAL STATUS AND ACADEMIC PERFORMANCE OF SCHOOL-AGE CHILDREN ENROLLED IN TWO FEEDING PROGRAMMES IN GHANA

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Background and objectives: School-age children (SAC) are vulnerable to malnutrition which can negatively influence their academic attainment. There is limited information on relationship between nutritional status and school attendance and performance of school age children enrolled in school feeding programmes in Ghana. We assessed the association between current nutritional status of SAC participating in school feeding programmes, and attendance and performance in selected subjects in the past term.

Methods: This was a cross sectional study involving one hundred and eighty-two school age children enrolled in either the Ghana School Feeding Programme or a Non-government Feeding Programme. Haemoglobin concentration, and weight and height of all children were measured using standard procedures. Data on school attendance and performance of SAC were abstracted from class and academic performance registers. Independent t-test was done to assess the differences in school attendance and performance by nutritional status of SAC.

Results: About two-thirds (67.0%) of children were either stunted, underweight, or anaemic. No significant associations were observed between haemoglobin levels, body mass index (BMI)-for-age, or height-for-age z-score and either performance or school attendance in the past school term. Albeit, having at least one nutritional deficit was associated with lower scores in mathematics (mean difference = 4.62), English (mean difference = 4.49) and creative arts (mean difference = 4.50) in the past term than better nourished participants $p< 0.05$.

Conclusions: Addressing malnutrition among SAC is an important contribution to academic success.

Keywords: School attendance, academic performance, malnutrition, school-age children, school feeding programmes

144/1153

COVERAGE OF AND FACTORS ASSOCIATED WITH UPTAKE OF ROUTINE VITAMIN A SUPPLEMENTATION IN SUB-SAHARAN AFRICA

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Background and objectives: In many sub-Saharan Africa (SSA) countries routine vitamin A supplementation (VAS) of children has been implemented as a short- to medium-term strategy to combat Vitamin A deficiency (VAD). However, in the subcontinent limited information is available regarding the coverage VAS. The objective of the current study is to assess the coverage of and factors associated with utilization of VAS for preschool children in SSA.

Methods: The analysis was made based on the data of 28 Demographic and Health Surveys conducted in SSA since 2010. The data of 152,406 children were included in the analysis. The VAS status in the preceding 6 months was determined based on the reports of the caregivers. Factors association with VAS uptake and it's with common childhood ailments (diarrhea, cough, fever and anemia) were assessed using mixed effect logistic regression model.

Results: The coverage of VAS was 56.3% (95% CI: 56.1-56.5%). Among the 28 countries represented, six countries (Rwanda, Senegal, Malawi, Namibia, Serra Leone and Togo) achieved 80% or higher coverage; conversely, four countries (Guinea, Nigeria, Comoros and Benin) had less than 50% coverage. VAS coverage appears to vary across categories of children's age and socio-economic status. Children 6-11 months of age were less likely to have received VAS (48.6%) than older children (57.9%). The coverage in urban areas (63.9%) was significantly higher than that of rural areas (53.9%). Better maternal education and household wealth index were associated with higher uptake of VAS. VAS was modestly associated with increased odds of fever [AOR=1.20 (95% CI: 1.17-1.23)], diarrhea [AOR=1.16 (95% CI: 1.13-1.20)] and cough [AOR=1.23 (95%: 1.17-1.29)]. Conversely, in the supplemented children the odds of anemia was reduced by 10.8% (95% CI: 8.2-13.3%). All the associations translated into trivial effect sizes.

Conclusions: In SSA the coverage of VAS is unsatisfactory. VAS is associated with trivial increase in the occurrence of common childhood ailments.

Keywords: Vitamin A supplementation, Sub-Saharan Africa, DHS, childhood illness.

144/1156

USE OF 'DESIGN THINKING' TO ASSESS PARTICIPANT BEHAVIORS TO INFORM THE DESIGN OF A SMALL-QUANTITY LIPID-BASED NUTRIENT SUPPLEMENT (SQ-LNS) COMMUNICATION STRATEGY IN PASTO, COLOMBIA: FORMATIVE RESEARCH

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Background and objectives: The SPOON project aims to design a social and behavior change communication (SBCC) strategy to prevent malnutrition among children aged 0-24 months through adequate infant and young child (IYC) feeding practices, including home-fortification with SQ-LNS. Design thinking brings together creative methods and graphic design to develop innovative assessment instruments. We aimed to understand participant context and behaviors using these instruments to inform the design of a SBCC strategy for SQ-LNS.

Methods: Research and design-thinking teams collaborated to develop unique data collection approaches for use as part of in-depth interviews. The three instruments (communication, free time, and community influence) were administered to a convenience sample of 12 key informants (KI), 28 caregivers (CG), and 10 health professionals (HP) to understand the best methods for reaching them with messaging and communication components. Exercises included elements of graphic design, pictures, and stories that helped respondents identify how they communicate, use free time, and seek advice regarding their children.

Results: The design thinking materials were well understood by participants, easy to administer, provided a change of pace and reprieve from open-ended questioning, and enhanced respondent participation. KI, CG, and HP differ in preferred communication methods. HP frequently use computers (100%), WhatsApp (90%), smartphones (80%) and television (80%), while KI and CG frequently use television (89%), radio (67%), and smartphones (44%). In their free time both KI and CG frequent parks (58%), churches (50%), and family homes (47%). In cases of child illness, respondents seek help at hospitals, while in cases of routine checkups for growth and development they seek advice at health centers.

Conclusions: This innovative research technique allowed us to explore practical and available options for the delivery of the SBCC strategy for SQ-LNS. Design thinking instruments can be designed and included in formative studies to capture the local context and develop relevant interventions. In the Pasto setting, the SQ-LNS SBCC strategy should consider use of mass commu-

nication such as television and radio, but also more personal and targeted methods such as short message service (SMS) and community spaces to reach the various target populations.

Keywords: Small quantity - lipid-based nutrient supplement (SQ-LNS), Design thinking, formative research, Colombia

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144/1176

INAPPROPRIATE TIMING OF INTRODUCTION OF COMPLEMENTARY FOODS: PRACTICES AND PERCEPTIONS AMONG MOTHERS OF INFANTS AND YOUNG CHILDREN IN BAJA VERAPAZ, GUATEMALA

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Background and objectives: The WHO recommends exclusive breastfeeding, followed be the timely introduction of adequate complementary foods (CF) at 6 months of age. Little is known about the specific age of introduction of CF in some areas of Guatemala and the perceptions which guide this practice. We aimed to assess the feeding practices of 6-23 months old infant and young children from Baja Verapaz.

Methods: As part of the formative research for SPOON, which aims to design social and behavior change communication (SBCC) strategy to prevent chronic malnutrition and reduce the risk of future obesity in children aged 0-23 months, qualitative and quantitative research methods were used to explore infant and young child (IYC) feeding practices and perceptions in 3 municipalities of Baja Verapaz. In-depth Interviews were conducted with 9 mothers and 28 mothers completed a structured survey.

Results: A theme that emerged from the in-depth interviews is that mothers delayed the introduction of CF until the infant was 7 or 8 months old, or even beyond the first year of life. Nine of the surveyed mothers started CF at <6 months, 10 at 6 months, 4 at 7 months, and 5 at 8 months. First foods offered included bean-broth, corn-tortilla, potatoes and rice. Fussiness, perceived negative effects of food on children's health, such as diarrhea or indigestion, are some of the reasons for delaying CF. Mother's perceptions are inspired by negative experiences with CF among older siblings and advice from role models, such as grandmothers. Economic restrictions also played a role in delaying CF.

Conclusions: Determinants that affect the timely initiation, establishment and continuation of CF are varied and specific to Baja Verapaz. Findings provide a foundation to design further behavior change interventions that promote appropriate feeding practices among infants and young children.

Keywords: Infant and young child feeding practices, complementary feeding, formative research

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144/1187

TOWARD A BETTER UNDERSTANDING OF ADHERENCE TO MICRONUTRIENT POWDERS: GENERATING THEORIES TO GUIDE PROGRAM DESIGN AND EVALUATION BASED ON A REVIEW OF PUBLISHED RESULTS

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Background and objectives: To generate preliminary theories about factors affecting caregiver adherence to recommendations regarding point-of-use fortification of complementary foods with micronutrient powders (MNP).

Methods: A literature search was conducted to identify MNP studies and program descriptions using the following criteria: (1) MNP as an intervention provided to children 6 to 59 months of age at home, (2) content related to adherence, and (3) full text available in English. Thirty-seven studies and 6 program descriptions, representing 27 countries, were identified. We used thematic analyses to generate a comprehensive list of factors that could influence adherence, followed by content analysis to quantify the results. We developed a Program Impact Pathway to concretize the points at which the factors identified in our analysis affect the sequence of caregiver behaviours involved in the process of adherence.

Results: We identified 24 factors that pertain to child, caregiver and household levels that are reported to potentially influence adherence. The most influential factors, measured by number of documents reporting the factor having an effect, are: caregivers' perception of positive changes as a result of MNP use (n=14), caregivers' perceived child acceptance of food with MNP (n=12), and caregivers' knowledge of MNP's purpose (n=11). The majority of factors (n=22) identified by investigators can be characterized as pertaining to the "cultural" or "ideational systems".

Conclusions: The preponderance of knowledge and perception factors identified likely reflects an underlying assumption by investigators that caregiver behaviour is primarily driven by these two aspects, which may result in emphasis on questions related to these in research related to adherence. To achieve greater impact

we need to adopt a more cultural-ecological perspective to inform the design of programs that take into account a broader set of determinants. New studies that assess the progress across the impact pathway, particularly from caregiver adherence to biological outcomes would be useful to guide future program evaluation design, particularly where time or other constraints may limit potential to measure biological outcomes. Greater understanding of caregivers' perceptions and other facilitators and constraints to adherence is also critical for designing and monitoring behavior change strategies to encourage MNP use.

Keywords: Micronutrient powders, adherence, infant and young child feeding, micronutrient deficiency, cultural-ecological

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144/1196

THE MOTHER-CHILD DYAD IS A CENTRAL FACTOR IN POINT-OF-USE FORTIFICATION OF COMPLEMENTARY FOODS WITH MICRONUTRIENT POWDERS IN ETHIOPIA AND MOZAMBIQUE

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Background and objectives: To identify household level barriers and facilitators for initiating and sustaining point-of-use fortification of complementary foods with micronutrient powders (MNP) in Ethiopia and Mozambique.

Methods: As part of a mixed-method process evaluation, we used the focused ethnographic technique of guided, in-depth interviews to generate narratives of caregivers' experiences and beliefs with respect to MNP, from initial "trying out" through continuation or discontinuation. Interviews were conducted in samples of 30 caregivers in Ethiopia and 60 caregivers in Mozambique by experienced, trained interviewers. Interviews were audio-recorded, transcribed and translated. Coding was facilitated with NVivo software, and a subsample of transcripts were double coded to check for coding bias. Higher level analyses were facilitated by the use of Excel spreadsheets and narrative text notes were compiled to illustrate themes.

Results: Child responses to foods prepared with MNP emerged as a central factor in mothers' experiences, assessments and use of MNP. Initial positive child behavioral and physical reactions facilitated continued MNP use. Mother-reported positive child reactions included acceptance of food, visual signs of enjoyment, and consuming the portion. Initial negative child reactions included refusing food, vomiting, crying. Negative child reactions did not always lead to stopping, but depended on mothers' beliefs and re-

sponses. The spectrum of mothers' responses included techniques to encourage eating, mixing MNP with different foods, hiding the MNP packet, continuing to try or stopping MNP. Many caregivers described an eventual acceptance of MNP by the child after repeated exposure. After adherence was established, some children went on to develop negative behavioral and physical reactions. As with initiation, the effects of these on continuing use were also mediated by mothers' beliefs and responses.

Conclusions: Like breastfeeding, complementary feeding, utilization of MNP involves a mother-child dyad. Further studies are needed to better define characteristics of mother-child interactions with MNP and differences in cross-cultural and intra-cultural manifestations. It is likely that current promotion efforts would benefit from reorienting key messages and activities to encompass strategies for MNP use as a dyadic interaction, as has been the case with breastfeeding promotion.

Keywords: Mother-child dyad, barriers and facilitators for MNP use, child responses to MNP, mother responses to child MNP reactions

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144/1203

INTRODUCTION TO OBESOGENIC FOODS AND OVERWEIGHT IN CHILDREN AT 2 YEARS

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Background and objectives: The prevalence of overweight (OW) has been increasing, even among young children. There is no conclusive evidence on the relationship between the development of childhood OW and the time of food introduction. Even if the relationship exists, it is not known if there is any peculiarity regarding the association of this condition and the type of food introduced. Studies show that complementary feeding (CF) starts early and with food not always nutritionally adequate. The purpose of the study was to find if there is a relationship between the time of introduction of obesogenic foods and the OW in children in early preschool age.

Methods: A historical cohort study of children attending municipal day care centers in Taubaté – State of São Paulo. Weight and height of children and information on the age of introduction of obesogenic foods were collected – using a self-filled questionnaire completed by those responsible. The classification of the nutritional status was by the body mass index z-score (zBMI), and children with zBMI $\geq$ 1 were classified as having OW. The data analysis was performed using the Stata statistical package, version 9.2. The study was approved by the Research Ethics Committee - School of Public Health/University of São Paulo.

Results: The final sample consisted of 463 children, 50.5% female, with a mean age of 2.4 years. The prevalence of OW was high (27.5%). The mean age at the beginning of the introduction of obesogenic foods was 10.4 months (median: 10.0; SD: 4.9) and the mode was to start consuming these foods between 9 and 12 months. In this sense, it should be noted that almost half of the children (46.9%) started eating obesogenic foods between the ages of 3 and 9 months. It was found that the age at the beginning of the introduction of obesogenic food did not correlate with the BMI z-score (r= -0.07, 95% CI from -0.16 to 0.02, p=0.1021).

Conclusions: It was observed that there is an important prevalence of overweight children, however, in this population, no correlation with the time of introduction of obesogenic foods occurring early in age was observed.

Keywords: Obesity, Overweight, Preschool, Complementary feeding, Obesogenic Food.

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144/1221

ANIMAL SOURCE FOOD CONSUMPTION DURING EARLY CHILDHOOD IS ASSOCIATED WITH REDUCED RISK OF POORER CHILD DEVELOPMENT OUTCOMES IN RURAL NEPAL

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Background and objectives: More than 200 million children <5 years of age in low/middle-income countries are at risk of not reaching their full developmental potential. This deficit has important economic consequences. Multiple factors contribute to this burden, including poor stimulation/learning opportunities, environmental toxins, and nutritional deficiencies, particularly diets deficient in animal source foods (ASF). However, few studies have explored longitudinal associations between household livestock ownership, child ASF consumption, and child development.

Methods: Child development was assessed using the Ages & Stages Questionnaire (ASQ-3, 3rd edition) in all 307 children age 23-38 months whose families were enrolled in a randomized trial of an intervention implemented over 33 months by Heifer Nepal in Banke, Nepal. Groups included (1) Intensive community development plus nutrition/livestock training ("full intervention") (2) Nutrition/livestock training alone, or (3) Control. Regular household visits were made to administer surveys/conduct child growth monitoring. The ASQ-3 was included in the 3rd visit (15 months after baseline). We used logistic regression to explore longitudinal associations between household livestock score, child ASF consumption (24-hr recall), and total ASQ-3 score in the bottom 25% of the distribution, adjusting for household wealth and maternal education.

Results: Mean number of ASFs consumed by children was low (Rounds 1-2-3, respectively): 0.51+/-0.73, 0.87+/-0.88, 0.90+/-0.92. Maternal education, household wealth and livestock ownership, participation in Heifer full intervention, and greater ASF consumption were significant or meaningful factors protecting children from an ASQ-3 score in the lowest quartile in unadjusted models. In multivariate models adjusted for wealth and maternal

education, the sum of ASFs consumed during the three 24-hour recalls collected over 15 months of observation significantly protected against a lower child development score (OR [95%CI]: 0.74 [0.60, 0.90]).

Conclusions: In this prospective longitudinal study, household livestock ownership, child ASF consumption, and participation in full Heifer intervention were each associated with better developmental testing results, even after accounting for socioeconomic status. Importantly, ASF consumption in early life (ages 8-23 months) was associated with later developmental performance. A trial to explore the potential benefits of ASF production and consumption on child development may be warranted.

Keywords: child development/Animal source food consumption/community intervention/livestock ownership

Further collaborators

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144/1237

EMPOWERING PRESCHOOLERS TO BECOME HEALTHY HABITS MESSENGER THROUGH SELECTED COMMUNICATION CHANNELS: STORIES MUSIC DANCE AND MAGIC TRICKS

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Background and objectives: Education has shifted away from simple dissemination of knowledge to using reinforcing communication channels (i.e. stories, music, dance, and magic tricks). Piaget's theory suggests that 2-7-year olds are in the pre-operational stage. The preschoolers think symbolically, use language, classify and represent objects by images and words. In addition, studies indicated that preschool children need appropriate outlets to express their energy in a positive and creative way. Two outlets, dance and music, should be considered among preschoolers. By adapting an established curriculum to include creative movement and music, preschoolers will have a better understanding of the arts while learning. Magic tricks are ageless and relevant across cultures.

The present program aimed to empower the preschoolers through stories, dance, music, and magic tricks to influence health behavior at school and at home and to measure the effectiveness of selected communication channels in reinforcing nutrition education among 3-5-year old preschoolers.

Methods: A two year longitudinal and experimental study design was used. Approximately 300 preschoolers (150/experimental group; 150/control group) participated at three Head START Centers. The Socio-ecological Framework was used. The curriculum, "Eagle Book Series" developed by the Center for Disease Control and Prevention (CDC) in response to the burden of diabetes among Native Americans was evaluated among African American children and implemented. Four lyrics with accompanying movement were created emphasizing each book's main message. The reading of each book was followed by music, dance, visual tools, and magic tricks. The effectiveness of the selected communication channels was measured using surveys and caregivers' feedback. Descriptive statistics (STATA 14), Paired-T-test, and content analysis were used.

Results: Approximately 300 preschoolers participated: 90% were African American. More than 80% of the participants in the experimental group understood the main message in each book and remembered the lyrics of the songs. Direct observation indicated that magic tricks increased their attention. Qualitative data indicated that preschoolers were able to share the messages at home with their siblings and caregivers.

Conclusions: Overall teaching an established curriculum using the right communication channels could make a difference in nutrition education among preschoolers. Preschoolers may affect the food decision making at home and at school.

Keywords: Preschoolers. communication channels. healthy behaviors.

144/1265

IMPAIRED NEURAL TUBE CLOSURE IN MICE LACKING HIGH DENSITY LIPOPROTEIN RECEPTOR SR-BI IS ASSOCIATED WITH DEFICIENT VITAMIN E UPTAKE AND ABERRANT GENE EXPRESSION

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Background and objectives: SR-BI is the main receptor for high density lipoproteins (HDL) and mediates the bidirectional

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transport of lipids, such as cholesterol and vitamin E, between these particles and cells. During early development, SR-BI is expressed in extraembryonic tissue, specifically in trophoblast giant cells in the parietal yolk sac. We previously showed that approximately half of the embryos in SR-BI-/- conceptuses fail to close the anterior neural tube and develop exencephaly, a perinatal lethal condition, suggesting that SR-BI-mediated transport of lipids is important for neural tube closure. In this work, we evaluated the role of SR-BI in embryonic vitamin E uptake during murine neural tube closure.

Methods: We generated heterozygous intercrosses, fed the dams with control chow or a vitamin E-supplemented diet, and obtained the embryos at E9.5, when the neural tube is normally recently closed. We determined the vitamin E content in embryos by HPLC, their reactive oxygen species (ROS) content with dichlorodihydrofluorescein, and gene expression by real time PCR.

Results: Our results showed that all the SR-BI-/- embryos analyzed had very low vitamin E content in comparison to SR-BI+/+ embryos. SR-BI-/- embryos with closed neural tubes (nSR-BI-/-) exhibited high reactive oxygen species (ROS), whereas SR-BI-/- with NTD (NTD SR-BI-/-) showed intermediate ROS levels between SR-BI+/+ and nSR-BI-/- embryos. Reduced expression of genes involved in neural tube closure was only found in NTD SR-BI-/- embryos. Maternal α-tocopherol dietary supplementation prevented NTD almost completely (from 54% to 2%, p<0.001), and SR-BI-/- embryos retrieved from those dams showed normal ROS and gene expression levels.

Conclusions: Altogether, our results suggest that SR-BI contributes in the provision of appropriate levels of vitamin E to the embryo, suggesting that an abnormal vitamin E uptake transfer from the mother to the embryo mediates NTD in this model.

Keywords: Vitamin E, neural tube, HDL, SR-BI

144/1272

REDUCED DOCOSAHEXAENOIC ACID CONTENT IN NEONATAL ERYTHROCYTES FROM OBESE MOTHERS

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Background and objectives: Long chain polyunsaturated fatty acids are an essential component for normal growth and development of the fetus and newborn. They participate in the control of cellular growth, metabolism, intercellular communication and gene expression, relevant for the physiopathology of metabolic and cardiovascular diseases. Docosahexaenoic (DHA) and eicosapentaenoic are the most known fatty acids from omega 3 family. It is known that low concentrations of omega-3 in humans is associated with disturbance of cellular metabolism, including neurological and visual development.

The objective of this study was to describe and compare fatty acid profile from normal and obese pregnant woman, then determine the relationship of mother´s nutritional status with neonatal DHA levels.

Methods: 17 pregnant women (7 normal weight, 10 obese) were recruited at the Clinical Hospital of Pontificia Universidad Católica de Chile after Ethical Committee approval and informed consent. Mother venous blood was collected, and newborn's blood samples were obtained from the umbilical cord vein at the moment of delivery. Fatty acids profile was determined in red blood cell by liquid gas chromatography.

Results: There was a trend of higher omega-6/omega-3 ratio in newborn erythrocytes from obese pregnant women compared to controls (3.78±0.37 vs 2.81±0.09, respectively, p= 0.065, Mean±SEM). There was a negative association between newborn DHA levels and mother's body mass index (r²=0.7, p=0.037). A lower concentration of DHA occurred in neonatal erythrocytes from obese mothers, compared to those with normal weight for height and gestational age at the end of pregnancy (140.3±7.68 vs 103.9±6.83 mg/dL, respectively, p=0.016, Mean±SEM).

Conclusions: There is a decreased concentration of DHA in neonatal erythrocytes from obese women. Due to the relevance of DHA during pregnancy and development of the newborn, the results of the present study put in evidence the importance of considering an

adequate reposition of DHA in obese pregnant women. Nutritional status, fatty acid profile, DHA concentrations, their relationship and physiopathology mechanisms involved require further research.

Keywords: Long chain polyunsaturated fatty acids; Docosahexaenoic acid; obesity; newborn.

144/1283

ASSOCIATION BETWEEN DOMAINS OF NUTRITION RISK AND HOSPITALISATIONS AND MORTALITY AT FIVE YEARS FOLLOW UP AMONG OCTOGENARIANS PARTICIPATING IN LIFE AND LIVING IN ADVANCED AGE: COHORT STUDY NEW ZEALAND

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Background and objectives: A high prevalence of nutrition risk was previously reported for Māori (49.4%) and non-Māori (38.3%) octogenarians in in Life and Living in Advanced Age a Cohort Study New Zealand. Māori are the indigenous people of Aotearoa, New Zealand comprising 14% of the total population. This study aimed to investigate the association between domains of nutrition risk with hospitalisations and mortality at five years follow up.

Methods: Sociodemographic and health characteristics were obtained by face-to-face interviews at baseline. The validated screening tool, Seniors in the Community: Risk Evaluation for Eating and Nutrition, Version II (SCREEN II) was used to evaluate nutrition risk according to three domains of risk: 1) "Weight Change", 2) "Dietary Intake", and 3) "Factors Affecting Intake." Five years from inception, participant hospitalisations and mortality were matched using National Health Index numbers. Survival analyses were performed to examine independent associations between nutrition risk scores from the three domains of SCREEN II with five year all-cause hospital admissions and mortality.

Results: Adjusted for age, gender, socioeconomic deprivation, education level, previous hospital admission, comorbidities and activities of daily living, lower nutrition risk in the "Dietary Intake" domain was associated with reduced hospitalisations and mortality [Hazard Ratios (HR) (95% CI) 0.97 (0.95-0.99), p=0.009 and 0.91 (0.86-0.98), p=0.005 respectively] and the "Factors Affecting Intake" domain was associated with mortality [HR, (95% CI) 0.94 (0.89-1.00) p=0.048] for Māori but not non-Māori.

Conclusions: Nutrition risk measured from "Dietary Intake" domain of SCREEN II was significantly related to all-cause hospitalisations and mortality for older Māori and suggests dietary inadequacy and potential lifestyle influences of diet may be the most important factors associated with nutrition risk for Māori.

Keywords: octogenarian, nutrition risk, hospitalisations, mortality, New Zealand

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144/1284

INFANT FEEDING PRACTICES AMONG MOTHERS WITH CHILDREN 6 TO 24 MONTHS OF AGE IN THE ADENTAN MUNICIPALITY OF THE GREATER ACCRA REGION, GHANA

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Background and objectives: The World Health Organization (WHO) recommends exclusive breastfeeding (EBF) for the first 6 months of life and appropriate complementary feeding from 6 to 24 months of age, with continued breast breastfeeding. Optimal feeding practices promote the growth, development and health of infants. The aim of this study was to assess infant feeding practices amongst mothers with babies 6-24 months old in the Adentan Municipality of the Greater Accra Region of Ghana.

Methods: This was a descriptive cross-sectional study among 391 mothers. Data were collected through face-to-face interviews. Bivariate analysis was used to evaluate the associations between independent variables and infant feeding practices.

Results: The age range of women was 17-45 years; half of the mothers had secondary or vocational education and were self-employed. About 98% of the children had normal birth weight ($\geq$ 2.5kg). Most women had more than 4 antenatal visits (81%), delivered at a government (54%) or private (37%) health facility with skilled attendance (90%), and were informed about the importance of EBF at least once during antenatal services (92%). About 70% of mothers initiated breastfeeding within 30 minutes to 1 hour after delivery, 59% exclusively breastfed their infants for the first 6 months postpartum, and 46% initiated complementary feeding at 6 months postpartum. Most mothers fed their children 3-4 times (72%) and gave at least one snack in a day (70%).

Antenatal clinic attendance (p = 0.003), skilled attendance at delivery (p = 0.003), place of delivery (p < 0.001) and time of breastfeeding initiation (p < 0.0001) were positively associated with EBF for the first 6 months postpartum. None of the independent variables were significantly associated with timely introduction of complementary foods at 6 months postpartum.

Conclusions: The rate of EBF was low among respondents. Less than half of respondents initiated complementary feeding at 6 months postpartum. Place of delivery, time of breastfeeding initiation, skilled attendance at delivery and antenatal clinic attendance were significantly associated with EBF for the first 6 months postpartum.

Keywords: Newborn, breastfeeding initiation, exclusive breastfeeding, complementary feeding, Ghana

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144/1291

ROLE OF PRECONCEPTION NUTRITION IN OFF-SPRING GROWTH AND RISK OF STUNTING ACROSS THE FIRST 1000 DAYS IN VIETNAM

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Background and objectives: There is growing interest in the health implications of preconception maternal nutritional status (PMNS), but gaps remain. We examine associations between PMNS and offspring growth during the first 1000 days.

Methods: This is a secondary analysis using prospective data from women who participated in PRECONCEPT, a randomized controlled trial of preconception micronutrient supplementation in Vietnam. Women/children pairs with information on preconception height/weight, at least one ultrasound measurement before 30 weeks (head and abdomen circumferences, biparietal diameter, and femoral length), singleton birth size and child length at two years were included in this analysis. We used structural equation and multivariate linear and logistic regression models to examine associations between three PMNS indicators (weight, height, BMI) on offspring growth (height for age Z-score, HAZ), and risk of stunting (< -2 HAZ) at 2 years of age. Models were adjusted for child age, gender, gestational weight gain, maternal education, socioeconomic status and treatment group.

Results: Of the 1,409 women included in study, a third of the women had a prepregnancy BMI <18.5kg/m2, height < 150cm or weight less than 43 kg. PMNS was significantly and positively associated with fetal growth and offspring HAZ at birth and 2 years. For each 1 standard deviation (SD) increase in maternal height, offspring HAZ at 2 years increased by 0.30 SD. A 1SD increase in maternal preconception weight or 1 SD increase in BMI was associated with an increase in HAZ at 2 years of 0.23 (p < 0.001) and 0.06 SD (p < 0.1), respectively. In structural equation modeling, the indirect effects of mother's height, weight and BMI on HAZ at 2 years were 14%, 31% and 86% of the total effect (through impact on fetal growth and size at birth). Women with pre-pregnancy height < 150 cm, a weight less than 43 kg or BMI < 18.5kg/m2 had 2.7 (2.1-3.6), 2.1 (1.6-2.7) and 1.2 (0.96-1.7) times, respectively, the risk for stunting at 2 years of age.

Conclusions: Maternal preconception nutritional status is a critical indicator of offspring linear growth and risk of child stunting across the first 1000 days.

Keywords: preconception, nutrition, stunting, Vietnam

144/1299

DIETARY INTAKE, WEIGHT GAIN AND SLEEP PATTERNS IN YOUNG CHILDREN PREDISPOSED TO OVERWEIGHT

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Background and objectives: Poor sleep patterns have been shown to be a contributor to obesity in both children and adults. Less evidence is available during toddlerhood period and among those with higher obesity risk. The objective of this study was to examine the relationship between sleep patterns and body weight development in a group of young obesity-predisposed children, and to assess whether dietary factors affect this relationship.

Methods: Participants included 368 Danish children aged 2-6 years from the Healthy Start Study, a 1.2 year randomised controlled intervention trial. Sleep habits were measured using a 7-day sleep diary, and dietary intake was assessed using 4 day food records at baseline. Multivariate linear regression with adjustment for confounders was used to assess the association of sleep duration and sleep variability with 1.2 year changes (Δ) in BMI z-score from baseline to follow-up. Energy intake was tested as a mediator in this relationship. Dietary factors associated with sleep duration and sleep variability were also examined.

Results: A significant inverse association was observed between nighttime sleep duration and ΔBMI z-score (β=-0.090, P= 0.046) with a 1-hour difference in sleep being associated with a 239 kJ energy intake. Energy intake was found to mediate this association with all macronutrients contributing to this effect. Sleep variability, although not associated with ΔBMI z-score, was associated with several dietary factors including higher consumption of added sugars and sugary beverages and lower consumption of fruit and vegetables.

Conclusions: Shorter sleep duration, mediated by energy intake in early in life, seems a risk factor for weight gain among young obesity-predisposed children. Additionally, dietary factors contribute to sleep variability during childhood.

Keywords: children, obesity, sleep duration, sleep variability, diet

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144/1321

HOW NUTRITION AND ENVIRONMENTAL IN-FLUENCES SHAPE CHILD DEVELOPMENT DURING THE FIRST 1000 DAYS: DIRECT AND INDIRECT ASSOCIATIONS IN FOUR PROSPECTIVE COHORTS OF YOUNG CHILDREN IN AFRICA

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Background and objectives: As countries mobilize to reach Sustainable Development Goal 4.2, to ensure "access to quality early childhood development" (ECD), evidence is needed to inform the design of interventions. Previous reviews have identified 44 risk factors for poor ECD in low- and middle-income countries. Our objective was to examine associations of these risk factors with ECD in four prospective cohorts of children who participated in trials conducted as part of the International Lipid-Based Nutrient Supplements (iLiNS) Project in Ghana (n=1023), Malawi (n=675 and 1385), and Burkina Faso (n=1122).

Methods: In two cohorts, women were enrolled during pregnancy. In two cohorts, infants were enrolled at 6 or 9 months. In all cohorts, motor and language development were assessed at 18 months. In multiple linear regression and structural equation models (SEM), we examined 22 out of 44 factors identified in previous reviews, plus 12 additional factors hypothesized to be associated with ECD.

Results: Out of 42 indicators of 34 risk factors examined, six indicators of five factors were consistently associated with 18-month language and/or motor development in three or four cohorts: children's variety of play materials, activities with caregivers, dietary diversity, linear and ponderal growth, and hemoglobin/iron status. Caregiving and child factors showed stronger associations with child development, as compared to environmental and maternal factors, even when considering both indirect and direct effects. At age 18 months, children from low socio-economic status (SES) households had fallen behind those from higher-SES households in language development in all four cohorts and in motor development in two cohorts, highlighting the importance of child development interventions targeting this early period. Associations between SES and language development were consistently mediated to a greater extent by caregiving practices than by maternal or child bio-medical conditions. This pattern for motor development was not consistent across cohorts.

Conclusions: Key elements of interventions to ensure quality ECD are likely to be promotion of caregiver activities with children, a variety of play materials, and a diverse diet, and prevention of faltering in linear and ponderal growth and improvement in child hemoglobin/iron status. Interventions to reduce socioeconomic disparities in ECD should target caregiving behavior.

Keywords: language development, motor development, caregiving, growth, iLiNS Project

Further collaborators

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144/1324

CAREGIVER PERSPECTIVES AND FACTORS ASSOCIATED WITH UTILIZATION OF A HOME FORTIFICATION OF COMPLEMENTARY FOODS PROGRAM

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Background and objectives: Home fortification of multiple micronutrient powders (MMP) is a globally recommended strat-

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egy to reduce anemia. However, further information is needed on program implementation and factors associated with household utilization.

Methods: A cluster randomized effectiveness trial in children 6-18 months was conducted in Bihar, India within the context of an ongoing program (CARE, India: Integrated Family Health Initiative). MMPs were delivered by existing community front line workers along with counseling over the course of a year for the intervention group. The primary objective was to examine program effectiveness in reducing child anemia, stunting and improving feeding practices. For this abstract, we examine factors associated with MMP utilization and caregiver perspectives using data that were obtained at endline (n= 4292).

Results: There was high program exposure with 82% of caregivers in the intervention group reporting having heard/seen MMP. Of these households, 70% had ever received MMP and of those, 85% had ever consumed MMP. The top reasons caregivers reported for never feeding MMP to their child were the child was not yet receiving food (30%) or the mother/family member did not like/accept MMP (12%). Among children (n= 1523) who received MMP at endline: 91% reported finding the MMP easy to use, 66% felt the child liked the powder, 85% thought it was important to give to the child, 81% would recommend the MMP to other families. 64% had consumed MMP in the previous month, 43% had consumed MMP in the previous week. The top reasons for not consuming MMP were ran out of supply (48%) or child did not like to eat the food with MMP (31%). MMP use was significantly higher among lower SES households [OR 1.3 (95%CI:1.0-1.7); compared to high SES], lower caste [OR: 1.6(95%CI:1.0-2.5) scheduled tribe, 0.7(95%CI:0.6-0.9) other-backward-class, 0.6(95%CI:0.4-0.9) other; compared to scheduled caste] and older children 12-18mo [OR 3.6 (95%CI:3.0-4.3); compared to 6-11mo]. There were no differences by maternal age, education, religion of child gender.

Conclusions: Home fortification of complementary foods was a well-accepted strategy by caregivers. Key barriers to program uptake include interruptions in supply and poor complementary feeding practices.

Keywords: anemia, home fortification, nutrition, India, micronutrients

144/1335

FATTY ACIDS PROFILE IN BREAST MILK FROM WOMEN LIVING IN BUENOS AIRES. PRELIMINARY STUDY

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Background and objectives: Fatty acids profile in breast milk is modified by maternal diet; this profile is important for the growing infant since it is reflected in child's tissues, particularly in the central nervous system. In recent years, the role of long chain polyunsaturated fatty acids (LCPUFA) on neurological development has been recognized. In our country, information about arachidonic acid (ARA) and docosahexaenoic acid (DHA) levels in human milk is scarce. The objective of the present study was to determine the fatty acids profile in breast milk from a high-income urban population.

Methods: Lactating women at 6 months postpartum attending the pediatric control visits (at a private clinic in Buenos Aires) consented to participate (n= 13). Morning milk samples were obtained by complete manual extraction from one breast and kept at -20°C. They were analyzed for fatty acids profile by gas chromatography (Perkin Elmer Claurus 500, capillary column Supelco SP2560 and FID detector) previous derivatization according to Lepage et al (J. Lipid Res 27:114-20, 1986) using nitrogen as carrier gas. Fatty acids were identified against SUPELCO FAME Mix NHI-C and FAME Mix C14-C22 standards.

Results: Fatty acids percentages were determined (% methyl esters /100 g total fatty acids). Median values together with maximum and minimum values are shown.

The contents of saturated, monounsaturated and polyunsaturated fatty acids were: 43.92% (50.42-29.56); 38.64% (47.79-32.46); 16.74% (23.46-11.67), respectively.

The three most abundant fatty acids, oleic, palmitic and linoleic acids, represented about 60% of total fatty acids; medians were 33.33% (41.58-25.64); 19.98% (23.87-17.25); 14.77% (20.48-9.32), respectively. For LCPUFA, ARA and DHA the following values were obtained: 0.44% (0.60-0.30) and 0.18% (0.71-0.08), respectively.

Conclusions: Global fatty acids profile was in agreement with published values. Regarding LCPUFA, ARA levels were similar to literature reports. This fatty acid tends to be stable and less dependent on dietary intake. On the other hand, DHA showed levels similar to those reported by other local investigators but lower than values published in other countries, particularly those corresponding to populations consuming marine foods. It would

be advisable in our country to increase intake of DHA providing foods both in pregnant and lactating women. Project UBACyT 20020130100520BA

Keywords: Fatty acids profile, breast milk, ARA, DHA

144/1340

MATERNAL, BREAST MILK AND INFANT B12 STATUS IN RURAL GAMBIA

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Background and objectives: Vitamin B12 is vital for infant growth and development. In rural Gambia animal source food consumption is low, placing both mothers and infants at risk of B12 deficiency. Here we investigate the relationship between maternal, breast milk and infant B12 status in a population at risk of B12 deficiency.

Methods: The current analysis used data collected as part of the Early Nutrition and Immune Development (ENID) study a randomised trial, conducted in rural Gambia, West Africa (IS-RCTN49285450). For this analysis, only women supplemented with either multiple micronutrients (MMN) or iron and folic acid (FeFol) during pregnancy were included. Plasma and breast milk samples from 350 mother-infant dyads were analysed for vitamin B12 during pregnancy and lactation.

Results: In early pregnancy 7% of mothers were below the threshold for low serum B12 concentrations (<150 pmol/l), and 16% had concentrations between 150-221 pmol/l. Maternal plasma B12 was significantly higher in the MMN group at 30 weeks gestation compared to the FeFol group (p<0.01). Median breast milk B12 for the FeFol group was 161, 146 and 185 pmol/l vs. 174, 162, 207 pmol/l in the MMN group at 8, 12 and 24 weeks postpartum, respectively (not significantly different, p>0.1). Infant plasma B12 was significantly higher at birth and at 12 weeks postpartum in the MMN group vs. the FeFol group (p<0.02). Median infant plasma B12 for the FeFol group was 354, 259 and 240 pmol/l vs 368, 297, 234 pmol/l in the MMN group at birth, 12 and 24 weeks, respectively.

Conclusions: Mothers were mildly B12 deficient in early pregnancy, but breast milk B12 concentrations and infant B12 status indicated a greater level of deficiency. Supplementation with MMNs during pregnancy had an effect on maternal and infant B12 status, but not on breast milk B12 concentration.

Keywords: pregnancy, B12, breast milk, infant, multiple micronutrient supplementation

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MATERNAL VITAMIN D STATUS IN RELATION TO FETAL GROWTH AND SURVIVAL: A PROSPECTIVE COHORT STUDY

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Background and objectives: Fetal growth depends on placenta function. Maternal vitamin D status has been inversely associated with uteroplacental dysfunction. We aimed to investigate the associations between vitamin D status in early and late pregnancy with prevalence of neonatal small for gestational age (SGA), low birth weight (LBW), preterm delivery and pregnancy loss.

Methods: Pregnant women were recruited at antenatal clinics in Sweden (latitude 57-58°N). Serum 25-hydroxyvitamin D (25OHD) was analyzed in gestational week ≤16 (trimester 1 (T1), N=2046) and >31 (trimester 3 (T3), N=1816) by liquid chromatography tandem mass spectrometry. Gestational and neonatal data were retrieved from medical records.

Results: Logistic regression showed that 25OHD at T1 was only associated with pregnancy loss (OR 0.99, p=0.041). 25OHD at T3 ≥100 nmol/L was associated with lower odds of SGA (OR 0.3, p= 0.031) and LBW (OR 0.2, p= 0.046), compared to vitamin D deficiency (25OHD <30 nmol/L). Women with a ≥30 nmol/L increment in 25OHD from T1 to T3 had the lowest odds of SGA, LBW and preterm delivery.

Conclusions: In early pregnancy, higher vitamin D status was associated with lower odds of pregnancy loss. In late pregnancy, high vitamin D status was associated with lower odds of fetal growth restriction. A higher increment in 25OHD during pregnancy was associated with lower odds of adverse neonatal birth outcomes. This emphasise the importance of adequate maternal vitamin D status for healthy pregnancy.

Keywords: pregnancy, 25-hydroxyvitamin D, fetal growth restriction

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144/1382

RISK VALUES OF METABOLIC AND NUTRITIONAL PARAMETERS IN CUBAN URBAN PEOPLE REPRESENTING DIFFERENT STAGES OF LIFE COURSE

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Background and objectives: Early stages of life course are crucial for detection of risk for adultness-common chronic diseases, in terms of applying early preventive interventions. In the elderly, evaluation of similar risk markers are useful to stop disease progression. Urban areas have shown a higher prevalence of chronic diseases risk factors. Our aim was to determine the prevalence of vascular risk values from main glucidic and lipidic metabolic parameters in Cuban scholars, adolescents and elders from urban areas.

Methods: A transversal study was carried out on 113 scholars (mean age 8, 9 years), 469 adolescents (mean age 13, 8 years), and 395 elders (mean age 78, 9 years), all from both sexes. All individuals were living in urban areas and were attending to urban schools or urban institutions for elders. Children and adolescents were apparently healthy without toxic habits. Elders had no previous diagnosis of common chronic diseases except for variable cognitive impairment. Groups were evaluated for serum glucose, triglycerides, total cholesterol (TC), HDL cholesterol, LDL cholesterol and VLDL cholesterol using standard enzymatic colorimetric assays.

Results: In scholars, triglycerides (49, 6%) and TC (31%) showed the highest frequencies of risk levels, as they did in adolescents: triglycerides (35,6%), TC (23.9%). In contrast, LDL (58,2%) and TC (48,6%) were the most altered in elders. Frequencies of risk levels for glucose were similar between elders and adolescents and were markedly higher between them and scholars. Both, percentages of individuals with risky values, and mean serum levels, were overtly higher in elders than in the other groups for TC and LDL. Scholars showed the highest frequency of risk levels for triglycerides, followed in order by adolescents and elders. In general, study groups did not differ in risk frequencies for HDL. Younger groups presented considerable percentages of individuals with more than one parameter altered.

Conclusions: This work shows an elevated prevalence of vascular risk values of metabolic parameters related to Nutrition in scholars, adolescents and elders of urban areas. This prevalence appears to increase with age but only for some of those parameters pinpointing the need for application of risk-modifying interventions since the early stages.

Keywords: scholars, adolescents, elders, urban areas, lipids risk values.

144/1388

EFFECT OF PRE- AND POSTNATAL NUTRITIONAL SUPPLEMENTS ON CHILDHOOD ILLNESSES IN BANGLADESH: A CLUSTER-RANDOMIZED EFFECTIVENESS TRIAL

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Background and objectives: Background: Several strategies for reducing child undernutrition in low and middle income countries are being implemented, which may affect child morbidity either positively or negatively. Objective: To examine the effects of providing lipid-based nutrient supplements (LNS) to pregnant and lactating women or providing LNS or micronutrient powder (MNP) to their children from 6 to 24 months on common childhood illnesses.

Methods: In a four-arm cluster-randomized effectiveness trial, women were enrolled at ≤20 wk gestation (n=4011) and received either: a) LNS during pregnancy and the first 6 months postpartum, and LNS for the offspring from 6-24 months (LNS-LNS); b) Iron and folic acid (IFA) during pregnancy and the first 3 months postpartum, and LNS for the offspring as described above (IFA-LNS); c) IFA as described above and MNP for the offspring from 6-24 months (IFA-MNP); or d) IFA as described above and no supplement for the offspring (IFA-Control). Information on acute lower and upper respiratory infection (ALRI/AURI), diarrhea and fever in the previous 14 days was collected at 6, 12, 18 and 24 months of age.

Results: At 6 months, prevalence of ALRI, fever or diarrhea did not differ between infants of women who received LNS vs IFA, but infants in the LNS-LNS group had lower prevalence of AURI

compared to the other three groups combined (27.7% vs 31.7%; OR 0.83(0.70, 0.99)). At 12, 18 and 24 months, there were no significant differences among the 4 arms in prevalence of fever or ALRI, but compared to IFA-Control infants, IFA-LNS infants had lower prevalence of AURI at 12 months (27.6% vs 33.9%, OR 0.74(0.56, 0.99)), and higher prevalence of diarrhea at 18 months (9.3% vs 6.0%; OR 1.74(1.00; 3.04)) after covariate adjustment. No other pairwise group differences were significant.

Conclusions: LNS provided pre- or post-natally may reduce AURI among infants but results were inconsistent. The difference in diarrhea prevalence in the IFA-LNS arm at 18 months was not evident in the LNS-LNS arm nor at any other time point. We conclude that providing LNS to women or LNS or MNP to children generally did not increase or decrease common childhood illnesses.

Keywords: child morbidity, childhood illness.

144/1400

NUTRITION AND DYSPHAGIA RISK AMONG RECENTLY HOSPITALISED ADULTS OF ADVANCED AGE

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Background and objectives: Older adults aged over 85 years are the fastest growing population segment in New Zealand. Maintaining a high level of nutritional well being is fundamental to successful ageing. Previously the prevalence of nutrition risk among community living octogenarians has been reported to range between 31-49%, but is unknown in people of advanced age recently admitted to hospital Admission, Treatment and Rehabilitation (AT&R) wards. The aim of this study was to establish the prevalence of nutrition risk and related factors among adults 85 years and older newly admitted to the AT&R wards at North Shore and Waitakere Hospitals in Auckland.

Methods: Participants were recruited within five days of admission to the AT&R wards. An interviewer administered questionnaire was used to assess sociodemographic and health characteristics, nutrition risk was assessed using the Mini Nutritional Assessment-Short Form (MNA-SF) and dysphagia risk assessed using the 10-item Eating Assessment Tool. Anthropometric measures were taken to assess body mass index (BMI), muscle mass (using bioimpedance scales) and grip strength (using a handgrip dynamometer). Pearson Chi-Square tests were used to examine differences in dysphagia risk between MNA-SF nutrition status groups. Pearson correlations were used to identify correlations between participant characteristics and nutrition status

Results: Assessments were completed in 88 advanced age adults (31 men), mean age 90.0±3.7 years. As determined from the MNA-SF over two thirds (71.6%) of the participants were either malnourished (28.4%) or at high nutrition risk (43.2%). A third (29.5%) of the participants was at risk of dysphagia. Malnourished participants were more likely to be at risk of dysphagia (p=0.015). The MNA-SF score positively correlated with BMI (r=0.484, p<0.001); grip strength in the dominant hand (r=0.250, p=0.026), and negatively correlated with dysphagia risk (r=-0.383, p<0.001).

Conclusions: Malnutrition and high nutrition risk was prevalent among newly hospitalised adults of advanced age. Routine screening on admission is an important first step to identify those at nutrition risk. Findings highlight the importance of screening for dysphagia in the malnourished to help shape appropriate interventions aimed at improving nutrition status.

Keywords: older adults, nutrition risk, dysphagia risk, hospitalisation, New Zealand

144/1402

ASSOCIATION BETWEEN SLEEP DURATION AND FOOD INTAKE IN ADOLESCENTS

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Background and objectives: Short sleep duration is prevalent among adolescents and it is indicated as a factor that can interfere with food intake. The objective of the present study is to estimate the association between sleep duration and food intake data in adolescents.

Methods: The data is from PAPPAS study, which stands for "Parents, students and teachers for healthy eating" in Portuguese, conducted in a public school from Niterói-Rio de Janeiro, Brazil, in 2015, with students from 5th to 9th grade, aged 10 to 17 years. Sleep duration was collected by questionnaire and categorized as insufficient, adequate and excessive, according to age, as recommended by the National Sleep Foundation. To estimate nutrient intake, the mean of two 24-hour food-recall applied on two non-consecutive days was used. Multiple linear regression was performed, considering p≤0.05. The analysis was performed with SPSS v.21.

Results: A total of 307 adolescents were included, 49.2% (n= 151) males, with a mean age of 12.8 (± 1.6) years. Of these, 52.1% (n= 160) presented insufficient sleep. Crude regression models estimated that sleep duration was positively associated with energy

consumption (β= 48.35, p= 0.049), protein (β= 2.72, p= 0.010), lipids (β=1,98, p= 0,037), total fiber (β= 0.57, p= 0.034) and cholesterol (β= 9.07, p= 0.019), and was not associated with carbohydrate consumption (β= 5.35, p= 0.161) and added sugar (β= 0.13, p= 0.949). After adjusting for energy consumption, sleep duration lost significance in the models, but became significant in added sugar analysis. It was observed that, at each hour of sleep, the consumption of added sugar was reduced by 2.8g (β= -2,79, p= 0.049). After adjusting for sex and age, an increase in the magnitude of this association was estimated (β=-3.36, p= 0.023).

Conclusions: This study showed that sleep duration was negatively associated with the consumption of added sugar in adolescents. Currently sleep becomes an important field of study for understanding its influence on the composition and quality of adolescents' diet and health.

Keywords: sleep, adolescent, food intake.

144/1404

CROSS-SECTIONAL AND LONGITUDINAL ASSOCIATIONS BETWEEN CLUSTERING OF MULTIPLE LIFESTYLE BEHAVIORS AND ADIPOSITY INDICATORS: THE ELANA MIDDLE SCHOOL COHORT

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Background and objectives: Cluster analysis has been used to identify the coexistence and clustering of multiple lifestyle behaviors in childhood, as well as its relation with adiposity indicators. However, few studies have applied a longitudinal perspective. Our objectives were: a) to explore how clustering of physical activity, sedentary behavior, sugar-sweetened beverages (SSB) intake and fruits and vegetables (FV) consumption is drawn among Brazilian middle school students; b) to investigate the associations between identified clusters and adiposity indicators, both in baseline and at the end of follow-up; c) to investigate the association between identified clusters with excessive weight gain over four years.

Methods: Lifestyle behaviors were assessed through self-report questionnaires. A combination of hierarchical and non-hierarchical gender-specific clustering analysis was applied, in order to identify clusters with similar behaviors. Analysis of variance and logistic regression were applied to examine the association between behavioral clusters and adiposity indicators (BMI and body fat percentage). Linear mixed effects models were used to assess trajectories of adiposity indicators according to clusters member-

ship. Conditional relative gain in adiposity indicators over four years were assessed by regressing z-score measures at the last evaluation on all previous z-score measures and sexual maturation.

Results: For 732 adolescents (mean age 11.8 years, SD 1.15 years) evaluated, four reliable clusters were identified. The "active cluster", with high physical activity level, had more boys than girls. Among boys, "neutral cluster" (with low z-scores to all behaviors) was mainly represented by students from private schools, while the "mixed cluster" (with higher z-scores to SSB and FV consumption) comprised significantly more public school students than the others. The "sedentary cluster" presented the highest proportion of overweight boys. Boys in the sedentary cluster had higher odds of having body fat percentage >1 z-score at the end of follow-up (OR = 3.18; 95% CI = 1.43–7.10), as well as excessive weight gain after four years (OR = 2.92; 95% CI = 1.04–8.20).

Conclusions: Especially for boys, our findings provide evidence to support the concern around sedentary behaviors worldwide, and can be useful to guide effective interventions that account for diversity of lifestyles.

Keywords: Energy balance-related behaviors; Cluster analysis; Adolescence; Body composition; Longitudinal studies.

144/1409

VIDEOS ABOUT DIETS BROADCAST ON YOUTUBE: A COMMUNICATION CHANNEL VERY ACCESSED BY ADOLESCENT

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Background and objectives: The number of adolescent who access websites such as YouTube for information on weight loss grows every day. This age group shows frequent dissatisfaction with body image, being more sensitive and vulnerable to the information contained in these videos, mainly on how to reach the ideal body through diets. Therefore, attention should be paid to the quality of the content posted, to avoid possible inappropriate eating behaviors and health damage in this specific population. Thus, the purpose of this work is to identify the contents of videos on YouTube about diets and weight loss.

Methods: This is an exploratory research, with a quantitative approach, carried out on the website YouTube, to characterize YouTube videos addressing diets for weight loss. A search of the videos was made from March 23 to March 27 2017 using the descriptor "diet". 2,160,000 videos were identified, but only the first fifty-five were analyzed. The exclusion criteria were humor vide-

os and / or parodies about diets and videos with an emphasis on physical activity (hypertrophy).

Results: 67,3% of the analyzed videos had as approach, restrictive diets, with main content short-term weight loss practices. These videos were also the ones that had the higher viewers, approximately 2 million and were transmitted by lay people (94,6%). Only 5,5% of the videos were transmitted by health professionals, such as nutritionist (33,3%) and nutrologist (66,7%) addressing guidelines for healthy eating.

Conclusions: Most of the videos showed inadequate weight loss practices being reported mainly by lay people. In this scenario, we identify the importance of nutritionists and government health agencies, through Public Policies, to join this growing communication channel (YouTube) in promoting healthy eating habits.

Keywords: Diet. Youtube. Adolescent Behavior.

ADHERENCE TO HEALTHY EATING INDEX FOR PREGNANT WOMEN IS ASSOCIATED WITH LOWER NEONATAL ADIPOSITY IN A MULTIETHNIC ASIAN COHORT: THE GROWING UP IN SINGAPORE TOWARDS HEALTHY OUTCOMES (GUSTO) STUDY

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Background and objectives: Evidence linking maternal diet quality during pregnancy with infant birth outcomes is limited in Asian populations. We investigated the association of maternal diet quality with risk of preterm birth, offspring birth size and adiposity in a multi-ethnic Asian birth cohort study.

Methods: Dietary intakes of 1051 pregnant women were ascertained at 26-28 weeks of gestation with the use of 24 h recalls and 3 d food diaries, from which diet quality (score range: 0 – 100) was measured by the Healthy Eating Index for pregnant women in Singapore (HEI-SGP). Gestational age was established by first trimester ultrasound. Neonatal weight and length were measured

at birth. Body composition was assessed by air displacement plethysmography in a subset of infants (n=313) within 72 h after birth and abdominal adiposity was assessed by magnetic resonance imaging (MRI) (n=316) within the first 2 weeks of life. Associations were assessed by multivariable linear regression for continuous outcomes and logistic regression for preterm birth with adjustment for confounding factors.

Results: The mean (SD) maternal HEI-SGP score was 52.1 (13.6). Maternal diet quality during pregnancy was not associated with preterm birth or birth weight. Greater adherence to HEI-SGP (per 10-point increment in HEI-SGP score) was associated with longer birth length (β (95% CI) 0.13 (0.02, 0.23) cm), lower sum of neonatal triceps and subscapular skinfold thickness (β -0.16 (-0.27, -0.06) mm), lower percentage body fat (β -0.53 (-0.84, -0.21) %), lower fat-mass (β -17.52 (-29.54, -5.51) g), lower percentage abdominal superficial subcutaneous adipose tissue (β -0.16 (-0.30, -0.02) %) and lower percentage deep subcutaneous adipose tissue (β -0.05 (-0.10, -0.01) %).

Conclusions: Higher maternal diet quality during pregnancy was associated with longer birth length and lower neonatal adiposity, but not with birth weight and preterm birth. These findings warrant further investigation in independent studies.

Keywords: Maternal diet, diet quality, preterm birth, birth size, adiposity

Conflict of Interest Disclosure: Yap-Seng Chong and Keith Godfrey have received reimbursements for speaking at conferences sponsored by companies selling nutritional products and are part of an academic consortium that has received research funding from Abbott Nutrition, Nestec, and Danone. None of the other authors reported a conflict of interest related to the study.

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Background and objectives: Moroccan food retail transition (Supermarket) introducing a changes in food retailing.

The aim the transition of food retail and its impact onhealth, overwieght and high blood pressure;

Methods: An exploratory transverse survey with a 264 people (131 men and 133 women, sex-ratio=0.98, old of 35.5 ± 9.3 years) in Casablanca; the participants completed a questionnaire bringing socioeconomic and demographic data; some concerning preferences in food supply, as well as their dietary habits of anthropometric measures (the weight, the size and the calculation of body mass index BMI) and blood pressure

Results: Biological data shows that 76 participants are overweight and 87 have a high blood pressure .

The used of food stores and the purchase rate are significantly different between participants in overweight and normal participants (p0.001 and p0.05, respectively). We observed that our participants use often a combination of two or three point of purchase. The most frequent combinations are supermarkets / traditional markets with or without convenience store. Furthermore, the participants in overweight prefer shopping food before the meals, while the participants with normal weight prefer after the meals (p0.01).

An increase of overweight according to:

- The use of supermarkets (OR): 3.77; 95 % IC: 1.63-8.74, p=0.002), within the population of the men (OR): 18.58; 95 % IC: 2.44-141.80, p=0.005);

- Shopping before meals (OR): 2.44; 95 % IC: 1.28-4.67, p0.01), for the women (OR): 3.92; 95 % IC: 1.61-9.52, p0.0001); Higher study Level (OR): 2.41; 95 % IC: 1.21-4.81, p=0.012), within women (OR): 6.18; 95 % IC: 2.15-17.81, p0.001).

A reduction of this risk according to:

- Marital status (single men) reduced (OR): 0.45; 95 % IC: 0.21-0.98, p0.045);

- Habits of supermarkets purchase: by comparison with those who never go to supermarkets (OR): 0.23; 95 % IC: 0.09-0.56), for men

Conclusions: Grocery shopping in large department stores is now part of most Moroccan families no matter their income and education levels.

The survey shows that while the use of food department stores regularly is significant for most participants, it remains higher among overweight and high blood pressure participants.

Keywords: Food retail, overweight, blood pressure.

144/1425

EFFECT OF DIETARY VITAMIN E DEFICIENCY ON SOCIAL RECOGNITION IN MICE

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Background and objectives: Vitamin E (VE) is a fat-soluble vitamin that has anti-oxidant properties. In our previous study, dietary vitamin E deficiency for 4 weeks caused a decrease in plasma α-tocopherol levels, and an increase in anxiety in rats. However, there are no studies on the relationship between VE and social recognition. Thus, in this study, we investigated the effect of dietary vitamin E deficiency on social recognition in mice.

Methods: Female C57Bl/6J mice were bred, and fed control diet (CON) or VE deficient diet (E-) from 16th day of pregnancy. Male pups were weaned, and fed the same diet as the mothers (CON: n - 10, E-: n - 11). These mice (74 day old) were bred in group housing (5–6/ cage), and isolated from day 75. We performed the olfactory habituation test on day 83, and the social recognition test on day 85, and then decapitated them. In these behavioral tests, we investigated mice behavior for 3 min and this 3-min investigation was repeated 3 times. The same stimulus was provided to the responder mice from the 1st to 2nd replicates, and novel stimulus and familiarity stimulus were provided during the 3rd replicate. We measured the time required by the responder to access to the stimulus. Mice were used as the stimuli in social recognition test and odor was used in the olfactory habituation test.

Results: α-tocopherol concentration in the back cortex decreased due to vitamin E deficiency. The result of the olfactory habituation test, in the CON and E- treatments showed that significantly more investigation time was required for the novel stimulus than for the familiarity stimulus presented at the same time. In contrast, the results of social recognition showed that, in the CON treatment, significantly more investigation time was required for the novel stimulus than for the familiarity stimulus presented at the same time; however, in the E- treatment, no significant difference was observed.

Conclusions: In conclusion, the intake of vitamin E deficient diet during the prenatal, neonatal and infant periods causes disability of social familiarly in mice.

Keywords: Social recognition, vitamin E

144/1445

IMPACT OF EXPOSURE TO LIPID-BASED NUTRIENT SUPPLEMENTS IN EARLY LIFE ON SWEET TASTE PREFERENCE OF GHANAIAN CHILDREN AGED 4-6 YEARS: A NON-INFERIORITY STUDY

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Background and objectives: Little research involving the measurement of sweet taste preference in children has been done in a developing country setting. Between 2010 and 2014, we conducted a randomized controlled trial in Ghana (iLiNS-DYAD trial) in which women (n=1320) received daily, a moderately sweet small-quantity lipid-based nutrient supplement (SQ-LNS) or a multiple micronutrient tablet during pregnancy through 6 months postpartum or iron/folic acid tablets during pregnancy and placebo for 6 months postpartum. Infants whose mothers received SQ-LNS also received SQ-LNS from 6 to 18 months. We followed up these children at 4-6 years of age to test the hypothesis that the sweet taste preference of children who were exposed to SQ-LNS (LNS group) would not be greater than that of children who were never exposed to SQ-LNS (non-LNS group).

Methods: We used the Monell 2-series, forced-choice, paired-comparison tracking procedure to measure sucrose concentration (SC) preferences of 624 children (LNS group, 323; non-LNS group, 301) randomly selected from participants who were eligible for the follow-up study. Each series included a number of forced choices between two concentrations of sucrose in water, one lower and one higher, across a range of 3 – 36% w/v. The preferred concentration was calculated as the geometric mean of the concentrations preferred in the two series. The difference in SC preference between the two groups was examined using negative binomial modelling techniques. The pre-defined non-inferiority margin was an effect size of 0.2, which corresponds to an 11% difference between groups in preferred SC.

Results: The test required on average 8 presentations of sucrose solution pairs. The mean preferred SC was 14.9±8.7 %w/v in the LNS group and 14.2±8.4 %w/v in the non-LNS group, which corresponds to a difference of 6.3% (95% CI -5.5%, 19.6%).

Conclusions: The preferred SC was not significantly higher in the LNS group, but because the confidence interval included our pre-defined non-inferiority margin we cannot establish non-inferiority. Thus, we cannot definitively conclude that at 4-6 years of age, the sweet taste preference of Ghanaian children who received SQ-LNS in early life was the same as (or lower than) that of children who did not receive SQ-LNS.

Keywords: Lipid-based nutrient supplements, sweet taste preference, forced choice test, non-inferiority

144/1449

A PARTICIPATORY COMMUNITY-BASED APPROACH TO EFFECTIVE IMPLEMENTATION OF THE BABY FRIENDLY COMMUNITY INITIATIVE IN RURAL KENYA

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Background and objectives: The child survival and development strategy in Kenya aims at improving child health and reduction in child mortality through the acceleration and scale-up of evidence-based high-impact interventions. Promotion of optimal maternal infant and young child delivery of such high impact interventions is marred by lack of clear evidence on what works, how it works and why. The Baby Friendly Community Initiative (BFCI) project conducted a formative qualitative study whose specific objectives were to determine the local contexts and cultural factors that influence breastfeeding and other maternal, infant and young child feeding practices in order to tailor the intervention package to the communities and to determine the enablers and barriers associated with the implementation of Baby Friendly Community Initiative and how to address them

Methods: The formative study employed a cluster randomized trial which used a participatory action research design for qualitative data collection. A total of 205 participants were interviewed in the study which covered 13 community units which were used as sampling units for the main project. A total of 52 interviews were done, 16 Focus Group Discussions, 14 In-depth Interviews and 22 Key Informant Interviews. The key informants included chiefs, village elders, religious leaders, women leaders, CBO leaders, Traditional Birth Attendants and health professionals at sub county and health facilities. In-depth interviews included pregnant women, breastfeeding women, HIV positive women and Health professionals. Focus group discussions were done with fathers, old and young mothers, grandmothers and Community Health Volunteers.

Results: Results revealed that cultural factors and traditions had great influence on maternal and child feeding practices. Mothers' decisions were also highly influenced by the health workers, community and family members, religious leaders and Traditional birth attendants. This information was used to develop appropriate and targeted intervention strategies for effective BFCI implementation.

Conclusions: End line qualitative data showed a great improvement in addressing some of the key barriers and enhancement of the existing enablers. There were significant positive outcomes for key indicators; the number of antenatal visits, health facility deliveries, exclusive breastfeeding, growth monitoring, motivation and capacity building of community health volunteers and functional mothers support groups.

Keywords: Baby Friendly Community Initiative, Enablers/Barriers

Further collaborators
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144/1462

IMPACT OF HEALTH AND NUTRITION EDUCATION ON HEALTHY LIFESTYLE TO IMPROVE NUTRITIONAL STATUS AND REDUCE FREQUENCY OF ILLNESS OF ELDERLY PEOPLE IN URBAN DHAKA

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Background and objectives: According to BBS (2007) the number of the elderly people aged 60 and over in Bangladesh was 9.41 million and by 2025, along with four other Asian countries, will account for 44% of world's total elderly population. This rapidly increasing population is an important group urging for the need of health and nutrition intervention. The objective of the study was to see the impact of nutrition and health education towards improving food consumption practice, nutritional status and morbidity rate among elderly population.

Methods: A 6 months longitudinal comparative study was conducted in Dhaka, Bangladesh. Data were collected from 164 elderly people (Intervention group=82, Control group=82) aged > 60 years both male and female in selected old homes. Health and nutrition education with minimum one hour duration within 2 contacts were given only in the intervention group following both face to face and in group intervention method. Baseline and end line anthropometric (weight, height, BMI) data, disease morbidity history and dietary intake (using 24 hours recall method) were recorded for both the intervention and control group using same standard questionnaire. Participant response, encouragements, dietary diversity, food frequency and health & disease status were observed.

Results: There was significant weight gain in the intervention group. The mean of weight of intervention group before intervention was 48.86 ± 6.18 and after intervention was 49.92 ± 5.97.

Prevalence of hygiene practice was higher in intervention group comparing to control group. Habit of hand washing was 48.7% higher in the intervention group.

The intervention resulted in reduced morbidity among the elderly population. At the end line 76.8% of control group and 43.9% of intervention group were attacked by any contagious disease (cough, Diarrhea, pain, anorexia, nausea). Food diversity and balanced food choice were also improved in the intervention group comparing to the control group.

Conclusions: Nutrition and health education to elderly people has great potential to increase their nutritional status, hygiene practice and decreasing disease morbidity. The result of this study will be effective constructing strategy for addressing the urgent issues of reducing the short life expectancy among elderly people.

Keywords: Nutrition, Health, Elderly, Hygiene, Life expectancy

144/1496

ACCEPTANCE OF AND COMPLIANCE WITH MULTI-MICRONUTRIENT AND IRON-FOLIC ACID CAPSULES IN BANGGAI DISTRICT, INDONESIA

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Background and objectives: One obstacle to increasing compliance with multi-micronutrient (MMN) or iron-folic acid (IFA) supplementation in pregnant women is the side effects, such as a bad smell, nausea, vomiting, stomachache, or headache. To address this problem, in this study, IFA and MMN were each encapsulated in soft capsules, and we evaluated the compliance and acceptance reported by respondents.

Methods: This study was conducted in three sub-districts of Banggai district from October 2016 to February 2017. The subjects were preconception women who were newlywed and 18-35 years of age and who did not have serious diseases, such as tuberculosis, heart disease, or kidney failure. Both IFA and MMN tablets were crushed and then placed in capsule shells with the same color and size. The capsules were randomly delivered to the respondents, who consumed a capsule once per week unless they were menstruating, at which time consumption was daily. Of the 102 preconception women who were recruited, 40 were interviewed about consumption and any side effects that they felt. The level of pleasure was scored on a 3-point hedonic scale, and the response for each sensory quality, namely, color, odor, taste and size, was rated 2 or 3 (likable or very likable).The data were analyzed based on distribution and frequency.

Results: The results showed that 36 respondents (90%) consumed the capsules consistently, as recommended. As many as 38 respondents (95%) liked the color, 37(92.5%) described no odor, 37(92.5%) liked the flavor, and 37 (92.5%) liked the size. Ten respondents (25%) reported an increase in appetite, and 5 respondents (12.5%) reported deeper sleep. Approximately 4 respondents (10%) reported headache, and 2 (5%) complained of constipation.

Conclusions: Encapsulation of MMN or IFA may be an alternative approach for increasing compliance with consumption and reducing side effects.

Keywords: Compliance, Acceptance, MMN, IFA

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144/1518

MFSD2A IN BLOOD AS POTENTIAL BIOMARKER OF THIS CARRIER IN PLACENTA AND RELATIONSHIP TO CHILD DEVELOPMENT

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Background and objectives: Gestational diabetes mellitus (GDM) is a global health challenge, and its prevalence is expect-

ed to increase further along with increasing obesity rates. Infants born to GDM mothers have reduced docosahexaenoic acid (DHA) levels in cord blood which could affect their neurological development. Recently, the membrane transporter Major Family Super Domain 2a (MFSD2a) was associated with the selective DHA transport as lysophospholipids. MFSD2a is an orphan transporter, whose ligands range from carbohydrates to amino acids, drugs, or organic anions, with great importance in regulating metabolism. Mean MFSD2a levels are lower in GDM placentas which could affect materno-fetal DHA transport and child development. We aimed to to evaluate whether MFSD2a in blood of pregnant women can serve as a biomarker of placental MFSD2a at delivery

Methods: Three groups of pregnant women were recruited: 25 health controls, 23 GDM with dietary treatment, and 20 GDM with insulin treatment. Maternal and neonatal anthropometric and biochemical parameters were evaluated. The MFSD2a expression was analysed by Western-blotting in maternal whole blood and serum obtained in the third trimester and in placenta at parturition

Results: MFSD2a level in maternal whole blood, but not in serum, was significantly lower in both GDM groups than i controls (GDM-diet 0.56±0.07b, GDM-insulin 0.49±0.46b, controls 0.9 ±0.08a, p<0.001). MFSD2a in maternal blood was positively correlated with placental MFSD2a ($r = 0.287$, $p = 0.035$) and inversely with the concentration of DHA in maternal serum lysophospholipids ($r = 0.34$, $p = 0.018$). MFSD2a in maternal blood correlated with cord insulin resistance ($r=0.340$, $p=0.013$), cord serum total protein ($r=0.276$, $p=0.05$) and cord serum triglycerides ($r=0.280$, $p=0.05$). MFSD2a in maternal blood also correlated to neonatal head circumference at 15 days and 1 month of age with similar trend during the first year of life of the baby.

Conclusions: MFSD2a concentrations in maternal whole blood are associated with MFSD2a levels in placenta and appear to affect placental DHA transport as well as offspring head size. MFSD2a in whole blood of pregnant women during the third trimester may serve as a biomarker of placental DHA transport capacity

Keywords: Membrane fatty acid carrier/ docosahexaenoic acid/Gestational Diabetes Mellitus/Human pregnancy/Neonatal head circumference

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ASSOCIATIONS BETWEEN BREASTFEEDING AND BREAKFAST CONSUMPTION IN ADOLESCENCE

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Background and objectives: There is evidence to suggest that obesity in later life could be determined by nutrition during the early life period. The type of nutrition during the postnatal period may play a critical role in appetite control during early and later life. The aim of this study was to examine whether breastfeeding during infancy is associated with breakfast consumption in adolescence. Previous evidence already demonstrated positive associations between breakfast skipping and body fat content in the same HELENA adolescent population.

Methods: Cross-sectional school-based study with 2929 adolescents of nine European cities participating in the HELENA study. Parents completed a questionnaire about breastfeeding duration. Breakfast habits were assessed by different agreement categories to the statement 'I often skip breakfast'. Agreement categories were grouped into breakfast 'consumers', 'occasional consumers' and 'skippers'.

Results: Twenty nine percent of the adolescents were breakfast skippers. Significant differences were found for skipping breakfast according to breastfeeding duration for female adolescents only. The chance of skipping breakfast was higher for girls who had been breastfed less than 4 months (OR = 2.77, 95% CI 1.35-2.32) than those who had been breastfed for 4 months or more. Girls who had never been breastfed, had also larger chance of skipping breakfast (OR = 2.20, 95% CI 1.56-3.12), compared to those who had been breastfed for 4 months or more.

Conclusions: Breastfeeding for more than 4 months was inversely associated with breakfast skipping among adolescent girls suggesting that breastfeeding may encourage the development of appetite control in later life.

Keywords: breastfeeding, breakfast, adolescent

Further collaborators: Stefaan De Henauw, Denes Molnar, Anthony Kafatos, Cinzia Le Donne, Silvia Pisanu

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144/1542

EXPLORING THE INFLUENCE AND TRANSFER OF INFANT AND YOUNG CHILD FEEDING PRACTICES TO MOTHERS: FORMATIVE RESEARCH FOR THE SPOON PROJECT IN COLOMBIA, GUATEMALA AND MEXICO

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Background and objectives: Exclusive breastfeeding (EBF) for 6 mo and adequate complementary feeding (CF) practices remain a challenge in Colombia, Guatemala and Mexico. Mothers typically receive advice on adequate infant and young child feeding (IYCF) practices from health professionals, as well as from informal sources such as family members. Little is known about the content and strategies used by different actors to influence these IYCF practices. Our aim was to explore sources of information, messages, and actors that influence IYCF practices.

Methods: As part of the formative research of the SPOON project, which aims to implement a strategy to prevent chronic malnutrition and reduce the risk of future obesity in children aged 0-23 months, in-depth interviews were conducted with health professionals (n=26), key informants (n=37) and mothers/caregivers (n=70) in Colombia, Guatemala and Mexico. Interviews were translated-transcribed verbatim, coded and analyzed using N-Vivo.11.

Results: In all settings, formal IYCF advice is commonly provided by doctors, nurses and health educators during the provision of health services and informal advice is provided mostly by grandmothers, and sometimes husbands in a home setting. Mothers value receiving counseling from health professionals because they are trusted, as well as from grandmothers because they are experienced and knowledgeable, and often provide foods. Advice provided from both sources sometimes contradicts IYCF practices as recommended by the WHO. Common advice given by grandmothers includes the importance of offering colostrum (Guatemala), the timing of introduction of specific foods (often resulting in premature of delayed complementary feeding), and the limited duration of continued breastfeeding among girls (Colombia), the importance to give different foods beside only the baby bottle. Influential strategies used by grandmothers include sharing successful-unsuccessful experiences and timely advice.

Conclusions: Mothers' IYCF practices are influenced by a dynamic integration of advice received from health providers, preceding generations, past experiences on infant nutrition and personal beliefs. Behavior Change Communication strategies must consider influential figures and cultural determinants that influence the adoption of appropriate IYCF practices.

Keywords: infant and young child feeding practices, formative research, Colombia, Guatemala, Mexico

144/1544

EFFECTS OF GESTATIONAL WEIGHT GAIN, NUTRIENT INTAKE, AND PASSIVE SMOKING ON LOW-BIRTH-WEIGHT DELIVERY

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Background and objectives: Evidence showed that maternal anthropometrics and nutritional status before and during pregnancy may affect the birth weight of neonates and increase the risk of low-birth-weight (birth weight<2500g, LBW) delivery. The aim of this study was to investigate the effects of pre-pregnancy body mass index (BMI) and maternal body weight gain, dietary intake, and blood biochemical parameters during pregnancy on the incidence of LBW delivery in Taiwan.

Methods: Healthy women (n=520, age 29.1 ± 4.2 y) at 8 to 12 weeks of pregnancy were recruited from prenatal clinics. Background information, anthropometrics, biochemical parameters, and dietary intake from 24 h-recall were obtained from the first, second, and third trimesters to delivery. Clinical outcomes of neonates were also collected.

Results: The results showed that 53.7% of women were primiparous with 4.31% of LBW delivery. Gestational weight gains (GWG) in the first trimester and throughout pregnancy were significantly lower in mothers with LBW delivery (LBW group) than those with non-low-birth-weight delivery (non-LBW group, p<0.05). Mothers who had lower GWG than the Institute of Medicine (IOM) guidelines had increased risk of LBW delivery (OR=7.64, 95% CI=1.56, 37.3, p<0.05). Mothers in the LBW group exposed to passive smoking for longer periods of time than those in the non-LBW group. In addition, maternal intakes of protein, cholesterol, calcium, phosphorus, potassium, iron, and vitamin B2, circulating white blood cell counts (WBC), and serum albumin levels were significantly lower, whereas serum magnesium and ferritin levels were significantly higher in the LBW group than in the non-LBW group.

Conclusions: Maternal gestational weight gain, WBC, micronutrient intakes, protein, magnesium and iron status, and passive

144/1548

BREAST MILK FATTY ACIDS AND INFANT EXECUTIVE FUNCTION: A PROSPECTIVE STUDY

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Background and objectives: Studies have shown that nutritional status during early life (including prenatal and postnatal nutrition) could affect individual's epigenetic profile, which subsequently influence the infant growth, including neural development. We aimed to study the relationship between fatty acids profile in breast milk and infant executive function.

Methods: Eight hundred new born infants were recruited and followed up for 30 months. Breast milk was sampled at 42nd day and 8th month old, and the fatty acids profiling of breast milk were evaluated with GC-FID. The executive function of infants was tested with Bayley Scale, AB task, and planning task at 8th month and 30th month. The relationship between fatty acid level and executive function was evaluated with linear regression. iCluster analysis was also used to classify the study subjects into subgroups according to fatty acids pattern..

Results: We found that the levels of saturated fatty acids (SFA) were increased in breast milk of 8th month compared to 42nd day (P=0.10). In contrast, poly-unsaturated fatty acids (PUFA) levels (P=0.04) and the n3/n6 PUFA ratio (P<0.001) were decreased. In 42nd day breast milk, the levels of C10:0, C14:0, and C14:1n5 were negatively correlated with distraction score of full term infants. In 8th month breast milk, the levels of C12:0 and C14:0 were positively correlated with finer motor score; and C20:0 level was positively correlated with distraction score of full term infants. For pre-term infants, levels of C14:1n5, C16:1n7, C18:3n3, C18:3n6, and C20:4n6 in both 42nd day and 8th month breast milk were positively correlated with gross motor and planning score.

Conclusions: Fatty acids levels in breast milk were changing at different time and individual fatty acids had different effects on executive function at different time. More fatty acids were found to be correlated with executive function of pre-term infants compared to full term infants.

Keywords: fatty acids, executive function, breast milk
Further collaborators: Hong Zhou

144/1568

STUNTING AND OVERWEIGHT IN RURAL HOUSEHOLDS OF SOUTHWEST AND NORTHERN UGANDA

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Background and objectives: Rates of overweight have been increasing in Uganda women of reproductive age while stunting rates in children under five remain high. The objective of this analysis is to assess the association of being a stunted child in a household with an underweight versus overweight female caregiver within the context of the changing profile of the nutrition burden in Uganda.

Methods: This analysis utilizes data from two rounds of data collected on the households in 2012 and 2014 on a female caregiver and all children under five years of age in 3 North and 3 South West Ugandan districts (random self weighting sample, n= 8589 women and children). Anthropometric data were collected on both female caregivers and all children under five. Data were collected on socio-demographics, household food security, agricultural production, individual health and dietary pattern (caregiver and children under five). Mixed effects logistic regressions, accounting for repeated measures, were conducted using STATA 14.

Results: Stunting prevalence in children under five in the pooled sample was 28.2% and in households with underweight, normal and overweight caregivers 27.2%, 28.3% and 29%, respectively. Controlling for confounders and survey year, children with an overweight caregiver were less likely to be stunted than children with underweight caregivers (OR=0.68, CI=0.50-0.93, p=0.016). Being stunted was also significantly strongly associated with being boy (OR=1.47 CI=1.29-1.68, p=0.000), older age group (13- 24 months, OR 5.10, CI 4.06- 6.40, p=0.000, 25-59 months, OR=5.18 CI 4.26- 6.30, p=0.000) and geographical location with children from the South West more likely to be stunted than children from

the North. (OR 4.45 CI 3.75-5.27, p=0.000). Other important factors include caregiver age (OR =0.98, CI=0.97-0.99, p=-0.003), caregiver education (OR=0.95, CI=0.93-0.98,p=0.000) and household wealth (OR=0.83, CI=0.76-0.89, p=0.000).

Conclusions: Stunting in children under five and overweight in women co-exist in the same rural Ugandan households. But nature of this relationship is confounded by factors such as gender of the child, age, geographical location, caregiver's age and education and household wealth. Particular emphasis needs to be given to future analysis to determine the extent of the difference in the association by geographical location.

Keywords: Stunting, Overweight, Rural Households, Uganda

144/1586

DEVELOPMENT OF AN M-HEALTH INTERVENTION FOR THE INFANT AND YOUNG CHILD FEEDING COUNSELLING IN THE PLANTATION SECTOR OF SRI LANKA

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Background and objectives: Sri Lankan health indicators are relatively better when compared to similar socio-economic countries. But the progress on child under-nutrition is poor, which is prominent in plantation sector. M-health is a possible technology to deliver feeding counselling, with relatively lower costs in these settings by improving access, quality, and timeliness.

The aim of this study was to develop an M-health intervention suitable for the plantation sector of Sri Lanka for infant and young child feeding counselling.

Methods: The research team conducted a formative study in the plantation sector to assess the acceptability of an intervention using mobile phones, registration of the clients, mode (text or voice) and timing of messages and signal strength. This lead to the development of an intervention with four stages.

Results: Stage I

Age appropriate sequence of text and voice messages were developed, aiming pregnant mothers with gestational age over 28 weeks and mothers of infants up to 2 years of age. Messages focused on encouraging mothers on exclusive breastfeeding, appropriate complementary feeding, relevant hygienic practices, immunization and micronutrient supplementation. Text messages were in Tamil text and voice messages were in female Tamil voice. Both were interactive messages and at the end of each massage the receiver was asked whether there are any feeding issues and the urgency of the issue. All the issues were notified to Public Health Midwife (PHM) through another text message.

Stage II

A mobile platform was developed to send the above messages to registered clients in partnership with a professional mobile service provider in Sri Lanka - Dialog Axiata PLC Messages sent on fixed dates and times during the week.

Stage III

Mobile application was developed for the use of the PHM, with the same mobile service provider for the registration of the clients. The application worked online and offline and was able to operate through smart phones or computers.

Stage IV

Clients and PHM were trained on use of mobile phones.

Conclusions: An M-health intervention was developed for infant and young child feeding counselling for the plantation sector of Sri Lanka which needs to be pilot tested.

Keywords: M-health. IYCF counselling. plantation sector. Sri Lanka

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144/1591

PROLONGING MICRONUTRIENTS SUPPLEMENTATION 2-6 MONTHS PRIOR TO PREGNANCY SIGNIFICANTLY IMPROVES BIRTH WEIGHT BY INCREASING HPL PRODUCTION AND CONTROLLING IL-12 CONCENTRATION: A RANDOMIZED DOUBLE BLIND CONTROLLED STUDY

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Background and objectives: The role of multi-micronutrients (MMN) supplementation to improve birth weight is still debatable. Its role on pregnancy outcomes may involve the Interleukin 12 (IL-12) and human Placental Lactogen (hPL). This research was conducted to evaluate the effect of prolonging multi-micronutrients supplementation 2-6 months prior to pregnancy on birth weight in relation to IL-12 and hPL concentration during the 3rd trimester of pregnancy.

Methods: A randomized double blind community-based trial was conducted at District of Probolinggo East Java, Indonesia. A two-arms study consists of group I received placebo before pregnancy and continued with daily iron and folic acid (IFA) during pregnancy, and group II received multi-micronutrient containing 15 micronutrients, 2 other days before pregnancy and continued with daily dose during pregnancy. A sample size of 115 pregnancy outcomes was obtained from 420 eligible brides-to-be. The primary outcome variable is birth weight. Concentration of IL-12 and hPL in the last trimester, gestational age, maternal weight gain and placental weight were assessed as the intervening variables. Preconceptional BMI, concentration of serum retinol, serum zinc, and serum ferritin prior to pregnancy were assed as baseline data. Data were analyzed using analysis of covariance to evaluate effect of supplementation. Causal relationship among variables was tested by using analysis of structural equation modelling.

Results: The characteristic between treatment group and control group were not different (Box's M value p = 0,398; Hotelling's Trace value p = 0,478I). Results show that compare to iron folic acid supplementation, subjects who received multi-micronutrients supplementation 2-6 months prior to pregnancy have lower IL-12 concentration by 0.10 pg/mL (p=0,665), higher hPL concentration by 1.14 mg/L (p=0,014), longer gestational age by 1.66 weeks (p=0,539), but no difference of total weight gain (p=0,995). There is significantly higher of placental weight and birth weight by 83.59 grams (p=0,000) and 309.89 grams (p=0,000) respectively (p=0,000).

Conclusions: It implies that prolonging multi-micronutrient supplementation 2-6 months prior to pregnancy and being continued during pregnancy improves birth weight by increasing hPL production and placental weight, as well as controlling maternal immune response, particularly reducing IL-12 concentration in last trimester.

Keywords: preconception nutrition, multi-micro nutrients, human placental lactogen, interleukin-12, birth weight

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THE LONG-TERM EFFECT OF MATERNAL AND EARLY CHILDHOOD SUPPLEMENTATION ON GROWTH AND BODY COMPOSITION AT 4-6 YEARS OF AGE IN GHANAIAN CHILDREN

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Background and objectives: Nutrition during the first 1000 days influences short and long term health outcomes including growth. Although several studies have examined the effect of nutritional supplementation on growth from birth to 24 months, few have evaluated the long-term effects of early supplementation beyond this period. We previously reported that maternal and child lipid-based nutrient supplements (LNS) provided during pregnancy and 6 months postpartum for the mother and from 6 to 18 months for the child increased mean attained length at 18 months. Our current objective is to report effects on growth and body composition at 4-6 years of age.

Methods: We conducted a follow-up study of children born to women who participated in the International Lipid-based Nutrient Supplements (iLiNS)-DYAD trial in Ghana. Women (n=1320) were randomized to receive 1 of 3 treatments at ≤20 weeks gestation: 1) iron and folic acid during pregnancy and placebo calcium tablet for 6 months postpartum, 2) daily multiple micronutrient tablets during both periods, or 3) LNS during both periods. Children whose mothers received LNS also received LNS from 6 to 18 months of age. At 4-6 years of age, we determined the effect of the intervention (LNS vs. non-LNS) on the primary outcomes height, height-for-age z-score (HAZ) and percent body fat determined by the deuterium dilution method. Other growth indicators were secondary outcomes.

Results: Follow-up anthropometric results represent 76.8% of live births from the main trial (n=966). There were no significant differences between LNS vs non-LNS groups in height [106.7 vs. 106.3 cm (β = 0.37; 95% CI -0.19, 0.93; p=0.347)], HAZ [-0.50 vs.-0.56 (β = 0.06; 95% CI -0.06, 0.18; p=0.347)], stunting (<-2 SD) [6.2 vs. 5.8% (β = 1.12; 95% CI 0.62, 2.03; p=0.706)], or percent body fat [15.7 vs. 15.6% (β = 0.09; 95% CI -0.60, 0.78; p=0.802)].

Conclusions: Although we had previously observed a difference in length at 18 months, there was no effect of LNS on height at 4-6 years of age in this cohort, which had a low stunting rate. There was no adverse impact of LNS on body composition or overweight.

Keywords: Growth, body composition, supplementation, lipid-based nutrient supplements

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144/1601

KNOWLEDGE, ATTITUDES AND PRACTICES OF FIRST LEVEL HEALTH WORKERS TOWARDS BREASTFEEDING, COMPLEMENTARY FEEDING AND MICRONUTRIENTS SUPPLEMENTS IN MEXICO: FORMATIVE RESEARCH FOR THE SPOON PROJECT

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Background and objectives: Adequate breastfeeding (BF), complementary feeding (CF) and micronutrients intake (MI) are important determinants of children growth and development. The first-level health workers in most cases are the gatekeepers of child nutrition information to mothers or caregivers during their visits to primary health care. The objective of this work was to identify first-level health workers' knowledge, attitudes and practices related to the promotion of BF, CF and micronutrient supplements (MS).

Methods: As part of the formative research of the SPOON project, which aims to implement a strategy to prevent chronic malnutrition and reduce the risk of future obesity in children aged 0-23 months, in-depth interviews with health workers (HW, n=8) were conducted to document their knowledge, attitudes and practices towards BF, CF and MS. Interviews were transcribed in verbatim, coded and analyzed using N-Vivo.11.

Results: HW recognize that BF is the best food for children, and they recommend exclusive breastfeeding (EBF) without any other type of food or liquid during the first six months. They mentioned that illness is a motive to interrupt BF (HIV, or with intake of strong medicine such as penicillin). According to them weaning starts at six months, some think that during this period breastmilk is useless or less nutritious for infants. They also think that the total duration of BF should be one year, and prolonging BF beyond than a year might causes emotional dependence and problems with social integration. They recommend that CF starts with semisolid foods, and they prescribe MS, however their information about appropriate CF and MS is scarce. Most of their information about BF, CF and MS, comes from personal/familiar experiences and some from vocational training

Conclusions: Even though HW recommend EBF, certainly their knowledge, attitudes and practices contradicts WHO recommendations towards total duration of BF. Since HW are important sources of information to mothers, they affect mother`s knowledge and practices related to child nutrition. Therefore, it is important to design a multidimensional strategy that address HW' lack of knowledge to the adequate promotion of CF and the use of MS.

Keywords: Health workers, infant and young child feeding practices, micronutrients supplements, knowledge, formative research, Mexico

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ACCEPTABILITY OF UNSWEETENED SMALL QUANTITY LIPID-BASED NUTRIENT SUPPLEMENT (SQ-LNS) IN CHILDREN AGED 6 TO 23 MONTHS: FORMATIVE RESEARCH FOR THE SPOON PROJECT IN COLOMBIA, GUATEMALA AND MEXICO

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Background and objectives: The SPOON project aims to design a social and behavior change communication (SBCC) strat-

egy to prevent malnutrition among children aged 0-24 months through adequate infant and young child (IYC) feeding practices, including home-fortification with SQ-LNS. In the context of the nutrition transition and the evidence linking IYC feeding to overweight and obesity, we aimed to assess acceptability of unsweetened SQ-LNS, and to identify context-specific barriers and facilitators of use.

Methods: As part of extensive formative research, a 14-day home feeding trial was conducted with a convenience sample of caregivers of children aged 6-24 months in poor urban communities of Pasto, Colombia (n=16), Baja Verapaz, Guatemala (n=28) and Nayarit, Mexico (n=30). Caregivers were instructed to administer a daily 20-g portion of SQ-LNS directly from the sachet or mixed with foods. Participants received three home-visits during which interviews were conducted to investigate use; in addition "used" sachets were collected. Focus groups discussions were also conducted.

Results: The proportion of caregivers who reported offering SQ-LNS on all 14 days was 71% in Guatemala, and approximately half in Colombia (47%) and Mexico (53%). Most caregivers chose to mix SQ-LNS with food (80% Colombia, 75% Guatemala, 71% Mexico) and approximately half reported children finishing the portion (52% Colombia, 60% Guatemala, 45% Mexico). At the level of the child, barriers included dislike of the flavor (peanut), rejection, and large portion size. At the level of the caregiver, barriers included difficulty in finding the right food to mix with, lack of patience to feed, activities outside the house and lack of collaboration of the father. Side effects such as diarrhea, change in stool color and constipation were mentioned. Perceived benefits included prevention of illness, increased appetite, activity, wellbeing and weight gain. Caregivers' recommendations for use of SQ-LNS include mixing it with a variety of favorite foods such as sweet foods and feeding with patience and playfulness.

Conclusions: To maximize acceptability and adherence, the SBCC strategies across the 3 settings must emphasize the variation in feeding practices and barriers uncovered through the study.

Keywords: small quantity - lipid-based nutrient supplement (SQ-LNS), acceptability, Colombia, Guatemala, Mexico

Sri Lanka with the support of UNICEF in 2007. The intervention was implemented in 12 of the most nutritionally vulnerable districts. The children aged 6 to 23 months were eligible to receive MMN supplement. The purpose of the present evaluation is to assess the effectiveness of MMN supplementation programme in the 12 intervention districts including a comparison between recipients and non-recipients.

Methods: We conducted secondary data analyses of 2 national surveys conducted early and late phases of the MMN intervention. The secondary data analysis employed data from the Nutrition and Food Security Survey 2009 (NFSS 2009) and the National Nutrition and Micronutrient Survey 2012 (NNMS 2012).

Results: The analysis revealed that only 45.2% of the children in the age group 6-23 months in the 12 intervention districts have received MMN powder in 2012. The comparison between the two surveys showed a significant and substantial reduction in the prevalence of anaemia in children aged 6-23 months by 11.7%, and an increase in mean Hb level by 0.3 g per dl between 2009 and 2012. Using the NNMS 2012 data, the micronutrient status was compared between children who received MMN and never received MMN in the 12 intervention districts. The results revealed that the prevalence of anaemia was lower (25.2%) among those who have received MMN powder compared to those who haven't received it (29.7%), but this difference was statistically non-significant. However, there was a statistically significant reduction in the prevalence of Iron Deficiency Anaemia among recipients of MMN (10.1%) in comparison to non-recipients (15.7%). There is also a significant improvement in the mean Haemoglobin level by 0.15 g per dl in the recipients.

Conclusions: The present evaluation has demonstrated that MMN supplementation for home fortification has clear benefits in reducing Iron deficiency anaemia in infants and young children in the pilot districts. In conforming to global guidelines, it is recommended that prevalence of anaemia more than 20% in the age group 6-23 months be used as the cut-off in determining scale up.

Keywords: multiple micronutrient supplementation. Anaemia. programme evaluation.

144/1610

EVALUATION OF MULTIPLE MICRONUTRIENT SUPPLEMENTATION PROGRAMME IN SRI LANKA

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Background and objectives: Multiple micro-nutrient (MMN) supplementation for infants and young children was introduced to the national maternal and child health programme in

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INFANT AND YOUNG CHILD FEEDING POLICY PROCESS AND PROGRAMMES IN SRI LANKA: AN ANALYSIS OF STAKEHOLDERS

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Background and objectives: Child nutrition indicators have not improved on par with other health indicators in Sri Lanka. Evidence-based interventions to improve infant and young child feeding(IYCF) practices are well documented. Adoption of such interventions, guided by robust polices, and backed by unstinted support from all stakeholders are pre-requisites for successful IYCF programmes, to tackle childhood malnutrition. This study was designed to describe the role of stakeholders in IYCF policies and programmes in Sri Lanka, in order to identify opportunities for improvement.

Methods: Technical and funding links of stakeholders involved in IYCF policies and programmes in Sri Lanka were analysed using Net-Map technique. Thirty five experts knowledgeable about IYCF programmes were selected for this purpose, and individually interviewed.

Data were analysed using ORA(Organizational Risk Analyzer) software. Relative importance of stakeholders was assessed through 'centrality' measures ('in-degree', 'out-degree', 'closeness' and 'betweenness'). In addition, 'level of influence' and 'support' of each stakeholder were also measured. The ORA software identified 'communities', i.e. groups of stakeholders closely connected.

Results: For technical and funding support for IYCF policies and programmes, 56 and 37 stakeholders respectively were identified.

Regarding technical support, stakeholders in the government health sector had the highest 'centrality' measures, 'level of influence' and 'support', followed by development partners. The research and academic, non-governmental organization (NGO) and government non-health stakeholders had relatively low 'centrality' and 'level of influence', though most of them were 'supportive'.

In the funding support map also government health sector stakeholders were prominent. High 'in-degree' suggested adequacy of funds for this main sector. Generally high 'supportiveness', 'level of influence' and 'centrality' of these stakeholders facilitate favourable distribution and utilization of funds for IYCF activities. Development partners had high 'out-degree' and 'level of influence' measures. Government non-health and NGO sectors had low 'in-degree', 'closeness' and 'level of influence' measures, though 'supportive'.

'Communities' in both technical and funding support maps were diverse, indicating healthy support and collaboration between stakeholders of various sectors.

Conclusions: The stakeholder analysis demonstrated that the government health sector was most active in IYCF programmes in Sri Lanka. For further improvement, strategic involvement of stakeholders in other sectors seems an attractive option.

Keywords: Infant and young child feeding, Stakeholder analysis, NetMap, Sri Lanka

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NUTRITIONAL SITUATION, FEEDING PRACTICES OF CHILDREN AND REPRODUCTIVE AGE MOTHERS FROM BANGANG RURAL COMMUNITY, CAMEROUN

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Background and objectives: Health and nutrition problems are the result of unsatisfactory food intake or severe and repeated infection, or a combination of both. In Cameroon, malnutrition rate among pregnant and lactating women, infant and young children is increasing. This work aimed at evaluating feedings practices, anthropometric measurements (aged, weights and heights), the nutritional status of the mothers and children aged 0 to 59 months, in order to prepare nutrition education and intervention.

Methods: A cross-sectional study was conducted in six pilot health centers at Bangang Rural Community in western Cameroon. Two hundred and ninety six (296) mothers with 440 children (214 male, 226 female) aged 0 to 59 months were randomly selected. Anthropometric measurements were taken on mothers and their children using NCHS/WHO international growth reference. A questionnaire was developed to collect information on

the socio-economic and demographic status of mothers. Statistical analyses were done using ENA Smart and SPSS software

Results: With BMI classification of mothers according to WHO criteria, 3.38 %, 55.40 %, and 42.22 % of the mothers were underweight, normal and overweight respectively. For the children, from Z-scores, 2.6 %, 10 %, and 42.22 % were wasted, underweight and stunted respectively. Very low rate of exclusive breastfeeding (3.54%) before 6 months, early complementary feeding were observed. The most frequents consumed food were cereals and tubers whose nutrients are poorly bioavailable. The daily proteins, minerals, vitamins, were generally poor

Conclusions: In Bangang rural community, many the high rate of malnutrition was linked to lack of knowledge, inappropriate breastfeeding and complementary feeding practices, poor access to health infrastructure, illiteracy and poverty. Hence, effective mother's nutrition education should be implemented to improve good feeding practices and then, reduce malnutrition

Keywords: Nutritional status, children, feeding practices, mothers, Cameroon

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144/1624

NUTRITION IMPROVEMENT FOR PRECONCEPTION WOMEN: FIELD EXPERIENCE OF THE SCALING UP NUTRITION (SUN) PROGRAM IN BANGGAI DISTRICT INDONESIA

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Background and objectives: MMR in Banggai district (2014) is relatively high (279/100.000) compare to thenational target 2015 (102/100.000). Stunting is also high, 36,8% based on Basic Health Research (2013), as well as low birth weight baby (LBW) that reach 164 cases (2015). Root cause for all these problem is malnutrition in the first 1000 days of life especially in pregnancy. One of the program to improve the nutrition status of pregnant is the improvement of the nutritional and health status of women pre-conception through Integrated Health Post (Posyandu) for pre-conception women (PcW).

Methods: The program started at the beginning of January 2015, by organizing national seminar and workshop inviting prominent scholars and stakeholders in the field to share their knowledge and experiences. The output of the seminar and workshop is the commitment of local government and stakeholders to support the SUN Program. We visited mutlisector office and public health center (Puskesmas) to do socialization. A pilot project was initiated in the village namely Padangon, and we launched Posyandu for PcW in every village. Program started with health and nutrition classes for bridegroom. After that, all the bride included as a member of the Posyandu for PcW. In Posyandu, we did counseling on health reproduction, nutrition education, check up of BMI, HB concentration, upper arm circumference (UAC), and blood pressure, and delivering multi micronutrient (MMN) supplement. To analyze the result, we compare data before and after program implementation from facility report.

Results: From the begining of the program until the end of 2016: MMR decreased from 13 become 7 cases; LBW from 164 to 138 cases; prevalence of chronic enegy deficiency of PcW (UAC < 23 cm) from 23.5% to 12% and anemia prevalence of PcW decreased from 56% to 38%.

Conclusions: Preconception care offers great opportunities to improve nutrition status, prevent anemia, reduced maternal mortality, and low birth weight baby. It's important to implement the preconception care as part of maternal and child health and nutrition program in SUN Movement. It takes a strong commitment from local leaders.

Keywords: Preconception, SUN, MMR, LBW, anemia, local leader

Conflict of Interest Disclosure: Research Asisstant

Further collaborators: Stakeholder and Research Collaboration

144/1628

POLYUNSATURATED FATTY ACIDS TRANSFER ACROSS THE PLACENTA WAS LOWER IN OBESE COMPARED TO NORMAL WEIGHT PREGNANT WOMEN

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Background and objectives: The incidence of obesity during pregnancy is increasing. Early programming of obesity could take place since very early stages of life, even during gestation. However, little is known about the mechanisms involved in this process. Our aim was to investigate the in vivo metabolism and placental transfer of fatty acids (FA) labelled with stable isotopes across the placenta in obese and normal weight pregnant women.

Methods: 10 controls (BMI 20-25kg/m2) and 10 obese pregnant women (BMI >30kg/m2) received orally, 12h before elective caesarean section, 0.05mg/kg 13C-oleic acid (13C-OA), 0.05mg/kg 13C-linoleic acid (13C-LA) and 0.01mg/kg 13C-docosahexaenoic acid (13C-DHA). Maternal blood was collected at -8h, -4h, -2h and at time of caesarean section; placental tissue and cord blood were also collected at delivery. VLDL, LDL and HDL were isolated by ultracentrifugation. Lipid fractions from serum and placenta were isolated by thing layer chromatography. All samples were analysed for 13C enrichment by gas chromatography combustion isotope ratio mass spectrometry (GC-C-IRMS).

Results: Both maternal serum triglycerides and cholesterol levels were similar in obese and normal weight pregnant women. Maternal insulin, placental weight and cord glucose tended to higher values in the obese group (n.s.). Both DHA and LA were significantly higher in plasma non-esterified fatty acids in obese vs. normal weight women (LA: 1.19±0.16% vs. 0.83±0.08%, P=0.058, DHA: 0.18±0.04% vs. 0.09±0.01%, P=0.046). HDL and LDL lipoproteins showed higher enrichment of LA and especially of DHA in the obese group, which may affect placental uptake of these FA. Tracer concentrations in total lipids of placenta were similar in both groups. However, the FA transfer to the fetus, evaluated by the ratio between cord and maternal 13C-FA plasma concentrations, was lower in obese women compared to controls, with a significant difference for LA (0.25±0.03% vs. 0.39±0.06%, P=0.04).

Conclusions: The materno-fetal placental fatty acid transfer of LA and DHA is lower in obese pregnant women without hyperlipidemia than in women with normal body weight.

Keywords: lipids, tracer study, mass spectrometry, docosahexaenoic acid, pregnancy

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SCALING UP REVITALIZED BABY FRIENDLY HOSPITAL INITIATIVE: DAY OF BIRTH TO 24 MONTHS - MALAWI CASE STUDY

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Background and objectives: Malawi 2016 DHS indicates a 10% decline in exclusive breastfeeding (EBF) and 37% of children under 5 are stunted. Only 31% of children under 2 years who had diarrhoea were breastfed. The Baby Friendly Hospital Initiative (BFHI) initiated in 1993 had collapsed since 2005. With limited tools and training, health providers aren't able to effectively support mothers, track and refer children under 2 years who are not thriving nutritionally.

Building on the ongoing scale-up of BFHI, the Maternal and Child Survival Program (MCSP), worked with the Ministry of

Health in collaboration with the World Health Organization in more than 20 districts, reaching over 1000 health workers to revitalize and scale up BFHI. Main objective: through effective integration along the continuum of care (COC), improve rates of early initiation of breastfeeding, EBF and timely complementary feeding at six months.

Methods: Designed and implemented an innovative package of interventions that optimized opportunities to strengthen and integrate along CoC at three main levels: 1) district health management teams plan, budget and implement, 2) sustainable on-site mentoring of health facilities to integrate BFHI into CoC of maternal, newborn and child health services including continuous assessment, and 3) operationalization of the community infant and child tracking system linked to health facilities. Data along the value chain of the CoC linked to the District Health Information System.

Results: Over 60% increase in early initiation of BF (2015-2016). More than 1000 health workers and over 1000 village volunteers have been trained whilst nearly 200 high volume health facilities and hospitals have been revitalized and operational in BFHI. Functioning linkages established between new mothers and trained community counsellors including new tools for messaging on the benefits of breastfeeding and sustaining behaviour for EBF and timely complementary feeding. Referral kits in use for tracking infants and children who are failing to breastfeed and not thriving nutritionally.

Conclusions: Globally BFHI continues to experience many challenges, which has resulted in slow scale-up. However, the Malawi case study demonstrates that scale-up and sustainability can be achieved using the systems strengthening along the continuum of care and community linkages approach.

Keywords: BFHI, Breastfeeding, Sustainable, Innovation, Thriving

Further collaborators: Ministry of Health Malawi. World Health Organization. USAID. Maternal and Child Survival Project. JHPIEGO. PATH.

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SENSITIVITY OF INFANT AND YOUNG CHILD FEEDING INDICATORS IN SEASONAL DIFFERENCES TO INFORM EARLY WARNING SYSTEMS

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Background and objectives: The goverment of Malawi, the World Food Programme (WFP) and World Vision are implementing a stunting prevention programme as part of 'Scaling Up Nutrition (SUN)' in Ntchisi district, Malawi. The programme has nutrition specific and sensitive components as well as a robust monitoring system that includes representative surveys every four months, measuring a range of indicators, including Minimum Acceptable Diet (MAD) and Minimum Dietary Diversity (MDD) for children 6-23 months of age. Currently, early warning systems to detect vulnerability to food insecurity and malnutrition rely primarily on household food security indicators. Nutrition indicators, such as MAD or MDD, if sufficiently sensitive to dietary changes, have potential to enhance such systems through capture of vulnerable household members' nutrition information.

The objective is to explore the sensitivity of MAD and MDD to predictable changes based on Malawi's seasonal calendar to inform design of early warning surveillance systems.

Methods: WFP analysed data from the representative surveys conducted in the programme district from 2015 to present. MAD and MDD measured at different times of the year were compared to the agricultural seasons (January (lean season), May (harvest), September (post-harvest)). IBM SPSS (v 20.0) was used to generate contingency table chi-square test ($\alpha=0.05$).

Results: Monitoring activities revealed that MAD and MDD changed in a predictable manner with the agricultural seasons across a 24-month period. In 2015, values for MAD were lowest during the lean season, highest during harvest, and intermediate post-harvest (10% vs 28% vs 14%; p<0.05). Values for MDD were also lowest during the lean season, highest during harvest, and intermediate post-harvest (12% vs 34% vs 20%; p<0.05). The same patterns were found in 2016 and 2017.

Conclusions: The regularly conducted surveys revealed that the two key nutrition indicators were sensitive to predictable changes in seasons. These findings suggest that MAD and MDD could be useful as early warning indicators in food security and nutrition surveillance systems.

Keywords: Minimum Acceptable Diet (MAD), Malawi, seasonality, stunting prevention, early warning

Conflict of Interest Disclosure: As a part of this SUN Stunting prevention programme in Malawi, Ntchisi district, World Food Programme collects trimesterly monitoring surveys where Minimum Acceptable Diet and Minimum Dietary Diversity indicators are assessed.

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FOOD CONSUMPTION PROFILE AND PHYSICAL ACTIVITY IN CHILDREN AT PRESCHOOL CARED AT HEALTH SCHOOL CENTER BUTANTÃ/ COLLEGE OF MEDICINE UNIVERSITY OF SÃO PAULO

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Background and objectives: Healthy dietary behavior formation along the period of preschool consists with the prevention of childhood obesity.

1. Check the risk of prevalence for overweight at preschool children cared at Pediatric nutrition clinic in the Health School Center Butantã

2. Check the food consumption profile of the preschool children

3. Compare the dietary frequency consume of the preschool children with the risk for overweight and weight excess in eutrophic children.

Methods: Studied Population: Preschool children attended at pediatric service care at Health School Center Butantã in which mothers accepted the participation of the attendance at the Pediatric nutrition clinic (N=69).

Measures and evaluations: weight, height. Evaluation of the nutritional profile based on standards of the World Health Organization; evaluation of the dietary intake by the dietary frequency questionnaire.

Statistical Analysis: frequency, measures and X^2; analysis preformed by SPSS® Software.

Results: The average age of the group is 2.53 years (+1.38), with 49.3% of girls and 50.7% of boys. The percentage of preschool children with overweight risk was 23.2% and the unhealthy food with the highest frequency intake by the children was: fruit yogurt, which in 50.1% consumes two to four times per week, and biscuits without filling are consumed by 50.5% two to four times per week. The amount of hours spent in front of the TV was 2.07 hours (+2.13).

At the analysis of the groups the intake of meat and chicken cheeseburger (one time per week, p=0,05); fermented milk (two to four times per week, p=0,001); sausages (two to four times per week, p=0,002) were more frequent in risk and excess groups than in eutrophic groups.

Conclusions: The prevalence of overweight risk in preschool children was 23.2%.

The unhealthy foods most consumed by preschool children with overweight risk were fruit yogurt and biscuit without filling.

The intake of cheeseburger, fermented milk and sausages were significantly higher in groups of children with excess and overweight risk than in eutrophic children.

Keywords: weight excess, pre- schools, unhealthy habits

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INFLAMMATION AND METABOLIC HEALTH BY BODY MASS INDEX IN EUROPEAN ADOLESCENTS: THE HELENA STUDY

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Background and objectives: Inflammation may influence the cardio-metabolic profile which relates with the risk of chronic diseases. Thus, the objectives are: to assess the inflammatory status by metabolic health/body mass index (BMI) category and to assess how inflammation can predict the cardio-metabolic profile in European adolescents, considering BMI.

Methods: 659 adolescents (295 boys) from a cross-sectional European study were included. Adolescents were classified by metabolic health based on age- and sex-specific cut-off points for glucose, blood pressure, triglycerides, high density cholesterol and BMI. C-reactive protein (CRP), tumor necrosis factor alpha (TNF-α), interleukin (IL-6), complement factors (C3, C4) and cell adhesion molecules were assessed.

Results: Metabolically abnormal (MA) adolescents had higher values of C3 (p<0.001) and C4 (p=0.032) compared to those metabolically healthy (MH). C3 concentrations significantly increased with the deterioration of the metabolic health and BMI (p<0.001). Adolescents with higher values of CRP had higher probability of being in the overweight/obese-MH group than those allocated in

other categories. Finally, high C3 and C4 concentrations increased the probability of having an unfavorable metabolic/BMI status.

Conclusions: Metabolic/BMI status and inflammatory biomarkers are associated, being the CRP, C3 and C4 the most related inflammatory markers with this condition. C3 and C4 were associated with the cardio-metabolic health consistently.

Keywords: Inflammation, metabolic health, metabolic syndrome, inflammatory biomarkers, adolescents.

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COMMUNITY-BASED DISTRIBUTION OF IRON-FOLIC ACID SUPPLEMENTATION: A REVIEW OF EVIDENCE AND PROGRAM IMPLICATIONS FOR ANEMIA PROGRAMMING FOR WOMEN AND GIRLS

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Background and objectives: Globally, anemia affects 29% of pregnant women and 38% of non-pregnant women. Anemia puts women at greater risk of mortality, morbidity, postpartum hemorrhage, and poor birth outcomes, including preterm births and low birth weight. The World Health Organization (WHO) recommends daily iron-folic acid (IFA) supplementation (30-60 mg iron, 0.4g folic-acid) initiated as early as possible and continued throughout pregnancy for all adolescent and adult women to prevent anemia and poor birth outcomes. Despite the benefits of maternal IFA supplementation, many low- and middle-income countries continue to face high anemia rates. Unfortunately, low coverage of these programs remains a problem due to lack of supplies, late or no attendance to antenatal care (ANC) and demand-side issues. Community-based distribution (CBD) of IFA may aid with supply and/or access issues. A literature review of CBD of IFA in low and middle income (LMIC) countries was conducted to understand how to improve coverage and utilization for pregnant women and young girls at the community level.

Methods: An extensive review of peer-reviewed and grey literature of CBD of IFA supplementation for pregnant women, girls and women of reproductive age in low and middle income countries was conducted. Authors reviewed and screened titles and abstracts. A final pool of 26 articles was included in this review. Components of program implementation including cadre of health worker, supply and demand issues, and coverage were reviewed.

Results: CBD programs had moderate success with midwives, and community health workers who counseled on health benefits and compliance with IFA supplementation. CHWs were more likely to identify and reach a greater number of women earlier in pregnancy, as women presented late to ANC. CBD channels had greater consistency in terms of adequate supplies of IFA in comparison to clinics and vendors, who faced stock-outs. Targeting women of reproductive age through school and community settings showed high compliance and demonstrated reductions in anemia.

Conclusions: CBD of IFA can be a valuable platform for increasing access and coverage of IFA supplementation.

Keywords: anemia, iron folic-acid supplementation, community distribution, pregnant women, girls

TIMING OF INITIATION OF BREASTFEEDING AND EARLY-NEWBORN SEPSIS: EVIDENCE FROM RURAL BANGLADESH

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Background and objectives: In Bangladesh, neonatal deaths decreased by 46% during 1990-2014. However, it remains high (28.0/1000 live-births), with early-neonatal deaths (19.3/1000) contributing over 65% of neonatal deaths. Neonatal sepsis is the cause of 24% neonatal deaths, while only 36% women start to breastfeed their newborn within 1st hour of birth. Early initiation of breastfeeding has a positive impact on neonatal health.

We aim to explore the effect of timing of breastfeeding initiation on early-newborn sepsis in rural Bangladesh.

Methods: We used data from a large community based trial in Bangladesh where pregnant women were enrolled from 2013-2015 covering 30,646 newborns. Sepsis was defined using neonatal danger signs reported by "The Young-Infants Clinical Science Study Group". Timing of initiation of breastfeeding was categorized as within 1hr, 1-24 hr,24-48hr, and more than 48hr of birth. Analysis includes descriptive statistics, risk attribution and binomial logistic-regression while adjusting for clustering effects of the trial design, and other maternal and infant characteristics.

Results: 29,172 live-births had information on initiation of breastfeeding. Of these, 4,121(14.1%) neonates had signs of sepsis till 7th day after birth. Two-thirds of the newborns [68.3%,(n=19,913)] had breastfeeding initiated within 1hr of birth. Mean time to initiation was 3.8hrs and by the end of 48hrs all but 3.5% neonates were breastfed. Breastfeeding within first hour was lower among women who delivered through caesarean section [46.5% vs 72.8%,(p<0.05)]. The incidence of sepsis increased as initiation of breastfeeding was delayed from 1hr (12.0%), 24hrs (15.7%), 48 hrs (27.7%) to more than 48hrs (36.7%) after birth. Overall, initiation after 1hr, 24hrs and 48hrs were associated with 6.8%, 20.4% and 23.4% higher attributable risk of having sepsis compared to those who initiated within 1hr, 24hrs and 48hrs respectively. Initiating breastfeeding after 1st hour significantly increases risk of having signs of sepsis during the first 7 days [1-24hr: OR=1.37(95%,CI:1.25-1.50); 24-48hr: OR=2.84(95%,CI:2.29-3.50); ≥48hr: OR=4.21(95%,CI:3.55-5.00)].

Conclusions: Findings indicate that timing of initiation of breastfeeding, especially within the first hour of birth, has significant protective effect on early-newborn sepsis. Tailored community-based intervention to promote initiation of breastfeeding within first hour of birth will help to reduce neonatal sepsis leading to neonatal deaths.

Keywords: Early breastfeeding, neonatal sepsis, maternal characteristics, infant, live-birth

DIETARY CONSUMPTION AND IRON DEFICIENCY ANEMIA IN INFANTS AGED 18-24 MONTHS

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Background and objectives: Iron deficiency (ID) is one of the most widespread nutritional disorders in both developing and industrialized countries, making it a global public health concern.1 ID and iron deficiency anemia (IDA), during the first years of life, are associated with impaired cognitive function and decreased motor activity.2 The major cause of micronutrient malnutrition is a diet consisting mainly of staple foods and lacking in animal sources. The aim of this study was to evaluate dietary consumption in infants with IDA or not

Methods: Infants (n=130, B/G: 72/58), aged 21±5 months, were recruited in three pediatric consultation and immunization centers of Oran. Dietary consumption, by the "24H recall" followed by 3 days record, was evaluated. Fresh blood count, plasma ferritin, and soluble receptors of transferrin (RsTf) were measured.

Results: Body mass index was 17±3 in infants, with 14% underweight, 25% overweight, and 15% obesity. Iron deficiency was defined according to several models: 22% met model criteria of ferritin<12μg/L and 73% with low ferritin or high RsTf or low mean corpuscular volume (MCV). IDA (Hb<11g/dL) was present in 48% of Infants (B/G: 35/27) with low MCV (<70μ3) compared to infants

without IDA (p<0.001). There was no significant difference in dietary consumption between infants with IDA or not. Total energy intake (TEI) represented 909±230 vs 961±273Kcal/d) but differed to recommended values (900Kcal/d).3 Intakes of proteins (12%) and carbohydrates (57%) were high, while that of lipids (31%) was decreased, compared to recommendations. 4 Qualitatively, animal proteins (74%), simple carbohydrates (49%) and saturated fatty acids (SFA) (51%) were high, compared to recommendations. Dietary iron consumption (5.6±3mg) was reduced compared to recommended value (7mg), showing that 81% of infants were deficient.

Conclusions: Dietary imbalance is probably at the origin of some micronutrients deficiencies, in particular iron leading anemia in half of infants. It is necessary to sensitize mothers to well monitoring and diversifying feeding of their infants, thus ensuring dietary balance for their growth and development.

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Keywords: Infants - Dietary consumption - Iron deficiency Anemia - Ferritin - RsTf

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INITIATION OF BREASTFEEDING AND MORTALITY RISK FOR NEWBORN IN RURAL BANGLADESH

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Background and objectives: The average annual rate of reduction of neonatal mortality is 2.6% and neonatal mortality contributes about 61% of under-five mortality in Bangladesh. Evidence has shown that early initiation of breastfeeding has a positive impact on neonatal health and survival. Although, the majority of Bangladeshi mothers breastfeed their infants till 23 months of life, initiation of breastfeeding in the 1st hour of life is only 36%.

We aim to explore the effect of timing of initiation of breastfeeding on cause specific neonatal mortality in rural Bangladesh.

Methods: We collected data from a large community based trial in Bangladesh during July 2013 till March 2015, which covered 30,646 live births. Primary outcome is the number of breastfed neonates. Neonates who died within 48 hours of birth were excluded from analysis to reduce reverse causality. Timing of initiation of breastfeeding is categorized as- within 1hr, 1-24 hr, 24-48hr, and more than 48hr of birth. Our analysis includes descriptive statistics and binomial logistic regression while adjusting for clustering effect of the trial design. Verbal autopsies were used to ascertain cause of death.

Results: 244 newborns died between 2-28 days of birth giving a mortality rate of 8.5/1,000 live-births. We excluded 501 neonates who died before day 2, as they may have been too sick for early initiation of breastfeeding. More than half of the infants [68.3%,(n=19,805)] started breastfeeding within 1hr of birth. Neonatal deaths were higher among children for whom breastfeeding was initiated after an hour of birth (10.1 vs 7.6/1000 livebirths, p<0.05). Compared with those fed within the first hour after birth, risk of mortality was 1.0 [(95%,CI: 0.69 to 1.45)], and 2.37 [(95%,CI: 1.26 to 4.45)] times higher among newborns first breast-fed within 24hrs and 48hrs of birth respectively. Newborns who initiated breastfeeding within 24-48hrs had a higher risk of death (RR=2.37 (95%,CI:1.26 to 4.45), after adjusting for birthweight, gestational age and parity compared to newborns who were breastfeed within 1hr.

Conclusions: Our findings highlight the importance of breastfeeding for reduction of neonatal mortality. Promoting need for early initiation of breastfeeding through community-based interventions may have potential to significantly reduce neonatal mortality.

Keywords: Early-breastfeeding, neonatal health, mortality, birth-weight, gestational age

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INFANT AND YOUNG CHILD FEEDING PROGRAMMES IN SRI LANKA: THE POLICY LANDSCAPE

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Background and objectives: Infant and young child feeding (IYCF) practices play a critical role in growth and development of children. A favourable environment supported by appropriate policies and positive contributions from all stakeholders are prerequisites for achieving optimal IYCF practices. As Sri Lanka has identified childhood malnutrition as a priority issue, this study aimed to assess the IYCF-related policy environment in Sri Lanka. This would help to identify opportunities to strengthen the policy environment to better support appropriate IYCF and reduce childhood malnutrition.

Methods: The research team mapped national level policy-related documents on IYCF across four selected domains of best-practice interventions. Mind mapping and causal analysis was used to identify relevant policy sectors and types. Documents were identified by searching government archives and websites, and through officials from Ministry of Health and other relevant Ministries. A matrix was designed to capture data from IYCF policy-related documents using a thematic approach, and a narrative synthesis of data from different documents was conducted.

Results: Twenty four policies and policy related documents were identified containing provisions in the areas of global recommendations for best-practice IYCF, marketing of breast milk substitutes, strengthening health and non-health systems, maternity benefits, inter-sectoral collaboration, capacity building, health education and supplementation. Twenty of them belonged to the health sector. Significant policy support for IYCF was evident across the four domains studied, i.e. general policy support, dissemination of evidence based information, capacity building of healthcare workers and enabling mothers/caregivers to engage with best-practice interventions.

On the other hand, there is no separate, written policy on IYCF in Sri Lanka, and it is not specifically mentioned in high level policy documents that demonstrates political will and strategic direction.

Conclusions: Globally accepted major evidence-based recommendations are covered in the policies and policy documents studied. This is in line with the findings of Gupta et al. (2013) of an assessment conducted in 40 countries, that Sri Lanka generally had good policy support for IYCF programmes.

In order to further improve, advocacy should be targeted towards strategic support for IYCF in high-level policy documents, and enhanced involvement of non-health sectors need to be explored.

Keywords: Infant and young child feeding, Nutrition policies, Sri Lanka

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NO DIFFERENCES BETWEEN THE INTAKES OF MACRO AND MICRONUTRIENTS IN PRESCHOOL CHILDREN, WITH AND WITHOUT EXCESS WEIGHT, CARED AT HEALTH SCHOOL CENTER BUTANTÃ/COLLEGE OF MEDICINE UNIVERSITY OF SÃO PAULO

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Background and objectives: A deficit of micronutrients normally is associated with unhealthy dietary behaviors.

1. Check the food consumption profile of the preschool children cared at Pediatric nutrition clinic in the Health School Center Butantã,

2. Compare the dietary frequency consume (micro and macronutrients) of the preschool children with the risk for overweight, weight excess and eutrophic children.

Methods: Studied Population: Preschool children attended at pediatric service care at Health School Center Butantã in which mothers accepted the participation of the attendance at the Pediatric nutrition clinic (N=69).

Measures and evaluations: weight, height. Evaluation of the nutritional profile based on standards of the World Health Organization; evaluation of the dietary intake by the dietary frequency questionnaire.

Statistical Analysis: Averages and T student Test for independent samples; analysis preformed by SPSS® Software and AVANUTRI®.

Results: The average age of the group is 2.53 years (+1.38), with 49.3% of girls and 50.7% of boys. At the analysis of groups

it is not possible to observe significant differences between the consumption of the studied macro and micronutrients. An average intake of proteins and sodium were revealed high, in the two groups regarding to the references (IDRs, 2002). The intake of protein and sodium, respectively, on the excess and overweight risk group=79.4g/day(+38.4), 1,8g/day(+0.93) and eutrophic group=73.4g/day(+41.5), 2.06g/day (+1.02). Still, the average intake of calcium was low in the two groups regarding the reference above. The intake of calcium on the excess and overweight risk group was 979.8mg/day(+814.2) and in the eutrophic group it was 759,6mg/day(+377.4).

Conclusions: The groups of risk, excess weight and eutrophic children exhibited similar macro and micronutrient consumption. The protein and sodium intake are higher than the references, and the calcium intake are discreetly lower at the preschool population, revealing the needing of orientation about healthy eating behaviors to the children.

Keywords: weight excess, pre- schools, micronutrients

144/1685

LIPIDOMIC ANALYSIS REVEALS THE SIGNIFICANT INCREASE OF DIACYLGLYCEROPHOSPHOCHOLINES IN UMBILICAL CORD BLOOD FROM PREGNANT WOMEN WITH GESTATIONAL HYPERCHOLESTEROLEMIA

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Background and objectives: Gestational hypercholesterolemia has been recognized as risk factors of some pregnancy complications. We supposed that maternal hypercholesterolemia modified the lipid profile of fetus.

Methods: Thirty hypercholesterolemic pregnant women and matched controls were recruited and cord blood was sampled. Lipidomic analysis was used to evaluate the lipid profile change between the two groups.

Results: The results showed that content of diacylglycerophosphocholines (PC) were significantly affected. PC (16:0/20:4) and PC (18:0/20:4) were selected as the most important lipid spices in cord plasma which positive related to total cholesterol (TC) and high density lipoprotein cholesterol (HDL) levels in cord blood. The contents of these two PCs were significantly high in hyperchplesterolemic group than that in control group.

Conclusions: These results suggested that gestational hypercholesterolemia might program the phospholipide metabolism in offspring.

Keywords: Lipidomic, cord blood, gestational hypercholesterima, glycerophosphocholines

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144/1690

DESIGNING A LARGE MULTI-SECTOR PROGRAMME TO REDUCE STUNTING IN BANGLADESH. LESSONS FROM SUCHANA

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Background and objectives: Bangladesh has made significant progress in addressing chronic malnutrition with national stunting rates falling from 51% to 36% between 2004 and 2014. Progress has not been uniform across the whole country however and in Sylhet, stunting rates have remained at 50%. The Suchana programme was developed over 4 years using an iterative and collaborative process to design a programme to address the multi-faceted causes of malnutrition.

Methods: A series of studies were undertaken between 2012 and 2015 to understand the context of under nutrition in Sylhet Division and design a programme tailored to that context. These included a political economy analysis, governance study, food security and nutrition survey, Household Economy Analysis (HEA), Cost of Diet (CotD) assessment, ormative research, multi-hazard risk analysis, social protection and child poverty assessment, food security and nutrition scoping study, value chain study and health and nutrition services mapping, and review of learning from similar programmes.

Results: Five core programme pillars were identified: 1) Improved nutrition governance; 2) improved access to and utilization of nutrition specific and nutrition sensitive services; 2) better nutrition through improved economic status; 4) Community mobilisation for optimal IYCF and Maternal Child Health and Nutrition (MCHN) behaviour and practices; and 5) robust evidence of impact generated for scale up. It targets 250,000 vulnerable households in Moulvibazar and Sylhet districts and is delivered through a coalition technical and implementing partners, working across 8 Ministries, in a phased approach over 6 years. The first year learning phase has just been completed generating valuable learning and recommendations to further improve the approach.

Conclusions: Suchana is unique yet challenging because it uses systems based, multi-sector and multi-pronged approach to addressing the underlying causes of malnutrition. It was designed with a strong evidence base and highly iterative process which is equally rare.

Keywords: Stunting, food security, systems, multi-sector, Bangladesh

Further collaborators

Collaborating organisations include Save the Children, Helen Keller International (HKI), World Fish, International Development Enterprises (iDE), Department of International Development (DFID) and the European Union (EU)

144/1699

DIETARY PATTERNS AND CHANGES IN FRAILTY STATUS - THE ROTTERDAM STUDY

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Background and objectives: The frailty index, developed by Mitnitski and Rockwood, appraises frailty as the accumulation of health-related and age-related deficits. The included deficits cover a broad range of health aspects including cognition, disabilities, laboratory abnormalities, and comorbidities. To provide more insight into how diet quality is associated with the frailty index and changes in frailty status over time we aim to: (1) examine the cross-sectional association between adherence to national dietary guidelines (a priori defined dietary pattern) and population-specific (a posteriori derived) dietary patterns and the frailty index in middle-aged and elderly populations and (2) examine if these a priori and a posteriori defined dietary patterns are associated with changes in frailty over a four year follow-up period.

Methods: Cross-sectional and longitudinal analysis embedded in the population-based Rotterdam Study (n=2,632 aged 45 years. Diet was assessed at baseline (year 2006) using food-frequency questionnaires. Dietary patterns were defined a priori using an existing index reflecting adherence to national dietary guidelines and a posteriori using principal component analysis. A frailty index was composed of 38 health deficits and measured at baseline and follow-up (4 years later). Linear regression analyses were performed using adherence to each of the dietary patterns as exposure and the frailty index as outcome (all in Z-scores).

Results: Adherence to the national dietary guidelines was associated with lower frailty at baseline (β -0.05, 95%CI -0.08, -0.02). Additionally, high adherence was associated with lower frailty scores over time (β -0.08, 95% CI -0.12, -0.04). The PCA revealed three dietary patterns that we named a "Traditional" pattern, high in legumes, eggs and savoury snacks; a "Carnivore" pattern, high in meat and poultry; and a "Health Conscious" pattern, high in whole grain products, vegetables and fruit. In the cross-sectional analyses adherence to these patterns was not associated with frailty. However, adherence to the "Traditional" pattern was associated with less frailty over time (β -0.09, 95%CI -0.14, -0.05).

Conclusions: Even in a population that is relatively young and healthy, adherence to dietary guidelines could help to prevent or delay frailty.

Keywords: Dietary patterns, diet quality, elderly, frailty, frailty index

144/1741

EXCESS WEIGHT AND INADEQUACY OF MACRO AND MICRONUTRIENT ADOLESCENT INTAKE IN A TOWN OF BRAZILIAN NORTH EAST

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Background and objectives: Adolescence is a stage of intense body modification. The eating habits during this period are associated with increased risk of obesity and other chronic non-communicable diseases. The objective was to correlate excess weight with macronutrient intake and inadequate micronutrient intake of adolescents in a town of brazilian northeastern.

Methods: Adolescents students at public school answered three 24-hour dietary recall. The intake of energy and nutrients was estimated based on the Brazilian Food Composition Table. The inadequacy prevalences were estimated using the Estimated Average Requirement method as a cut-off point, the macronutrients were analized by Acceptable Macronutrient Distribution Range. Weight and height measurements were performed for BMI calculation and nutritional status classification as recommended by the WHO. The descriptive analysis of the data and the analytical test of the chi-square. The analyses were stratified according sexes.

Results: The analysis of nutritional status by sex showed that the girls had higher frequency of adequade weight (62.2%) and overweight (33.3%), compared to boys, who were respectively 47.2% and 13.9%. On the other hand, obesity was higher in boys, being 38.8% compared to 4.4% in girls. The mean energy consumption of male participants was higher (2352.5 kcal) than female (2200.7 kcal), however with no statistically significant difference. The percentage contribution of carbohydrates, proteins and lipids to total energy intake was similar among the different sexes and nutritional status. The consumption was out of the range in 6.3% for carbohydrates, 28.4% for proteins and 36.8% for lipids. Micronutrients that had the highest prevalence of inadequacy were calcium (92.6%), vitamin A (78.7%) and vitamin C (52.6%). Adequate iron consumption is present in the most subjects (87.2%). There were also no statistically significant differences in micronutrient intake by sex or nutritional status. The ERICA study in Brazil found either the highest prevalence of inadequacy with calcium and vitamin A, similar results among sexes. However, inadequate iron intake was higher among females.

Conclusions: There were no relation between sexes, nutritional status and inadequacy of micronutrients or high intake of macronutrients. There were a high prevalence of weight excess and inadequacy of calcium, vitamin A and vitamin C.

Keywords: Food Consumption; Nutritional Status; Adolescents

144/1743

SNACKING BEHAVIOR IN ADOLESCENT GIRLS LIVING IN URBAN CITIES IN JAVA, INDONESIA

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Background and objectives: Adolescence is a critical period in the lifecycle characterized by physical, social and developmental changes that impact on health and eating behavior. Indonesia is experiencing dramatic economic and infrastructural changes, causing greater access to the global food industry and media. This transition is influencing modifications in food intake, leading to new nutritional challenges in adolescent girls. Social science research was conducted to examine factors affecting eating and snacking behaviors in adolescent girls between 16-19 years of age. An overall aim was to inform the development of a communication strategy to improve snacking behavior.

Methods: Qualitative research was conducted between November 2016 and January 2017 in five urban sites in Java, Indonesia. Methods: **Results:** Freelisting results identified over 200 snack foods, with the most salient being packaged foods such as chips and cookies or fried foods available from street vendors or fast food restaurants, with little mention of fruits or vegetables. Respondents typically snacked multiple times daily, either with friends or while alone, with girls commonly storing snacks in their bedroom. Triggers for snacking included boredom, cravings, the desire to replace a heavy meal, and the need for a "companion" while studying, watching movies, or browsing social media, a regular activity of adolescent girls. Snack food selection is guided by taste, price, and accessibility, while health is not considered. Factors influencing snacking included its central role while socializing with friends, parental provision of snack foods and pocket money, the ubiquitous availability of snacks and their low price, and media advertisements, as well as a limited understanding of food content, nutritional needs and the adverse effects of poor food consumption.

Conclusions: Routine consumption of low quality snack foods high in sugar, salt and fat will likely have long-term implications on the nutritional status and health of Indonesian adolescent girls. This in-depth study provided context-specific information for the development of a social media campaign designed to motivate girls to modify snacking practices.

Keywords: snack food consumption, qualitative research, adolescent girls, social media campaign, Asia

144/1769

ENHANCING CAPACITY OF COMMUNITY SYSTEMS TO IMPROVE MATERNAL INFANT AND YOUNG FEEDING PRACTICES: APPROACHES AND TOOLS USED IN THE BABY-FRIENDLY-COMMUNITY-INITIATIVE

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Background and objectives: Background: In Kenya, 39% of mothers deliver at home and those discharged from hospital require continuity of care hence Baby Friendly Hospital Initiative does not reach some women. Baby-Friendly-Community-Initiative (BFCI) could fill this gap.

Objective: To describe community based approach and tools used in implementation of BFCI to improve maternal infant and young child feeding practices.

Methods: Method: Participatory research on community engagement in BFCI, desk review, country case studies and exchange study to Cambodia. A package of BFCI implementation was developed which includes BFCI implementation guidelines, training package, orientation package, communication and advocacy materials. Eighty (8) step point plan and 11 key interventions/activities were determined in the implementation package. Monitoring and assessment tools were developed which includes mentorship and supervision tool, community self-assessment tools, individual child feeding and growth monitoring forms and external assessment tools. Two levels of community support groups were defined in the policy documents and integrated in the established community health strategy system; the community mother support groups (CMSGs) and mother to mother support groups (M2MSGs). Community health volunteer (CHV) were identified as implementers with supervision from the community health extension worker (CHEW). Income generating activities were encouraged as a form of incentives for CHVs.

Results: BFCI has been integrated successfully within the community health strategy structures. Training of over 200 TOTs and roll out of trainings to over 50% of the counties and successful

integration of nutrition sensitive programmes has been achieved. BFCI has led to successful achievement of the following; Improved exclusive breastfeeding rates upto over 80% and 65% at 3 and 6 months respectively, referral and reporting rates from 41% to 80% (MOH reports), 4 ANC attendance upto over 60% and scaling up of ART services to over 90% lower level facilities in a pilot site.

Conclusion: BFCI is can be effectively integrated into already existing community structures to improve feeding practices. A structured way of enhancing capacity of communities to providing services to improve infant feeding is key for success.

Keywords: Baby-Friendly-Community-Initiative, community-mother support groups.

144/1771

FOOD FORTIFICATION GLOBAL MAPPING STUDY: HIGHLIGHTING DONOR ENGAGEMENT AND ADVANCING UNDERSTANDING OF CHALLENGES AND OPPORTUNITIES TO REDUCE MICRONUTRIENT DEFICIENCIES

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Background and objectives: Food fortification is a component of interventions aimed at tackling "hidden hunger" and an area in which the European Commission is increasing its support to building, improving, and sustaining programmes in low- and middle-income countries, in alignment with the priorities of the Commission's Action Plan on Nutrition. A Global Mapping of food fortification was conducted by the Food Fortification Advisory Services to advance understanding on food fortification and biofortification, including key strategic and operational challenges, coverage and consumption trends, and impact on reducing micronutrient deficiencies. The mapping leverages the recommendations from the Global Summit on Food Fortification, held in September 2015 in Arusha, Tanzania.

Methods: The Global Mapping was conducted via a desk review of documentation from peer reviewed and grey literature sources in combination with a survey sent to a limited number of key stakeholders working in fortification. An analysis of the overall global status, results, and key learnings accompanies cues for future programming.

Results: Six key findings are articulated in the Mapping: 1) Fortification can make a significant contribution to improving public health outcomes if properly implemented; 2) A comparative advantage of fortification is it's delivery through national food systems; 3) Fortification can significantly improve the micronutrient content of existing diets of populations; 4) Sustainable and transparent public-private partnerships in nutrition form the basis for fortification programmes; 5) Inappropriate programme planning and poor compliance with standards are major challenges in achieving expected impact of fortification in some settings; and 6) Monitoring and surveillance of national fortification programmes are often inadequate and should be strengthened at national and global levels.

Conclusions: The Global Mapping report is a resource for enhancing mobilisation and political commitment for nutrition, scaling-up actions at country level, and contributing to the generation of knowledge and evidence on nutrition and food fortification. It represents an example of donor engagement in the scientific, programmatic, and policy spaces of nutrition. It has the potential to contribute towards food and nutrition program coordination by the Commission, partner countries and international donor and implementing agencies. This will help ensure fortification programmes achieve public health objectives and support relevant sustainable development goals.

Keywords: Food Fortification
Biofortification
Food Systems
Multi-Stakeholder Partnerships
Monitoring

144/1783

SARCOPENIA, FRAILTY AND NUTRITIONAL STATUS IN VERY OLD WOMEN LIVING IN A NURSING HOME

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Background and objectives: Sarcopenia is a geriatric syndrome characterized by loss of mass, strength and skeletal muscle function. When sarcopenia is associated with frailty and malnutrition; it contributes to dependence, physical disability, morbidity and mortality.

OBJECTIVE: To estimate the prevalence of sarcopenia, frailty and malnutrition in elderly women (aged 65 year and over) living in a nursing home in Mexico City.

Methods: A cross-sectional study. To identify sarcopenia, the criteria of Consensus of the European Working Group on Sarcopenia in Older People (EWGSOP) was applied. The gait speed was measured in meters/second (≤ 0.8 m/s = low value) the handgrip strength was measured using a dynamometer (< 20 kg = low value).

To estimate muscle mass, two methods were used: 1. Calf circumference (CP) (<31 cm, low value) and 2. bioelectrical impedance analysis (BIA) (applying Janssen's formula). Fried L. criteria were used to detect frailty. To evaluate nutritional status, the Mini-Nutritional Assessment tool (MNA) was applied.

Results: A total of 114 elderly women, with an average age of 85 years, were studied. The prevalence of sarcopenia using BIA was 61.1% and using CP 30.7%. 50.9% of the old women had pre-frailty and 45.6% frailty. Undernutrition was detected in 3.5% and risk of malnutrition in 29.8%. Sarcopenia identified by BIA, it was associated with frailty and we observed that 46.0% of the elderly women were pre-frailty and 27.8% frailty. When sarcopenia it was identified by CP, we observed 32.1% with frailty and 62.9% with pre-frailty. The percentage of frailty was lower in those without sarcopenia (16.35%). While sarcopenia diagnosed across BIA, it was associated with nutritional status: 30.1% of the sarcopenic women presented risk of malnutrition, and 4.7% undernutrition. Using CP: 11.4% presented risk of undernutrition and 45.7% malnutrition

Conclusions: The prevalence of sarcopenia in very old women differs according to the method used to estimate skeletal muscle mass. The prevalence of malnutrition increases when there is fragility. The very old women living in a home car, requires intervention programs for prevent and receive an opportune therapeutic management for sarcopenia, fragility and malnutrition.

Keywords: Sarcopenia, Frailty, Malnutrition, Elderly

Further collaborators: D´Hyver C. Medical Doctor. Professor. National Autonomous University. Mexico

formations, genetic syndromes, studied intrauterine infections or cerebral palsy were excluded.

Instruments: Growth chart and outcomes on the rings subtest (RSubt) of the ENFEN. This subtest assesses executive functions, especially those related to planning and problem solving.

Statistical analysis: RSubt performance scores were divided in 2 categories: 1-4 and 5-10. Low RSubt score was defined as a score less than 4. Normal RSubt score was defined as a score >=5. Categorical data was analyzed using Chi2 or Fisher test. Significance level was set at $p<0.05$.

Results: 92 born preterm children (10-12 y/o) were studied. 31.52 % were SGA (n=29) and 68.47 % AGA (n=63). There were 68.96% of girls in SGA group and 52.38% in the AGA group. Mean+/-SD of BW and GA by group are shown in table 1. Table 2 shows the Chi2 results of the RSubt scores (<4 and >=5) for each group (SGA and AGA) and for each growth z score group at 1 and 2 years of life. There were no statistically significant differences between AGA children. However, the Chi2 test resulted significant for those in the SGA group ($p<0.05$).

Conclusions: Preterm SGA children are at special risk for cognitive impairment. We found that SGA in preterm (<1500g) children was associated with growth restriction at 1 and 2 years of life and lower scores in the RSubt of the ENFEN ($p<0.05$).

Keywords: Growth Trajectory - Very Low Birth Weight Infants-Executive Functions

Further collaborators Gisela Gerometta, Mónica Brundi, Victoria de la fuente

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ASSESSING THE IMPACT OF GROWTH TRAJECTORY OF VERY LOW BIRTH WEIGHT INFANTS ON EXECUTIVE FUNCTIONS AT 11 YEARS OF AGE

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Background and objectives: Several studies on preterm-born children have identified birth weight (BW) as a potent predictor of later cognitive functioning and academic success, with poorer outcomes in those born SGA (small for gestational age) compared with those born appropriate for GA (AGA).

The objective of the study was to compare SGA and AGA born preterm (<=1500g) children between 10-12 years old (y/o) on growth at 1 and 2 years of life and on the outcomes of the rings subtest (RSubt) of the ENFEN (Evaluación Neuropsicológica de las Funciones Ejecutivas en Niños.

Methods: 92 born preterm (<1500g) children between 10-12 y/o (53 girls, 39 boys) were studied. Children with congenital mal-

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MATERNAL VITAMIN D SUPPLEMENTATION DURING PREGNANCY AND LACTATION TO PROMOTE INFANT GROWTH IN DHAKA, BANGLADESH (MDIG TRIAL): A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Infant linear growth faltering is a significant public health problem in South Asia. Low length-for-age z-scores (LAZ) are associated with adverse physical and neurocognitive outcomes in childhood. Linear growth faltering often begins early in infancy, suggesting that prenatal factors have a significant impact on postnatal growth. Vitamin D regulates bone mineral homoeostasis and growth plate activity and is, therefore, a key candidate nutrient involved in fetal and infant linear growth.

Methods: In a randomized controlled dose-ranging maternal vitamin D supplementation trial in Dhaka, Bangladesh, 1300 women were enrolled in mid-pregnancy (17-24 weeks gestation) and allocated into on of five treatment arms, receiving 1) placebo, 2) 4,200 IU/week, 3) 16,800 IU/week, or 4) 28,000 IU/week vitamin D in the prenatal period and placebo in the postpartum period, or, 5) 28,000 IU/week vitamin D in the prenatal and 28,000 IU/week vitamin D in the postpartum period. Infants underwent weekly morbidity evaluation until 6 months of age and anthropometric and clinical evaluation at 3-month intervals until 1 year of age. Laboratory analyses were performed at enrollment, 30-weeks gestation, delivery, and 3 and 6 months of age. The primary outcome was mean lenght-for-age Z score (LAZ) at 1 year of age. Secondary outcomes included pregnancy/birth outcomes and infant morbidity.

Results: Of 1300 women enrolled, 64% were vitamin D deficient (25-hydroxyvitamin D<30 nmol/L) at baseline. There were 20 stillbirths, 29 infant deaths, and 86 other losses to follow-up, such that 1165 (90%) infants completed anthropometric follow-up at 1 year of age. The effects of maternal vitamin D supplementation during pregnancy and lactation on infant LAZ, other anthropometric indices, and various clinical outcomes will be presented.

Conclusions: The impact of the current findings on maternal vitamin D supplementation on infant length and maternal and infant health outcomes in Bangladesh will be discussed. The significance of the findings for current maternal vitamin D supplementation guidelines will be discussed.

Keywords: vitamin D, pregnancy, nutrition, infant health, bone growth

Further collaborators

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144/1811

FREQUENCY OF VITAMIN D DEFICIENCY IN OUR OBESE PATIENTS

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Background and objectives: The objective of the present study is to determine the frequency of vitamin D deficiency in obese patients

Methods: Methodology: A cross-sectional observational, descriptive study with an analytical component, performed in 40 patients of the Integral Management Unit of the Obese Patient of the Hospital de Clínicas from June 2015 to May 2016. Variables: socio-demographic, clinical data, 25- Hydroxy-Vitamin D and relation between them. The data collected were loaded in Microsoft Excel ® version 2007 and analyzed using Epiinfo 7 version February 2011

Results: The mean age was 40 ± 11 years (19-59), mostly women (88%), who work Office (30%), residents of the Central area (68%). The medical diagnosis was predominantly Hypertension (62%) and Type 2 Diabetes (29%), with predominance of obese type II and III with 40% and 38%, respectively. 40% have vitamin D deficiency (≤20ng / ml) and 40% deficiency (21-29 ng / ml) and 20% adequate. The environment, 9 miles, being higher in women. The most frequent risk factor was 55% of the non-exposed subjects with the lowest vitamin D value (μ18 ± 9). Of those with deficiency, 50% had grade II obesity and in those with good results, 75% were grade III.

Conclusions: Almost half of the obese studied had vitamin D deficiency, more affecting those with type II obesity

Keywords: obesity, vitamin D, vitamin D deficiency, Paraguay.

Further collaborators: Dr. Rafael Figueredo

144/1840

WHO GUIDELINES ON FEEDING COMPLEMENTARY FOODS TO 6-24 MONTH OLD CHILDREN: DEMOGRAPHIC & HEALTH SURVEY (DHS) DATA FROM CAMEROON, EGYPT, INDONESIA AND THE PHILIPPINES

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Background and objectives: The World Health Organization (WHO) recommends complementary foods with sufficient diversity to meet nutritional needs that are measured by four solid food feeding indicators (FI). Earlier studies have reported associations between meeting the FI and economic status or maternal education. Our purpose was to determine if meeting the WHO FI was associated with country economic status measured by Gross Domestic Product (GDP).

Methods: We assessed complementary feeding practices of children 6-24 months of age and their family socio-demographics and lifestyle factors using comparable Demographic and Health Survey (DHS) data and the WHO FI, among four countries of dissimilar economic status: Egypt, Indonesia, Philippines, and Cameroon (World Bank: GDP= 6,600; 5,200; 4,700; 2,400 USD/capita, respectively).

Results: The percent of children meeting the WHO guidelines did not parallel GDP. Cameroon had significantly fewer children meeting all four of the solid food FI (p<0.01) than the other countries, yet children in Cameroon were significantly more likely to be fed with meat, vitamin A rich foods, and fruits than children in Egypt (p<0.01). While Philippines had a lower GDP than Egypt and Indonesia, it had a higher percentage of children meeting all four FI's (p<0.01) and mothers completing secondary school or higher education. In terms of food groups overall, more than 80% of the children in all 4 countries received grain-based foods with between 45% and 70% of children having been fed with fruit. Higher maternal education was a significant predictor of meeting the FI specifically for food diversity in Egypt, Indonesia and Cameroon, while working outside the home was a significant predictor of meeting this FI only for women in the Philippines and Indonesia (p<0.01). Overall, a higher family asset index was associated with meeting the FI for food diversity alone among all countries (p<0.01).

Conclusions: Among these four countries, maternal educational achievement appears to be a better predictor of general complementary feeding practices than country GDP.

Keywords: complementary feeding, WHO guidelines, DHS

144/1847

ENERGETIC CONTRIBUTION OF ULTRA-PROCESSED PRODUCTS TO THE FOOD LISTFROM DE DIET OF ADULTS IN NORTHEAST OF BRAZIL

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Background and objectives: The ultra-processed products are formulations of industrial sources of dietary energy and nutrients, likefree sugars and salt, saturated fat or trans fats, plus additives including those designed to intensify sensory impact. They typically contain little or even no intact food. Recent studies have shown significant associations between the food consumption of ultra-processed food products with non-communicable diseases (NCDs), in all ages.

The aim of this study was to verify the energetic contribution of ultra-processed food products on a food list in adults, in Northeast of Brazil.

Methods: The food list was obtained by food records using data from a nationwide survey, the Pesquisa de Orçamentos Familiares 2008-2009 (POF), in a population sample of Northeast of Brazil in age between 20 and 59 years. Data on pregnant and lactating women have not been included. To construct the list was opted for the methodology of relative percentage of contribution of each food item from Block et al. The foods classifications based on the extent and purpose of their processing, was used the NOVA system of food classification.

Results: The list was constituted by 97 foods that contributed up to 90% of the energy consumption. Ultra-processed (n=30) food products contributed together with 11,4% of the energy from the list of food consumed. The food that most contributed to energy was margarine (n = 15;% = 1,23), followed by the crackers (n = 19;% = 1,03%). Were part of the contributions, foods like cookies and stuffed, soft drinks and fast foods.

Conclusions: The ultra-processed food products have an important contribution in the energetic consumption of adults in the northeast of Brazil. This results demonstrated the need for public policies aimed at the promotion of healthy eating. For these public policies aimed at the promotion of healthy eatingbe successful, it is important to recognise the conflict of interests between the ultra-processed products food market and public health. To tackle the NCDsit is necessary that there should be a strengthening of the regulatory capacity of the State in the production and marketing of food.

Keywords: food list; food processing; noncommunicable diseases;nutrition; feeding behaviour.

144/1853

BIOLOGICAL AND SOCIAL DETERMINANTS OF OVERWEIGHT IN CHILDREN AT ENTERING PRIMARY SCHOOL. RESULTS OF MINISALTEN STUDY

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Background and objectives: Overweight (OW) at early ages is a vulnerable condition due to the effect of tracking adiposity during infancy and adolescence. The goal of this study was to identify the main determinants in a sample of first grade children attending at public schools in Buenos Aires.

Methods: This analysis includes the baseline assessment of the MiniSALTEN Study (obesity prevention program developed in 12 Public Schools in Bs As, Argentina). Data was collected from June to November 2015. All first grade children and their mothers were invited to participate. Data of intake was collected face to face with a 24 h recall for both mother and child, for the last one, the information was completed by the research team, at school. Weight and Height was measured and BMI calculated. Socio demographic information, including socioeconomic level (SEL) was collected. Time of sleep (in hours) was collected during one week. Intake data was analyzed with a software (NDS-R, Nutrition Data System). All analyses were performed with SPSS for Windows. Multivariate logistic regression model was used to find the most predictive variables associated with overweight and obesity. The final models are reported using odds ratios (ORs) and their 95% confidence intervals (CI) and p-value.

Results: Final sample was composed by 205 dyads. Children's mean age was 6.68 y. The prevalence of overweight was 26,3 % and obesity 22 %. Significant factors associated with overweight and obesity were Mother's BMI (OR: 1.09, CI 1.03-1.153, p-value: 0.003) and low SEL (OR: 2.279, CI: 1.224-4.242, p-value: 0.009). Were also analyzed energy (OR:1.00, CI: 1.00-1.001, p-value: 0.160), added sugars (OR: 0.983, CI: 0.95-1.018, p-value: 0.345), average daily time of sleep (OR: 1.071, CI: 0.7-1.639, p-value: 0.752), birth weight (OR: 1.183, CI: 0.712-1.965, p-value: 0.517) and exclusive breastfeeding up to 6 months (OR: 1.319, CI:0.730-2.385, p-value:0.359). Non of them shawed association with children's BMI.

Conclusions: Argentina is a developing country with one of the highest prevalences of children's overweight in Latin America. Both mother's adiposity and poverty (main determinants) are environmental preventable conditions to tackle obesity at early ages.

Keywords: Childhood obesity, Diet, Risk factors, Multivariate analysis.

Conflict of Interest Disclosure: The source of funding for the research is the Coca-Cola Foundation. The authors declare that they have no competing interests. The funding source had no role in study design, data collection and analysis, decision to publish, or preparation of manuscripts.

Further collaborators: On behalf of the MiniSALTEN Study Group

144/1857

PRENATAL NUTRITIONAL CARE IMPROVED PERINATAL OUTCOME OF PREGNANT WOMEN IN THE CONTEXT OF PRIMARY HEALTH CARE IN MANGUINHOS, RIO DE JANEIRO, BRAZIL

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Background and objectives: Maternal morbidity is strongly associated with neonatal mortality. Adequate prenatal care, with early detection and intervention during risk situations, as well as good quality care during labour, are key health indicators related to mother and child, with the potential to further reduce the effects of the main causes of maternal and neonatal mortality. The aim of the study was to assess the impact of a prenatal nutritional care programme on perinatal outcome in the context of primary health care.

Methods: That's a non-randomized controlled clinical trial developed in a unit care in Rio de Janeiro, Brazil. 284 pregnant women were allocated into one of two groups: an intervention group (IG; n = 122), comprising pregnant women who received the intervention of nutritional care through collective consultations with a nutritionist, and a control group (CG, n = 162) consisting of pregnant women who did not receive the intervention.

Results: There was a higher proportion of pregnancy complications (p=0.000) and abnormal total gestational weight gain (p=0.031) in the CG. In the final model, it was found that belonging to the CG (adjusted OR=4.721; CI 95%=1.009-22.090) and living with four or more people in the household (adjusted OR=2.692; CI 95%=1.021-7.101) were predictors of pregnancy complications, while belonging to the CG (adjusted OR=2.354; CI 95%=1.063-5.213) and starting prenatal care after 16 weeks (adjusted OR =8.509; CI 95%=1.023-70.784) were determinants of abnormal pregnancy weight gain.

Conclusions: These findings reinforce that the prenatal nutritional care programme contributed to improving the health of pregnant women.

Keywords: Pregnancy. Nutrition programmes. Prenatal nutrition.

144/1859

EXPERIENCING A PROPOSAL OF NUTRITIONAL ANTENATAL CARE AMONG PREGNANT WOMEN ATTENDED IN A FAMILY CLINIC IN RIO DE JANEIRO, BRAZIL

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Background and objectives: Scientific evidence suggests the effectiveness of prenatal and nutritional care on the improvement of perinatal outcomes. The research aimed at analyzing the meanings attributed by mothers to prenatal nutritional care developed in a family clinic in the city of Rio de Janeiro, using Depth Hermeneutics as the methodological framework.

Methods: Pregnant women received nutritional care offered in three collective appointments during the prenatal, characterized as "conversation circles" (CC), structured as follows: evaluation of medical records; nutritional assessment; development of educational activities related to health and nutrition; delivery of educational material. Nutritional assessment and medical records provided subsidies for the development of nutritional care developed at CC, in which we applied the nutritional and dietary counselling techniques, taking into account what the woman thinks, how she lives, her daily life, her social representations of "being pregnant" and her eating habits. Participant observations and 15 semi-structured interviews were performed with mothers who participated in the conversation circles (CC).

Results: It is possible that pregnant women have realized the CC as a form of emotional support for their concerns, when they could display their behaviours, as well as get information and guidance concerning their new status as pregnant. CC were considered as an opportunity for sharing experiences among pregnant women and professionals, and a significant involvement of both parties in the care production process was observed. It was also recognized as a welcoming environment for enabling dialogue, allowing free expression of doubts, feelings, and expectations, strengthening the bond between the team and the pregnant woman and among pregnant women.

Conclusions: The CC represented an important strategy for promoting health in the period of pregnancy, being an environment of humanization, citizenship and social inclusion.

Keywords: Pregnancy. Prenatal nutrition. Primary health care. Food and nutrition education. Qualitative research.

144/1865

SOCIAL DISPARITIES AND THE NUTRITIONAL STATUS OF CHILDREN UNDER FIVE AND CHILD BEARING WOMEN IN PERU

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Background and objectives: Social disparities are the root of inequalities in health for both communicable and chronic diseases. Understanding the social determinants of nutritional status in Peru can contribute to promote broader and structural interventions. This work examines associations between socioeconomic status (SES), education and ethnicity with overweight (OW), stunting and anemia in children under 5 y and women of 20-49 y.

Methods: We analyzed the Peruvian 2015 National Demographic and Family Health Survey. We used multivariate log-binomial regression model to obtained the prevalence ratio (PR) and assess the independent associations between (SES), education and ethnicity with stunting in children and with overweight and obesity combined (OW) and anemia in both children and women. Low levels of SES, education and non-indigenous were used as reference of prevalence comparison. We used a confidence level of 95%.

Results: The prevalence of OW, stunting and anemia in children was 9.1% (8.5-9.8), 14.1% (13.4-14.9) and 32% (31.0- 33.0), respectively. Independently and compared with their respective reference, it was found that the prevalence of stunting and anemia was higher in indigenous children [PR=1.35 (1.21-1.50)]; [PR=1.29 (1.2-1.4)], and lower in children with high SES [PR=0.25 (0.21-0.31)]; [RP=0.64 (0.58-0.70)]. Children with high mother education had less prevalence of stunting [PR=0.4 (0.3-0.5)]. For OW only SES was independently associated, its prevalence was higher in high SES children [PR=3.1 (2.5-3.9)]. In women the prevalence of OW and anemia was 65.2% (64.3-66.2) and 21.7 (20.8-22.6) respectively. The prevalence of OW was higher in high SES women [PR=1.27 (1.2-1.3)] and less in indigenous and high educated women [PR=0.64 (0.6-0.7)]; [PR=0.84 (0.8-0.9)]. For anemia, only being indigenous was independently associated; indigenous had more prevalence than non-indigenous [PR=1.18 (1.0-1.3)].

Conclusions: Social disparities were associated to the nutritional status of children and women. In general, undernutrition is negatively associated to SES, education and being indigenous, whereas OW is positively associated to SES.

Keywords: Social disparities, children and women nutritional status.

144/1868

PRE-INTERVENTION CHARACTERIZATION OF NUTRITIONAL STATUS TO ESTIMATE BURDEN AND POTENTIAL TO BENEFIT AMONG MOTHERS AND THEIR CHILDREN LIVING IN URBAN SLUMS OF MUMBAI, INDIA

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Background and objectives: The efficacy of biofortification, which is a promising strategy to tackle widespread micronutrient malnutrition, has not been demonstrated in the first 1,000 days. We are conducting the first randomized efficacy trial of biofortified iron- and zinc-enriched pearl millet in children under two years of age residing in urban slums of Mumbai, India. The objective of this analysis was to examine the pre-intervention nutritional status (including micronutrient biomarkers, anthropometric measures, and body composition) of mothers and their children in the community to inform the potential to benefit and the design and implementation of this randomized intervention trial.

Methods: Children (6-24 months) were recruited from urban slums in Mumbai, India after obtaining informed parental consent. Anthropometric measurements were assessed in children and a subset of mothers, including length/height, weight, body circumferences, and skinfold thicknesses using standardized methods and calibrated instruments. Z-scores for length-for-age (LAZ), weight-for-length (WLZ), and weight-for-age (WAZ) were calculated using the World Health Organization Child Growth Standards. Percent fat mass was calculated using the Slaughter equation. Hemoglobin (Hb), serum ferritin, serum zinc, and C-reactive protein (CRP) concentrations were evaluated in children at baseline.

Results: The median age of children was 12.1 (10.0-13.2) months and 48% of participants were female. A total of 29% of children were stunted (LAZ<-2); the prevalence of stunting and underweight (WAZ <-2) was higher in boys compared to girls [36% vs. 21% (p<0.05), and 34% vs. 17% (p<0.05), respectively]. Median fat mass was 15.9% (13.7-18.7). In analyses among mothers, 26% were underweight, 54% were of normal weight, and 20% were overweight or obese, based on standard BMI cutoffs. 51% of mothers were less than 150 centimeters tall. A total of 75% of children were anemic (Hb <110 g/L). Approximately 74% of children were iron deficient (serum ferritin <15 μg/L), and 54% were zinc deficient (serum zinc <70.0 μg/dL).

Conclusions: Findings demonstrate a high burden of malnutrition, particularly iron and zinc deficiency, in children in the urban slums of Mumbai and indicate the suitability of this population as the target for the biofortified crops-based intervention (ClinicalTrials.gov ID: NCT02233764).

Keywords: Stunting, iron, biofortification, children, India

Conflict of Interest Disclosure: Saurabh Mehta is an unpaid board member for a diagnostic start-up company focused on developing point-of-care assays for nutritional status, informed by his research as a faculty member at Cornell University. All other authors report no conflict of interest.

144/1878

KNOWLEDGE OF HYDRATION PRACTICES OF AMATEUR RUNNERS FROM THE CITY OF SÃO PAULO

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Background and objectives: Street racing is a sport of easy execution that has great health benefits. Thermoregulation is a physiological process in modalities that require physical effort as in street races. This process can affect the hydration of the runner, as increased body temperature will result in excessive production of sweat assisting in dehydration.

Methods: A total of 18 male (n = 4) and female (n = 14) between the ages of 31 to 53 years old belonging to a race office in the city of São Paulo were evaluated. The methodology used was of the exploratory type, through a descriptive research using a questionnaire composed of 12 objective self-management questions. The study was approved by ethics committee number 97/06.

Results: The results indicated that individuals didn't adequately perform hydration procedures, since the most consumed solution was water and they practice more than 90 minutes of physical exercise. It was also found that there is a greater concern of the runners in hydrating only during and after training and competitions, neglecting hydration before exercise. The main symptoms associated with dehydration were: pallor, sensation of loss of strength and headache.

Conclusions: It is concluded that individuals have prior knowledge about the importance of hydration. However, they didn't perform correctly, requiring more specific guidelines to reduce the effects of dehydration on the performance and health of runners.

Keywords: Hydration; Runners; dehydration; Performance.

144/1880

PROMOTING NUTRITION AND HYGIENE FOR ORPHANS AND VULNERABLE CHILDREN IN THROUGHOUT CHILDHOOD IN NIGERIA

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Background and objectives: Out of Nigeria's 69 million children, an estimated 17.5 million are considered orphans and vulnerable children (OVCs), of which 7.3 million are orphaned by HIV/AIDS. Communities often face challenges when trying to feed and care for these children and meet particular needs due to their OVC status. In 2015, The USAID-funded Strengthening Partnerships, Results: **Methods:** SPRING conducted a landscape analysis to identify priority nutrition practices, existing nutrition materials and curricula, and other interventions across Nigeria for the early childhood (2-5), middle childhood (6-11), and adolescent (13-17) age groups. Data were collected via a combination of desk review and surveys conducted with 63 civil society organizations (CSOs) working with OVCs. SPRING used the findings to design a training package with key nutrition information for use by CSOs associated with Kids' Clubs and early child development (ECD) centers. SPRING concept tested selected activities from the package in four communities in the Federal Capital Territory with teachers and children from each age group.

Results: The resulting training package builds the nutrition capacity of CSO staff and volunteers working with OVCs. It includes four modules that use highly engaging and participatory activities for all three age groups and colorful graphic training aids to highlight nutrition concepts. In September 2016, SPRING conducted a training of trainers (implementing partners and donors) to build a pool of 26 master trainers. Each of the five OVC partners is now able to cascade the trainings across CSOs and communities in which they work; one partner has already adopted this package for use in northern Nigeria.

Conclusions: This package incorporates developmentally appropriate lessons about food and nutrition using language, concepts, and instruction techniques tailored to each age group. In addition to OVC partners in Nigeria who are cascading this curriculum for their communities, Ministry of Education representatives were specifically included in the TOT to facilitate the incorporation of activities from this package into their existing curricula.

Keywords: ECD, OVC, training, curriculum, education

144/1885

BACK TO BASICS FOR BETTER BREASTFEEDING: FINDINGS FROM THREE REGIONS OF THE WORLD

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Background and objectives: Given its benefits, exclusive breastfeeding (EBF) remains low in many countries. Studies in three in countries in Africa, Asia, and the Middle East were conducted to determine coverage of EBF in the first 6 months and the reasons for non-EBF.

Methods: In-depth interviews (IDIs) about breastfeeding were conducted with mothers of children<2 years in Lao People's Democratic Republic (PDR) in 2001 (67 mothers), Malawi in 2009 (100 mothers), and in Yemen in 2013-14 (32 mothers). Breastfeeding practices also were observed in homes. IDIs with key informants (KIs) (fathers, grandmothers, health workers) also identified barriers to EBF.

Results: In Yemen, only one child<2 years had been exclusively breastfed. In Malawi, nearly half of babies<6 months were exclusively breastfed while in Lao PDR, one-third of babies had been exclusively breastfed until 4-6 months. EBF varied by region and ethnic group only in Lao PDR.

The major reasons for non-EBF, reported by mothers and KIs, was that breastmilk was insufficient or mothers had to return to work. While there was knowledge about the benefits of EBF in all countries, there was less knowledge about (and fewer observations of) optimal breastfeeding practices. The perception about breastmilk insufficiency, triggered by babies crying after breastfeeding or too much, led to the introduction of breastmilk substitutes and/or food. Inadequate practices co-existed with perceptions of insufficiency and included late initiation of breastfeeding; giving pre-lacteal feeds; withholding colostrum; incorrect positioning; breastfeeding for short durations or infrequently; breastfeeding from only one breast per feed; mothers returning to work; and lack of knowledge about how to increase breastmilk production. A few mothers and key informants said the cause of insufficiency was that mothers' diets were inadequate.

Conclusions: To successfully breastfeed in the first six months, nutrition programs need to get back to basics and give mothers adequate information about and support and time to breastfeed. Detailed information is needed by mothers and their families about all the practices required to ensure optimal breastfeeding. Agricultural and income-generating programs need to be nutrition-sensitive by giving mothers the time and support to breastfeed.

Keywords: breastfeeding, breastmilk, practices, barriers, education

144/1895

IDENTIFICATION OF FACTORS ASSOCIATED WITH NUTRITIONAL RISK AND MALNUTRITION FOR USE IN COMPREHENSIVE GERIATRIC ASSESSMENT – CGA BY CORRESPONDENCE ANALYSIS

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Background and objectives: Background: Comprehensive Geriatric Assessment (CGA) is a tool used to early identify health problems (medical, psychosocial, and functional limitations) of a frail older person. Nutritional screening is an important component of the CGA that can provides an indication of a patient's nutritional risk. Objective: The study aimed to identify the factors associated with nutritional risk and malnutrition, using the Comprehensive Geriatric Assessment.

Methods: This is a cross-sectional study with systematic random sample. A total of 233 older adults patients (aged 60 years or older) attending the Rehabilitation Screening of the Center for the Elderly Reference in the north area of São Paulo (CRI-Norte) (Centro de Referência do Idoso da Zona Norte). Initially, Chi-square and Fisher's exact tests were performed to identify variables associated with nutritional risk and malnutrition, treated as a single variable. For these analysis, it was adopted a level of significance of 5%. Multiple Correspondence Analysis (MCA) were used to identify the association between nutritional risk and malnutrition and the co-variables of the study: weight loss, altered appetite, decrease intake, physical difficulty to buy food, self-health assessment and nutritional self-assessment. MCA is a technique used to analyze the pattern of relationships of several categorical dependent variables, aiming to reduce large sets of variables into smaller sets of components that summarize the information contained in the data.

Results: Based on the Multiple Correspondence Analysis, nutritional risk and malnutrition were correlated with unintentional weight loss, decrease appetite, decrease food intake, receiving physical help for to buy food, poor and regular self-health assessment, and nutritional self-assessment low-weight.

Conclusion: Through the joint relationship between nutritional risk and malnutrition and the identified variables, it is suggested the development and validation of a nutritional screening tool for the early identification of risks. This instrument will be important for the optimization of the time and appropriate referral of the elderly to the nutritional attention essential for the recovery and maintenance of the health and quality of life of this population.

Keywords: nutritional risks, aging, malnutrition, nutrition-assessment.

144/1897

EPIDEMIOLOGY OF ANEMIA IN CHILDREN, ADOLESCENT GIRLS AND WOMEN OF REPRODUCTIVE AGE IN BHUTAN

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Background and objectives: In Bhutan, anemia has declined but remains a public health concern. Globally, causes include iron or other micronutrient deficiencies, helminths or genetic disorders. We estimated prevalence and identify risk factors of anemia in children, adolescent girls and women in Bhutan.

Methods: In a 2015 national survey, hemoglobin was measured in 1,083 children 6-59 months, 1,103 adolescent girls 10-19 years, 118 gravida and 3,234 non-pregnant women 15-49 years. We calculated anemia prevalence adjusted for altitude and survey design using life-stage-specific cutoffs. Predictors of hemoglobin and anemia were evaluated in unadjusted and survey-adjusted multivariable regression models.

Results: Anemia affected 42%, 32%, 36% and 28% in children, adolescents, non-pregnant and pregnant women, respectively. Children 24-59 mo were at lower risk [OR (95% CI): 0.4 (0.3-0.7)] than 6-11 mo olds, as were girls [0.7 (0.5-0.9)] versus boys. Stunted and overweight children were at higher risk [1.5 (1.1-2.1) and 3.7 (1.4-9.5), respectively] than normal height/weight children. Child feeding practices were not associated with anemia. Adolescent and adult women's risk was lower in the East [0.7 (0.5-1.0) and 0.7 (0.5-0.8)] than West region. Older adolescents (15-19 yrs) were at higher risk than 10-14 yr olds [1.5 (1.1-2.2)]. A protective odds was observed for adolescents in households consuming animal foods 1-6 versus zero, but also, paradoxically, ≥7 times per week. Among non-pregnant women, risk was higher at 30-39 and 40-49 years [1.2 (1.0-1.6) and 1.4 (1.0-1.8), respectively], versus 20-29 yrs. Primary versus no schooling was protective [0.7 (0.6-0.9)], as was being married [0.4 (0.3-0.6)] versus unmarried and having a child <5 yr [0.8 (0.6-1.0)] versus not. Beginning antenatal care (ANC) in the first trimester may have put pregnant women at lower risk [0.4 (0.1-1.1)]. In survey design-adjusted regressions, point estimates were unchanged but most CIs contained 1.

Conclusions: Age, region, socioeconomic status and possibly diet pose diverse risk associations with anemia in Bhutanese children and women. National ANC coverage including IFA supplementation may have reduced anemia among pregnant wom-

en; scaling supplementation for other demographic groups may reduce anemia further, though other potential causes (e.g., thalassemias) should also be investigated.

Keywords: Anemia, risk factors, Bhutan

144/1901

PERCEPTIONS AND ACCEPTABILITY OF DONATING, DONATED AND BANKING OF HUMAN BREASTMILK, IN AN URBAN COMMUNITY, KENYA

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Background and objectives: Kenya has a high burden of neonatal deaths (22/1,000 live births). Breastfeeding is among the most effective interventions for reducing infant mortality but some babies lack access to breastmilk due to mother's sickness, unavailability, or death. World Health Organization recommends Donor Human Milk (DHM) as the best alternative, for vulnerable infants without access to mother's own milk (MOM). However, Kenya has not implemented the best practice of providing safe DHM from Human Milk Banks (HMB), for children without access to MOM. This study aims to establish the perceptions and acceptability of donating and using DHM and the perceived barriers and facilitators in establishing HMBs.

Methods: The study was conducted in Nairobi.Quantitative interviews were conducted in three health facilities with 980 mothers of children under 3 years. Qualitative interviews included 17 focus group discussions, 29 key informant interviews and 25 in-depth interviews, with mothers, fathers, and other community members, health professionals and policy makers. Descriptive analysis of quantitative data was done in STATA 13 software while qualitative interviews were transcribed verbatim, coded using NVIVO and analyzed thematically.

Results: HMBs and use of DHM were new concepts to over 70% of the mothers. Majority of the participants had a positive attitude towards donating breastmilk to a HMB (80%) and feeding children on DHM (87%). At a personal level, participants were more willing to donate their milk to HMBs (78%) than using DHM on their own children (56%). The main concerns on donating and use of DHM were personal dislike, fear of diseases including HIV, hygiene concerns and cultural beliefs.Testing DHM for contamination, Ster-

ilizing DHM and the processing equipment, enhancing personal hygiene were recommended to ensure DHM safety. Community education and involvement in the establishment of HMBs, multidisciplinary approach and assurance on the safety and quality of the DHM were proposed as important ways of enhancing the acceptability and successful establishment of the HMBs.

Conclusions: The Findings show potential feasibility of establishing HMBs in Kenya, and are useful in HMB's guidelines development and informing future actions towards establishment of HMB in Kenya, as a strategy to promote optimal child health and nutrition.

Further collaborators

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144/1916

NUTRITIONAL STATUS, EATING HABITS AND INDICATORS OF SALUGENIC ENVIRONMENT IN RURAL ADOLESCENTS OF TUCUMÁN

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Background and objectives: Literature indicates that socioeconomic disparities affect health, due to a reduced presence of physical, ecological and psychosocial protective resources.

The objective was to evaluate the relationship between nutritional status, eating habits and salugenic environment indicators in rural Tucuman adolescents.

Methods: Anthropometric Measurements (Weight, Height, BMI) according to WHO criteria.

Structured questionnaire of Food Habits with descriptive rating scale of 5 categories (designed for this study).

Structured questionnaire of salugenic environment indicators (presence of tap water, waste collection and presence of sewers). The environment was considered salugenic when the respondent had at least one of these indicators.

Sample: 167 adolescents students of low and medium socioeconomic level between 11 and 18 years (57% were women), from rural schools of the province of Tucumán. It was stratified into 2 subgroups: Clinical group (over weight) and Control group (regular weight). There is no incidental type probabilistic.

Results: The clinical group presented a greater absence of salugenic environmental indicators than the control group (24% vs. 21%).

Comparing the clinical and control groups with eating habits, the control group represented a higher consumption in the categories of "always and always" protective foods (fruits, vegetables, dairy products and eggs) and hypercaloric (sweets, ice cream, chocolates). The clinical group had a lower consumption of protective foods.

Relating eating habits and indicators of the salugenic environment, it was found that in the categories "never and almost never" the consumption of healthy foods (beef, fish, eggs, fruits, vegetables and dairy products) the percentages were higher in people who did not present Indicators of salugenic environment than in their peers who responded to have at least one indicator (Fish 39% vs. 29%, vegetables 31% vs. 11% and milk 54% vs. 28%).

Regarding the consumption of hypercaloric foods (sweets, ice cream, chocolates and soft drinks), a greater proportion of "always / almost always" responses were observed among adolescents with not salugenic environment indicators in this food group (81% Vs. 45%, 50% vs. 28%, 61% vs. 35%).

Conclusions: Rural adolescents belonging to less salugenic environments reported higher consumption of hypercaloric foods. These data are relevant for the design of interdisplinary intervention strategies focused on food and surrounding ecological contexts.

Keywords: Nutritional status, eating habits indicators of salugenic environment

144/1933

'YOU ARE NEARLY AN ADULT NOW': ENGAGING ADOLESCENTS IN NUTRITION PROGRAMMING IS CRITICAL

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Background and objectives: Addressing the nutritional needs of adolescent girls is a key step towards achieving SDG 2, Target 2.2, ending malnutrition by 2030. This formative study provides a landscape analysis of adolescent programming in four high priority countries (Kenya, Uganda, Cambodia and Guatemala) and presents new empirical data on perceptions and experiences of adolescents regarding nutrition and engagement platforms particularly aimed at reaching the most vulnerable.

Methods: The collaborative study was conducted in three phases. First, a country landscape analysis of adolescent programming categorized the focus, timeframe and location of interventions, target group (age, ethnicity, gender), modes of engagement, and key programme implementer(s). Second, formative qualitative research using participatory creative methodologies elicited perspectives, experiences and suggestions from adolescents and their communities. Third, data was synthesized to provide evidence to improve the design of nutrition-specific and nutrition-sensitive interventions for adolescents across different contexts. Adolescents participated from a range of communities including food insecure pastoralists, rural agriculturalists, settled refugees, remote ethnic minorities, and urban and slum communities.

Results: Final results will be available by June. Initial stakeholder mapping indicated a wide range of government, non-governmental and private sector engagement with adolescents, with different policy and operational environments influencing the focus of interventions and modes of engagement. Preliminary analysis highlighted that the concept of 'adolescence' is varied, that nutrition is one of several key areas of intervention alongside education, sexual reproductive health, gender-based violence and employment opportunities. Thematic synthesis across the four countries will identify points of convergence and divergence in engaging with adolescents in different contexts and operational environments.

Conclusions: Increasing the visibility, priority and engagement of adolescents is critical. Evidence can be operationalized to develop adolescent friendly, context specific interventions and appropriate modes of engagement that can positively influence health- and nutrition-related behavior, and encourage the timely utilization of services by adolescents.

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144/1936

VALUATION OF NUTRITIONAL STATUS BY AN-THROPOMETRIC METHODS AND BIOELECTRIC IMPEDANCE IN SCHOOLSCHILDREN'S AND ADOLESCENTS OF PUBLIC AND PRIVATE SCHOOLS IN THE CENTRAL DEPARTMENT

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Background and objectives: The nutritional status allows to focus groups of risk that present deficiencies and excesses. Child malnutrition is a public health problem in Paraguay. There are few national publications on body composition therefore a descriptive observational research with analytical component was designed to determine the nutritional status and body composition in school-children and adolescents attending Public and Private Educational Institutions of the Central Department.

Methods: A Sampling probabilistic, stratified, random study was conducted on 494 school children and adolescents between 6 to 17 years old attended public and private educational institutions in the Central Department during 2016. Anthropometric indicators were evaluated according to the current WHO growth curves.

Results: 50% of the sample was male. It was found 22.3% of Overweight malnutrition and 13.2 % of overweight and obesity, 88% of normal height. There is a positive correlation between BMI and waist circumference (WC). As for the muscular area of the arm, 21% of the female population is with low protein reserve, 60% with normal protein reserve and 19% with high protein reserve. On the other hand, in the men, 32.4% had low protein reserves, 44.1% had normal protein reserves and 23.5% had high protein reserves. In reference to the women fat area, 90.6% showed a normal energy reserve, while 9% showed a high energy reserve. As for males, 74.5% showed a normal energy reserve and 25.1% high energy reserve.

Conclusions: Overweigh malnutrition is high among school-children in the Central Department. The percentage of fat mass measured by impedanciometry does not exceed the limit that is 25% for men and 30% for women. There is a positive correlation between BMI and WC.

Keywords: nutritional Valuation, body composition, schoolschildren's , adolescents, malnutrition.

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144/1938

DIETARY INTAKE AND BIOCHEMICAL PARAMETERS RELATED TO BONE HEALTH IN WOMEN OVER 65 YEARS OLD IN THE BUENOS AIRES CITY, ARGENTINA

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Background and objectives: Both nutritional status and bone health influence elderly's health and quality of life. The aim of this study was to evaluate: the relationship between the nutritional status of vitamin D (VD) and biochemical markers of bone turnover; the relationship between the intake of Calcium (Ca), protein, VD and vitamin K (VK) and bone formation and resorption markers; the relationship between total osteocalcin (OC) and undercarboxylated osteocalcin (ucOC) to VK intake and bone remodeling parameters.

Methods: 102 healthy women were evaluated, with age: (X±SD) 71±5 years, BMI 28.7±3.8 kg/m2. A validated food frequency questionnaire was used to asses' dietary intake. Serum 25 hydroxyvitamin D (25OHD), crosslaps (sCTX), bone alkaline phosphatase (BAP), calcium (sCas), phosphorus (sP), OC y unOC were determined in blood samples and calcium/creatinine ratio (uCa/uCr) in 24-hour urine samples.

Data were analyzed applying descriptive statistics, Kolmogorov-Smirnov, Mann-Whitney and Pearson or Spearman correlation. Linear regression models were used to analyze the relationship between numerical variables.

Results: Calcium, VK and VD intakes were lower than the recommended doses 79%, 33.7% and 100% of population respectively. Median protein intake was 1.03 g/kg body weight/d, with 100% reporting intakes higher than the recommended. Vitamin D insufficiency affected 32.7% of women and deficiency 55.9%, higher levels of sCTX were observed in those women with lower 25OHD levels. There were significant ($p<0.02$) correlations between 25OHD and sCa, sP, uCa/uCr and Ca intake. OC correlated directly with the bone resorption marker: sCTX ($p<0.0001$), but not with the formation parameters. In contrast, the unOC showed an inverse cor-

relation with BAP, no correlation with sCTX and was related with VK intake (p<0.0001). OC levels were lower in the deficiency and insufficient VD groups and were related to sCTX levels (p<0.0001).

Conclusions: The intake pattern was high in protein, and deficient in calcium, VD and VK. Poor vitamin D status affected 93% of women, with an increase in bone remodeling observed in severe deficiency. The ucOC was related to VK intake, so it could be considered an adequate indicator of its nutritional status, while OC and its relation to sCTX would reflect the increase in bone remodeling.

Keywords: Elderly, bone health, intake, nutritional status

144/1957

A BABY FRIENDLY COMMUNITY INITIATIVE IN KENYA: HARNESSING THE POTENTIAL OF THE COMMUNITY HEALTH STRATEGY IN ENHANCING MATERNAL AND CHILD NUTRITIONAL AND HEALTH STATUS IN RURAL KENYA

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Background and objectives: Background:The Baby Friendly Community Initiative (BFCI) is a multifaceted program for the promotion of optimal breastfeeding and maternal, infant and young child nutrition practices in the community. BFCI extends the care provided at the health facility through the Baby Friendly Hospital Initiative (BFHI) to the community, while providing the mothers and their babies a comprehensive support system to improve breastfeeding practices and other maternal, infant and young child nutrition practices at the community level thereby bridging the gap between health facilities and the community.

Objectives: We present the design and implementation of the BFCI in rural Kenya, while highlighting its contribution to the improvement of maternal and child nutritional and health status. BFCI leverages on the community health strategy, a program established by the government of Kenya in 2007, and one that uses the vast network of community health volunteers to promote health care at the community level.

Methods: The BFCI is implemented within the community health strategy. The community units, which includes the community health volunteers (CHVs) and the community health committees (CHC) are sensitized on appropriate and optimal maternal, infant and young child nutrition practices. The CHVs are empowered and facilitated by knowledge and materials to provide home based counselling to pregnant women and breastfeeding mothers on maternal, infant and young child nutrition practices.

Results: The BFCI program in the rural community in Koibatek sub County, Baringo County engages about 260 CHVs, in 13 community units. From August 2015 to December 2016, CHVs have been actively involved in home visits and counselling of pregnant and breastfeeding women and their families in the community. BFCI also includes introduction of sustainable income generating activities, formation of community mother support groups which includes men and other community members as they influence feeding practices at household level.

Conclusions: Ultimately, we hope that the BFCI will: (i) strengthen the capacity for CHVs and the community members regarding MIYCN at community level; (ii) improve nutrition, health and survival of children substantially; and (iii) inform the design and implementation of ongoing and future interventions while advancing knowledge among the research community locally and internationally.

Keywords: Baby Friendly Community Initiative, breastfeeding

Further collaborators: Koibatek Sub County Health Management Team

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144/1960

RELATIONSHIP BETWEEN CHOLINE METABOLITES AND DEVELOPMENTAL OUTCOMES IN HEALTHY TODDLERS AT 24 MONTHS-OF-AGE

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Background and objectives: Choline is an essential nutrient that plays an important role in growth and development and is the precursor of acetylcholine, phosphatidylcholine, and the methyl donor betaine. There is limited data on choline status of infants and toddlers and the potential relationship to neurodevelopmental outcomes. The objective of this study was to assess choline status in healthy toddlers at 12 and 24 months-of-age and to determine relationships to neurodevelopment.

Methods: Participants were part of a prospective longitudinal double blind controlled study of arachidonic acid (ARA) and docosahexaenoic acid (DHA) supplementation of toddlers between 12 and 24 months-of-age (24 months). Plasma free cho-

line, betaine, and dimethylglycine concentrations were quantified by liquid chromatography tandem mass spectrometry at baseline (13.4±0.9 months-of-age; mean±SD) and 24 months; developmental outcomes were assessed by the Bayley Scales of Infant and Toddler Development 3rd Ed (Bayley-III) Cognitive and Language composites, and Beery-Buktenica Developmental Test of Visual–Motor Integration (5th Edition) (Beery) at 24 months. Relationships between choline metabolites and developmental outcomes at 24 months were determined by separate general linear models adjusted for sex, supplement group, maternal nonverbal intelligence (TONI-3), and baseline concentrations.

Results: At baseline (n=122) plasma free choline, betaine, and dimethylglycine concentrations [median (IQR)] were 9.8 (8.1-12.3), 36.2 (30.8-47.7), and 3.7 (2.9-2.8) μmol/L, respectively. Plasma free choline, betaine, and dimethylglycine concentrations at 24 months (n=103) were 8.1 (6.9-9.5), 37.5 (31.2-45.0), and 2.9 (2.3-3.6) μmol/L, respectively. The DHA/ARA supplement had no effect on plasma choline metabolites at 24 months but plasma free choline and dimethylglycine concentrations were lower (P<0.001) at 24 months compared to baseline. Plasma betaine concentrations were positively associated with Bayley III Language composite scores (B=59.4, P=0.002) at 24 months but no relationships were found with the Bayley III Cognitive or Beery scores. No associations between plasma free choline or dimethylglycine and neurodevelopment tests were observed.

Conclusions: This finding suggests a positive relationship between plasma betaine concentrations and language development in healthy toddlers at 24 months-of-age. Additional work is required to investigate this relationship further and to delineate choline metabolism in toddlers and its role in neurodevelopment.

Keywords: Choline, betaine, development, toddlers, long chain polyunsaturated fatty acids

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144/1961

FACTORS ASSOCIATED WITH PARENT'S UNDERESTIMATION OF CHILD'S WEIGHT STATUS: A STUDY IN BRAZIL

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Background and objectives: Childhood overweight is a recognized public health problem, including in Brazil. Early intervention is critical in the prevention and treatment of overweight and obesity, as dietary patterns and eating habits are often formed in childhood, and persist through adolescence into adulthood. Parents can be seen as 'agents of change' in the recognition and treatment of childhood obesity. However, they usually fail to recognize their child excessive weight. The aim of this study was to examine the prevalence of parental misperception of child weight status, and identify socioeconomic, anthropometric, behavioral and dietary factors associated to underestimation.

Methods: Cross-sectional study. Data was collected in 14 Brazilian private schools. Parents of two-to-eight-year-old children (n=976) completed a self-reported questionnaire about their perception of child weight status, and sociodemographic, anthropometric, behavioral and dietary information. To measure the agreement between parental perception about child weight status and actual child weight status, we estimated the Kappa coefficient, and to investigate associations between parental underestimation and independent variables, we calculated chi-square tests, followed by multiple logistic regression model, considering p≤0.05 for statistical significance.

Results: Overall, 48.05% of the parents incorrectly classified their child's weight; more particularly, 45.08% underestimated their child's weight status. Logistic regression demonstrated that children with higher body mass index (OR=2.03; p<0.001) and boys (OR=1.70; p<0.001) were more likely to have their weight status underestimated by parents. The poor agreement of parent's perception and child's weight status was also confirmed by the Kappa coefficient (0.038).

Conclusions: Clinical practitioners should focus their interventions on these children to assist parents to correctly evaluate their child weight status. The awareness of parents about a weight problem in children is essential towards the prevention and treatment of childhood obesity, and healthy lifestyles.

Keywords: Weight perception; pediatric obesity; parent-child relations; overweight; child.

144/1968

STRENGTHENING OF THE ESSENTIAL NUTRITION ACTIONS (ENA), AT THE PRIMARY LEVEL HEALTH SERVICES ON 30 MUNICIPALITIES OF THE WESTERN HIGHLANDS FROM GUATEMALA

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Background and objectives: Guatemala is ranked as the sixth country worldwide and the first in Latin America with the highest prevalence of stunting in children less than five years old. Data shows a national prevalence of 46.5% in 2014-2015, mostly focused on the population located at the western highlands of the country. In order to contribute to the Government´s efforts to battle this

problem a project based on interventions to address mother-child health and nutrition during the first 1,000-day window of opportunity, which efficacy has been widely recognized, and also based on the Normative Framework of the Ministry of Health (MOH) for the primary level of attention was promoted. This study aims to strengthen the capabilities of the primary level health workers at 30 municipalities of the western highlands from Guatemala, to provide nutrition actions to reduce stunting in Guatemala.

Methods: A project based on the analysis of needs and conditions of the environment was generated, which started with the collaborative work among the international cooperation, INCAP and the MOH on its different levels of organization and implementation, afterwards the curricula of the program supported by the MOH and the methodology of implementation were designed, including the training addressed to trainers. The topics included were: nutrition of the pregnant woman, breastfeeding, complementary feeding and feeding of a sick child, water, hygiene and sanitation, growth monitoring and promotion and effective counseling. The topic of self-esteem was included in order to promote the appreciation of the human resource as an agent of change. A process of monitoring and evaluation was applied.

Results: The model was carried out in two cohorts, which trained 97 trainers, 1,163 health workers. An 18% of increase on knowledge acquired was reached. Educational printed and multimedia materials were created. The collaborative work at all levels, favored the positioning of the topic related to the first 1,000-day window of opportunity at the MOH and the transference of the program.

Conclusions: The feasibility, realignment and interinstitutional coordination were essential for the achievement of results and will be key for sustainability.

Keywords: Forming and training, stunting, 1,000-day window of opportunity, essential nutrition actions.

144/1982

HEIGHT TRAJECTORIES AND WAIST CIRCUMFERENCE IN LATE CHILDHOOD OF MEXICAN CHILDREN

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Background and objectives: The relationship between fast early growth and adiposity has been of particular interest in the literature. While accurately assessing adiposity can be expensive and invasive, waist circumference (WC) adjusted for total body weight is a cost-effective and useful maker of body fat distribution. The aim of this study was to determine the association between height trajectories during the preschool years and WC in late childhood.

Methods: Study participants were a sub-sample that participated in the 8-10 y follow-up of the POSGRAD study, a double-blind, randomized, placebo-controlled trial of prenatal DHA supplementation. Sex-specific height latent class trajectories were derived from 11 measures of height from birth to 5 years of age. MPlus version 7.3 was used in the derivation of trajectories using latent class growth analysis. At ages 8-10, WC (to the nearest 1 mm) was measured at the smallest horizontal circumference between the costal margin and the iliac crests. Multivariable linear regression models were used to determine the relationship between growth trajectory classes and WC in late childhood. Covariates included in the analysis were current body weight (kg), SES (low, medium and high), parity and maternal schooling. Regression analyses were conducted using STATA 14.

Results: We included 281 boys and 255 girls. Two height classes were determined for girls [low (58%), high (42%)] and three for boys [low (17%), medium (51%) and high (32%)]. In boys, relative to the intermediate growth class, the high trajectory class had lower waist circumference in late childhood β = -1.15 cm 95% CI (-2.27 – -0.03) after controlling for covariates, while no significant associations were found the low trajectory class. For girls, the high class had lower waist circumference relative to the low class, β= -1.06 cm, 95%CI (-1.93 - -0.20).

Conclusions: In this study, children who followed the higher growth trajectory through 5 years of age, had lower waist circumference in late childhood. This suggests that children with shorter stature during the first 5 years of life are at a higher risk of becoming overweight or obese.

Keywords: child nutrition, latent class growth analysis, height, waist circumference, BIA, Anthropometry

Further collaborators

144/1992

EFFECTS OF TWO FORMS OF DAILY PREVENTIVE ZINC AND THERAPEUTIC ZINC SUPPLEMENTATION FOR DIARRHEA ON GROWTH AND ACQUISITION OF DEVELOPMENTAL MILESTONES IN RURAL LAOTIAN CHILDREN: A RANDOMIZED TRIAL

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Background and objectives: Evidence is needed on the optimal strategy for delivering zinc to improve growth and other zinc-related functional health outcomes in children. In this double-blind, placebo-controlled, randomized trial, we determined the impact of providing daily preventive zinc tablets (7 mg/d), daily multiple micronutrient powder sachets (containing 10 mg zinc, 6 mg iron and 13 other micronutrients), therapeutic zinc supplements for diarrhea treatment (20 mg/d for 10 days) or daily placebo powder, on growth and acquisition of motor and language developmental milestones in young children in rural Lao PDR.

Methods: 3433 children 6-23 months old at enrollment were randomized to one of four intervention groups and followed weekly for ~9 months. Weight and length were assessed at baseline and endline, 32-40 weeks later. Motor milestones (crawling, sitting without support, standing with assistance, standing alone, walking with assistance, walking alone, running, eating, drinking and waving) and language acquisition were assessed weekly by caregiver report and monthly by observation. We compared final height-for-age, weight-for-age, and weight-for-height z-scores, and stunting, underweight and wasting prevalence, and age of acquisition of developmental milestones among the 4 groups using linear or logistic regression (anthropometric outcomes) and cox proportional hazard models (milestone acquisition), controlling for age and baseline values. Intervention groups are still masked.

Results: Groups were comparable regarding age, anthropometric scores and attained milestones at baseline. Mean age at baseline was 14.2 ± 5.1 mo; and there was a high prevalence of stunting (37.9%), underweight (26.0%) and wasting (7.9%). We observed a marginally significant treatment effect on the prevalence of final stunting (34.8-41.2% across the groups), wasting (3.8-6.6%) and underweight (22.3-24.9%). There were no between-group differences in final anthropometric indices. We observed a significant treatment effect on reported or observed onset of crawling, sitting without support, standing with assistance, standing alone and walking with assistance but not on other milestones.

Conclusions: Endline stunting, wasting and underweight were marginally different and onset of crawling, sitting without support, standing with assistance, standing alone, and walking with assistance differed significantly by treatment group after ~9 months of supplementation. Specific pairwise differences will be identified when codes are revealed.

Keywords: Zinc supplementation strategy, growth, developmental milestones

Conflict of Interest Disclosur: KHB works for the Bill & Melinda Gates Foundation, which provided part of the financial support. The spouse of SYH works for the Bill & Melinda Gates Foundation. KRW and SYH received non-monetary support from Nutriset SAS. None of the other authors have a conflict of interest to declare.

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144/1995

TIMELY COUNSELLING AS A STRATEGY TO IMROVE AGE APPROPRIATE INFANT AND YOUNG CHILD FEEDING (IYCF) PRACTICES AMONG MOTHERS FROM URBAN SLUMS OF VADODARA

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Background and objectives: Good nutrition during first 1000 days of life can give a good head start to a child to achieve his/her physical and cognitive potential. Therefore, the present study aimed at capacity building of health functionaries to improve Infant and Young Child Feeding (IYCF) practices among mothers of urban slums of Vadodara.

Methods: Counselling regarding age appropriate IYCF practices was provided to pregnant women in last trimester and lactating mothers (N=57) by Anganwadi Workers (AWWs; service provider under ICDS government nutrition health program), doctors and nurses for 3 months once every month. The pregnant women formed the intervention group 1, younger lactating women (4-6 months) formed the intervention group 2 and older lactating women (7-9 months) formed the intervention group 3. Perceptions and practices of mothers were assessed at baseline and post intervention.

Results: Sixty five percent of the mothers in intervention group 1 initiated breastfeeding within 1 hour after birth and 96% fed colostrum to the child. Intervention group 2- Exclusive breastfeeding practices were good and majority of the mothers knew about correct age of introduction of complementary foods but percep-

tions regarding quality, quantity and frequency of feeding complementary foods were poor. Post intervention 85% of the mothers fed solid, semi solid or mushy foods along with breast milk. Intervention group 3- The rates of feeding appropriate quality, quantity and frequency of complementary foods were average at baseline in children 7-9 months. Forty three percent of the mothers fed 3 or more food groups at baseline while the same increased to 86% at the end of intervention. Forty three percent of the mothers started feeding adequate quantity of food after intervention. Knowledge and attendance of mothers at mamta day and annaprashan day (nutrition days celebrated under ICDS) were poor at baseline and marginal improvement was observed after intervention.

Conclusions: Counselling by AWWs and doctors was found to bring about improvement in age appropriate IYCF practices in intervention group 2 and 3. Timely counselling on age appropriate feeding practices can bring about significant improvement in adoption of age appropriate IYCF practices.

Keywords: 1000 days, age appropriate IYCF practices, complementary feeding

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144/1997

EFFECT OF MULTIPLE MICRONUTRIENT SUPPLEMENTATION IN LACTATING WOMEN ON INFANT GROWTH AND MORBIDITY: A DOUBLE-BLIND RANDOMIZED CONTROLLED TRIAL IN RURAL BURKINA FASO

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Background and objectives: Micronutrient deficiencies contribute to the vicious cycle of growth restriction in low and middle-income countries. Lactating women and their infants are at risk of inadequate intakes and deficiencies in multiple micronutrients due to the imbalance between their high requirements and a typical low intake of micronutrient-dense foods. Infants born small-for-gestational age (SGA) or preterm may be particularly vulnerable. However, there currently is no evidence on the effect of multiple micronutrient supplementation in lactating women on infant growth and morbidity. The objective of this study is to test the efficacy of supplementation with the UNICEF/WHO/UNU International Multiple Micronutrient Preparation (UNIMMAP) compared to iron and folic acid (IFA) on growth and morbidity of infants, and particularly those born SGA or preterm.

Methods: In a randomized controlled trial in rural Burkina Faso, 1426 pregnancies were allocated to daily supplementation with either UNIMMAP (intervention) or IFA (control) for three months after delivery. In total, 1296 mothers with live births were enrolled in the study. Daily tablet intake was directly observed by trained community workers. Anthropometry, morbidity and hemoglobin concentration of infants were measured monthly until the first birthday.

Results: Infant linear growth and relative weight gain remained suboptimal despite supplementation of lactating mothers. The linear growth rate of infants in the UNIMMAP group increased compared to IFA (Beta coef = 0.0117 length-for-age Z-score/month; 95% CI: -0.0022 - 0.0256; P interaction = 0.099). Infants who were born SGA had significantly higher linear growth rates (Beta coef = 0.0217 length-for-age Z-score/month; 95% CI: -0.0012 - 0.0447; P interaction = 0.063), but did not show significant reductions in stunting. Preterm infants had increased hemoglobin concentration rates (Beta coef = 0.1569 g/dL/month; 95% CI: - 0.0208 - 0.3346; P interaction = 0.084). Infants in the UNIMMAP group had a reduced relative weight gain rate (Beta coef = -0.0179 weigth-for-length Z-score/month; 95% CI: -0.0355 - 0.0002; P interaction = 0.047).

Conclusions: Supplementing UNIMMAP instead of IFA during the first three months of lactation promotes overall infant linear growth, and shows a larger effect in those born SGA. However, UNIMMAP reduced ponderal growth compared to IFA.

Keywords: Infant Health, Iron-Folic Acid, Lactation, Multiple Micronutrients, Small for Gestational Age

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144/2001

EARLY LIFE HEIGHT TRAJECTORIES AND LATE CHILDHOOD ADIPOSITY IN MEXICAN CHILDREN

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Background and objectives: In Mexico, childhood obesity is a major public health concern, with a current prevalence of 34.4 % in school-aged children classified as overweight or obese. Previous research suggests that poor growth during early childhood may increase the risk of obesity, but others have reported that the rate of growth is more important than size at birth or early nutritional status. Therefore, the objective of this study was to determine if distinct trajectories of growth are associated with body fat mass (FM) in late childhood.

Methods: Study participants were a sub-sample that participated in the 8-10 y follow up of the POSGRAD study, a double-blind, randomized, placebo-controlled trial of prenatal DHA supplementation. Sex-specific height latent class trajectories were derived from 11 measures of height from birth to 5 years of age using MPlus v.7.3. Body composition and anthropometric measures were obtained between ages 8-10 years. Body composition was estimated using validated equations for Mexican children based on the measures from a tetrapolar bioimpedance analyzer (Impedimed DF50). Multivariate linear regression was used to determine the relationship between growth trajectory classes and FM (kg) in late childhood, controlling for current body weight (kg), SES (low, med and high), parity and maternal education. All statistical analyses were conducted with STATA 14.

Results: 255 girls and 281 boys and were included. Two height latent classes were identified in girls [low (58%) and high (42%)] and three classes in boys [low (17%), medium (51%) and high (32%)]. Mean FM in girls (high and low) and boys (high, medium, low) per class were 12.66 kg and 8.99 kg and 10.76 kg, 8.97 kg and 8.39 kg, respectively. In girls, there were no significant associations between classes and FM. In boys, relative to the intermediate growth class, the low class had higher FM $\beta = 0.69$ kg, 95% CI (0.26 - 1.11) and the high class had lower FM in late childhood $\beta = -0.40$ kg, (-0.76 - -0.05).

Conclusions: Among boys, more rapid growth in early childhood is associated with lower adiposity in late childhood compared to children who grew slower.

Keywords: child nutrition, latent class growth analysis, height, fat mass, BIA

144/2003

THE DEVELOPMENT OF GESTATIONAL DIABETES IS LINKED TO HIGHER INTAKE OF TRANS FATTY ACIDS IN THEIR CHILDREN AT 6 YEARS OLD. A FOLLOW-UP FROM THE PREOBE COHORT

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Background and objectives: Maternal diet and nutritional status are powerful determinants of development in utero and the first years of life. Women from disadvantaged groups tend to have the poorest quality diets which are translated into their offspring.

We aimed to investigate the long-term influence of maternal obesity and gestational diabetes (GD) during pregnancy on their children diet up to 6 years of life.

Methods: 119 children participating in the PREOBE study, born to overweight (n=16), obese (n=15), GD (n=35), and healthy normal weight pregnant women (n=53) were included in the present analysis. Children dietary intake was recorded using three days 24h dietary record (2 working days and 1 weekend day). Quantification of nutrient intake by each child was performed by using the DIAL nutritional software. MANCOVA were performed using SPSS version 23.0, and the results were adjusted for confounding factors (maternal age, weight gain during pregnancy, maternal education and family status). Bonferroni corrected post hoc comparisons were used to identify significant group differences.

Results: Children born to GD mothers showed higher levels of fatty acids and trans- fatty acids intake than those born to normal weight (p=0,013 and p=0,006;respectively) and overweight mothers (p=0,026 and p=0,008;respectively). Children born to GD mothers showed higher levels of monounsaturated fatty acids (MUFA)-cis than those born to normal weight (p=0,034) and MUFA-trans respect to those born to normal weight and overweight mothers (p=0,031 and p=0,013;respectively). The intake of polyunsaturated fatty acids-trans were higher inchildren born to GD mothers than in those born to normal weight or overweight mothers (p=0,005 and p=0,002;respectively).

Conclusions: At 6 years of age, children born to mothers who developed GD show an inadequate dietary intake of trans fatty acids from manufactured foods. Diabetic pregnant women are included by routine in medical and nutritional programs to prevent undesirable problems during pregnancy and on their offspring, and furthermore after this intervention, an improvement of their eating habits isusually expected. However, the present results reflect the turn back to poor eating habits in the diabetic mothers which are translated into their offspring up to school age. The consequences of this fact are unknown. Behavioural programs are needed to maintain healthy eating habits in the mothers and children.

Keywords: Gestational diabetes, Diet, trans fatty acids

144/2007

MAIN SOURCES OF INFORMATION ON INFANT FEEDING, AND THEIR APPRAISAL, AMONG SOMALI AND IRAQI MOTHERS RESIDING IN NORWAY – A MIXED-METHODS STUDY

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Background and objectives: Child health centers have a unique opportunity to support infant nutrition. However, studies suggest there can be communication barriers between health centers and immigrant mothers. The objective of the present study was to describe the main sources of information regarding infant nutrition, and how they have been evaluated, among Somali and Iraqi mothers residing in Norway.

Methods: Two rounds of surveys and qualitative interviews were carried out in the Oslo region in 2013-2014 among Somali and Iraqi mothers with infants aged 6 and 12 months. At infant's age 6 month, 187 mothers participated in the questionnaire-based survey and 29 in qualitative, in-depth interviews. At age 12 months, 166 mothers participated in the survey and 30 in qualitative interviews.

Results: Both in the 6- and 12-month surveys, the main source of information on infant nutrition was the child health center, received by more than 90% of the mothers. At infant's age 6 months, more Somali (97%) than Iraqi mothers (86%) evaluated the information received at the health center as useful. Information received from family members was the second most important source of information, at both 6 and 12 months. At 12 months, slightly more mothers (83%) rated the information from the family as useful, as compared with information received from the health station (80%). Qualitative interviews revealed that the mothers trusted the public health nurses. Some found it challenging to balance the information from the different sources. The mothers missed information that was adapted to their language and culture. Around 60% of the mothers wanted more information on infant and child nutrition.

Conclusions: The child health center is the main source for information on infant nutrition among Somali and Iraqi mothers in Norway. The information should be culturally adapted and more informative about feeding of toddlers.

Keywords: Infant feeding, nutrition information, immigrants, Norway

144/2012

MATERNAL DIET WITH ELEVATED FOLIC ACID AND LOW VITAMIN B12 CONCENTRATIONS INCREASES THE METABOLIC RISK IN MICE (C57BL/6)

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Background and objectives: Folates and vitamin B12 (B12) are essential during pregnancy to ensure adequate fetal and placental development. Several countries have implemented public policies of food fortification and supplementation with folic acid (FA), but not with B12. Potential side effects for the mother and offspring of high FA/ low B12 consumption during pregnancy are unknown. The aim of this work was to determinate whether maternal diets containing high levels of FA and low B12 increase oxidative stress markers in maternal livers and placentas.

Methods: Female mice (C57BL / 6, age 8 weeks) were fed with diets containing high FA (8mg/Kg) and low B12 (0.5mg/Kg) diet (T) and with normal diet (C) 60 days before, during (20 days) and 21 days after pregnancy. A group (n=13) was scheduled for caesarean and another group (n=8) grew up until 60 days of age with same prenatal diet. Oxidative stress was assessed measuring TBARS in maternal livers and in placentas. Offspring weight was registered after weaning (21 days of age) and fasting glycemia was determined at 60 days of age.

Results: TBARS (MDA equivalents µM/mg protein) in T were higher in both, livers (10.5±2.4 vs 6.38±1.3, p=0.0082) and placentas (20.2±5.2 vs 14.2±2.4; p=0.0275) compared to C. Offspring weight at weaning was higher in T compared to C, in both, males (13±3 vs 8±1, p=0.0188) and females (12±2 vs 9±2, p=0.0227). Fasting blood glucose levels (mg/dL) at 60 days of age were higher in T vs. C only in males (153 ± 23 vs 116 ±30).

Conclusions: Maternal diets containing high levels of FA and low B12 before, during and after gestation may increase the risk of metabolic alterations in mothers and their offspring, in the short and long term; as evidenced by an increase in oxidative stress in the liver and placenta, in weaning weight, and in fasting blood glucose levels at 60 days of age.

Keywords: Folic acid, vitamin b12, oxidative stress, placenta, fetal programming.

144/2018

CONTRIBUTION OF COMPLEMENTARY FOODS TO ENERGY AND NUTRIENT INTAKES AMONG CHILDREN LIVING IN THE URBAN SLUMS OF MUMBAI, INDIA

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Background and objectives: This cross-sectional study was conducted in preparation for a randomized controlled feeding trial assessing the efficacy of iron-biofortified pearl millet based complementary foods in improving child health outcomes. The main objective of the present study was to characterize dietary intake and their appropriateness based on the Indian recommended dietary allowances (RDAs) in urban slums of Mumbai, India.

Methods: Study participants were children aged eight to 22 months (n=106). Children's dietary data was collected using 24-hour dietary recall (administered to mothers). Nutrient intakes were calculated using CS Dietary System and compared with the Indian RDAs per day for children.

Results: Mean intake of complementary foods was 260 ± 231 g per day. Daily energy intake was less than the RDA for complementary foods in 53% (6 to 12 months, RDA=276 kcal/d) and 89% (12 to 24 months, RDA=714 kcal/d) of children. Protein intake from complementary foods accounted for 81% (6-12 months, RDA=14 g/d) and 88% (12-24 months, RDA=16 g/d) of the total RDA. Iron, zinc, vitamin B-12, and vitamin A intakes were inadequate in more than 90% of children. Dietary iron intake from complementary foods was 24% (6 to 12 months, RDA=5 g/d) and 17% (12 to 24 months, RDA=9g/d) of the Indian RDA. Zinc intake from complementary foods contributed to 10% of the RDA (12 to 24 months, RDA=5 g/d). Vitamin B-12 intake contributed to only 1 % of the total RDA (12 to 24 months, RDA=0.2-1 g/d). Vitamin A intake provided 4% and 5% of RDA in the children from both the age groups. Seventy-two percent (n=76) of children consumed animal source foods including whole milk, eggs, yogurt, and chicken.

Conclusions: Our results demonstrate the widespread prevalence of inadequate energy and nutrient intake from complementary foods among children in Mumbai. Implementation of effective and sustainable nutritional interventions is essential to ameliorate nutritional deficiencies in such vulnerable populations (ClinicalTrials.gov ID: NCT02233764).

Keywords: Energy intake, complementary foods, nutritional status, iron, zinc

Conflict of Interest Disclosure: Saurabh Mehta is an unpaid board member for a diagnostic start-up company focused on developing point-of-care assays for nutritional status, informed by his research as a faculty member at Cornell University. All other authors report no conflict of interest.

144/2023

GESTATIONAL WEIGHT GAIN AND NUTRITIONAL STATUS AT MID-PREGNANCY IN BRAZILIAN AMAZON

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Background and objectives: Weight gain during pregnancy is a prognostic factor for maternal and child health and its inadequacy is associated with undesirable outcomes for both. The present study aims to evaluate the relation between gestational weight gain and anemia, vitamin A insufficiency, and blood pressure in the third trimester of pregnancy.

Methods: Prospective study in the urban area of Cruzeiro do Sul, Acre state, Western Brazilian Amazon. Women up to 20 weeks of pregnancy (by last menstrual period) attending primary health care units were enrolled in this study (n = 457). Weight gain between the second and third trimesters was classified as insufficient, adequate and excessive according to pre-pregnancy body mass index, using the guidelines of Institute of Medicine (2009). Outcomes of interest in the third gestational trimester were: anemia (Hb <110 g/dL), vitamin A insufficiency (retinol <1.05 μmol/L) and blood pressure levels (continuous variable, in mmHg). Multiple Poisson regression models with robust variance adjusted for age, schooling and use of micronutrient supplements were performed using Stata software 14.0, p <0.05.

Results: Prevalence ratios (PR, 95% CI) for anemia among pregnant women with insufficient (n=85) weight gain was 0.41 (0.18, 0.93) when compared to those with adequate weight gain (n=102). For vitamin A insufficiency, PR was higher among pregnant women with insufficient weight gain (2.85, 95% CI: 1.55, 5.24) and excessive (1.53; 95% CI: 0.84, 2.74) when compared to those with adequate weight gain. Pregnant women with excessive weight gain presented higher mean systolic blood pressure (111.1, 95% CI: 109.9, 112.2) than those with insufficient weight gain (107.5, 95% CI: 105.4, 109.6) and adequate weight gain (106.2; 95% CI: 104.3, 108.2).

Conclusions: This is the first study in the Western Brazilian Amazon to evaluate the association between inadequate gestational weight gain and nutritional status and blood pressure levels during pregnancy. Insufficient gestational weight gain was associated with poorer vitamin A nutritional status, while excessive weight gain was associated with higher blood pressure levels. Findings highlight the importance of promoting adequate gestational weight to improve maternal nutritional status and maintain blood pressure in appropriate levels.

Keywords: vitamin A; anemia; pregnancy; nutritional status; epidemiologic factors

Further collaborators

144/2031

WOMEN'S EMPOWERMENT: PATHWAYS TOWARDS MATERNAL AND CHILD NUTRITIONAL OUTCOMES

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Background and objectives: Women's empowerment (WE) is a key determinant of nutritional status of women and children. In this paper we examine the role of several domains of WE and the pathways by which they influence child nutritional status (CNS).

Methods: We used nationally representative data from the Demographic and Health Survey (2011-2015) for married women with children under five in East Africa (Ethiopia, Kenya, Rwanda, Tanzania, and Uganda) (n=42,721). Our key outcome, CNS was operationalized through anemia, height-for-age-z score (HAZ), and body mass index (BMI). Based on our previous work, we used three domains of WE as our primary exposure variable: human/social assets, justification of wife-beating, and household decision-making. We used measured variable path analysis to estimate the strength of a priori hypothesized biological and behavioral pathways from WE to CNS. For the biological pathway, the mediating variable was women's nutritional status (WNS) including anemia, underweight, and BMI. The behavioral pathway included infant and young child feeding (IYCF) practices measured by breastfeeding and timely introduction of complementary foods. Analysis reported with standardized coefficients and was further adjusted for maternal and household characteristics. .

Results: In Ethiopia, the direct association of WE and CNS was significant for the household decision-making domain, with higher empowerment being positively associated with better CNS (beta=0.64; p<0.001). For the biological pathway, higher WE was positively related to WNS for each domain of empowerment (assets: beta=0.40; p<0.005; beatings: beta=0.12; p<0.001; decision-making: beta=0.38; p<0.001). Improved WNS was related to improved CNS (beta=0.54; p<0.001). Along the behavioral pathway, the assets domain was related to appropriate IYCF practices (beta=0.09; p<0.005). Improved IYCF was related to CNS (beta=0.10; p<0.005). Further examination of these relationships and pathways including analysis of data from the other four countries is ongoing.

Conclusions: These findings indicate that the direct and biological pathways are more strongly associated with CNS than the behavioral pathway in Ethiopia. Further analysis will help determine if these observations are generalizable across East Africa. Based on the relative contribution of the specific components of WE and pathways by which they influence CNS, appropriate interventions and programs that improve WE could be developed to improve CNS.

Keywords: Women's Empowerment; Nutritional Status; Maternal & Child Health; East Africa

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144/2066

LIFE-COURSE HEIGHT AND WEIGHT TRAJECTORIES IN MEXICAN CHILDREN

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Background and objectives: Growth during infancy is important for future health and overall well-being and rapid weight

gain during childhood has been associated with adverse health effects in adulthood. Latent class growth analysis (LCGA) identifies heterogeneity of growth patterns in cohort subgroups whereas other modeling techniques assume a single underlying trajectory per population. In LCGA, similar individuals are grouped together on the basis of their growth characteristics. The aim of this study was to derive height and weight growth trajectories from birth to 5 years of age in Mexican children.

Methods: Study participants were a sub-sample that participated in the 8-10 y follow-up of the POSGRAD study, a double-blind, randomized, placebo-controlled trial designed to assess the effect of prenatal supplementation with DHA on offspring growth and development (281 boys, 255 girls). Sex-specific height and weight latent class trajectories were derived from 11 measures of height and weight from birth to 5 years of age. Analyses were conducted by using MPlus version 7.3 (Muthen &Muthen). Tests of class membership association between the latent classes formed by sex were carried out using Pearson's Chi Squared in STATA 14 and p<0.05 was considered significant.

Results: Two weight and height latent classes were identified in girls [height: low (58%) and high (42%), weight: low (67%) and high (33%)] and three classes in boys [height: low (17%), medium (51%) and high (32%), weight: low (30%), medium (52%) and high (19%)]. The 2-class models for girls and the 3-class models for boys had the highest entropy (sign of successful convergence), they were all above 0.79. Classes also had the highest posterior probabilities of candidate models suggesting high class separation, all above ~0.92. For both sexes, height latent class membership was associated to weight latent class membership (p<0.000).

Conclusions: Based on these results, distinct height and weight trajectories separate within the first months of life, suggesting that early life factors may play a role in this separation. There is also a high correlation of latent class membership in height and weight trajectories.

Keywords: child nutrition, latent class growth analysis, height, weight

144/2074

EFFECTIVENESS OF THE BABY FRIENDLY COMMUNITY INITIATIVE ON EXCLUSIVE BREASTFEEDING IN RURAL KENYA

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Background and objectives: Interventions promoting optimal infant and young child nutrition could prevent a fifth of under five deaths in countries with high mortality. Effective strategies to improve infant and young child feeding practices are needed. This study aims to pilot implementation of the baby friendly community initiative (BFCI), a global initiative recommended by the WHO that is aimed at promoting optimal infant and young child feeding practices, to determine its feasibility and effectiveness with regards to exclusive breastfeeding in a rural setting in Kenya.

Methods: The study, employing a cluster-randomized trial design, was conducted in rural Kenya between 2014 and 2016. A total of 13 clusters, constituting community units within the government's community health strategy were randomized with six allocated to the intervention and seven to the control arm. A total of ~800 pregnant women and their respective children were recruited into the study. The mother-child pairs were followed up until the child was at least six months. The intervention involved regular counseling and support of mothers by trained community health volunteers and health professionals on maternal, infant and young child nutrition. Regular quantitative assessment of knowledge, attitudes, and practices on maternal, infant and young child nutrition was done. A qualitative exploration of the effect of the intervention was also done. The analysis involves assessment of the effectiveness of the intervention on the primary outcome (exclusive breastfeeding for six months).

Results: Preliminary results indicate potential effectiveness of the intervention on exclusive breastfeeding. Narratives indicate that the counseling of women enhanced their skills and competencies in breastfeeding including with regards to breast positioning and attachment which led to better breastfeeding practices. The analysis is ongoing.

Conclusions: The study indicates potential effectiveness of the Baby Friendly Community Initiative in promoting exclusive breastfeeding in a rural setting. Findings from the study will inform feasibility and effectiveness of a community-based intervention aimed at promoting optimal breastfeeding and other infant feeding practices. The study will inform policy and practice in Kenya and similar settings.

Keywords: Baby friendly community initiative, exclusive breastfeeding, rural settings, infant feeding

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144/2083

ANTHROPOMETRIC, CLINICAL AND INFLAMMATORY PROFILE OF CHILDREN AND ADOLESCENTS WITH WEIGHT EXCESS BEFORE AND AFTER NUTRITIONAL INTERVENTION WITH OATMEAL

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Background and objectives: Several studies have demonstrated the presence of healthy risk factors in children with weight excess. Interventions strategies may be used to treat this population and the nutritional guidelines are considerate essential part of this process, not only in the period of treatment, but at whole life, equipping this population to do healthier food choices. The aim of this study was to evaluate the anthropometric, inflammatory, insulin and clinical profile of children and adolescents with weight excess before and after nutritional intervention with oatmeal.

Methods: This research consisted in an open randomized clinical pragmatic trial with duration of six weeks, with children and adolescents, recruited by a clinic of nutrition in a University Hospital. After the selection, the patients were allocated in two groups: control (G0) with diet based on lipid stratification and intervention (G1) with diet and 51g of oatmeal. The anthropometric profile analyzed was: weight, height (H), BMI/Age, waist circumference (WC) and abdominal circumference (WA), waist/height (WC/H), C reactive protein (CRP), blood pressure (BP) and HOMA-IR. The database was constructed in SPSS 17.0, in which the descriptive and inferential statistics (paired t test and independent samples with normal distribution and Mann Whitney Test and Wilcoxon non-normal distribution by the Kolmogorov-Smirnov normality test) were analyzed. It was also performed the chi square test. The significance level was 0,05. The study was approved by the Ethics Committee.

Results: The sample consisted of 151 patients, 77 by G0 and 74 by G1. The groups were homogeneous at the beginning of the study. The age was 10.1±2.8 years. After nutritional intervention there was a significant reduction in weight, WC, WA, WC/H, CC/ AND HOMA-IR, SBP and DBP in both groups. In relation to CPR, there was a significant reduction of 0.56±0,69mg/dL to 0.37±0.66

in the G0.. The same did not occur with the G1 that initially showed a value of 0.26 ± 0.25/dL and after 6 weeks, 0.34±0,58mg/dL. However, this change was not significant.

Conclusions: Both the G0 and G1 showed a reduction of weight, circumferences, BP and HOMA-IR, however there was no significant difference by type of diet instituted (with or without oatmeal).

Keywords: Obesity; HOMA-IR; C reactive protein; Children

144/2084

DETERMINANTS OF ENERGY AND NUTRIENT INTAKES AMONG PREGNANT WOMEN IN ACCRA, GHANA

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Background and objectives: During pregnancy nutrition plays a vital role in the well-being of both the mother and the developing fetus, and further influences health during childhood and adulthood. Nutrition is of major concern for maternal health and optimal fetal development since pregnancy is a time of increased nutritional requirement. The study is focused on identifying factors influencing energy and nutrient intakes in pregnancy.

Methods: A cross-sectional survey using systematic random sampling was employed in selecting 279 pregnant women from the Korle-Bu Teaching Hospital and Osu Maternity Home. Data obtained include dietary practices and demographic information. Dietary data was obtained using the 24-hour recall and analysed with the Esha Fpro software for nutrient analysis.

Results: The study showed that almost 73% of the women did not meet the RDA for energy, 40% were below the RDA for protein and almost (99.6%) all were short of the RDA for folate. Again 83.5%, 87.8%, 73.5% and 73.5% were below the RDA for vitamin B12, zinc, riboflavin and iron respectively. Also, income level of the pregnant woman, the educational level of the pregnant women as well as the frequency of meals consumed during pregnancy influenced protein and zinc intakes. Household size significantly influenced the intakes of energy and nutrients. However, dietary practices observed during pregnancy (pica practice, food craving and food avoidance) did not influence energy and nutrient intakes.

Conclusions: Maternal educational level, maternal income, household size and frequency of meal consumption were predictors of nutrient intake in pregnancy in this study. Dietary practices observed in pregnancy were not worrying since it did not influence nutrient intakes. Nevertheless interventions targeted at improving nutrient intake in pregnancy should be intensified.

Keywords: Pregnancy, Nutrient intakes, Maternal health

144/2092

THE ASSOCIATION BETWEEN ACTIVE TOBACCO USE DURING PREGNANCY AND GROWTH OUTCOMES OF CHILDREN UNDER FIVE YEARS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: Current research on infant and young child growth faltering, manifesting in the form of stunting, primarily focuses on nutrition-specific risk factors. However, less is known about the nutrition-sensitive risk factors of growth faltering, including exposures to harmful substances, such as tobacco use during pregnancy. The objective of the study is to investigate the relationship between active tobacco use among pregnant women and growth outcomes of children under five years globally through a systematic review and meta-analysis.

Methods: CABI Global Health, CINAHL, Embase, Global Index Medicus, PubMed, and Web of Science databases were searched to identify studies from 1980 to present on the association between active tobacco use during pregnancy and child growth. Studies that collected data on active tobacco use as either a binary measure, quantity, or frequency at any time during pregnancy based on self-reporting or biomarker assessment were included in the review. At least one of the following child growth outcomes was considered: small for gestational age (SGA), length/height, and head circumference. A meta-analysis using a random effects model was conducted for the association between active tobacco use and SGA.

Results: Of the 13,189 citations identified by the search strategy, 406 studies were included in the full text review and 213 studies were eligible for inclusion in the analysis: 42 cross-sectional, 77 prospective cohort, 41 retrospective cohort, 29 case-control, and 24 unclear study design. In total, 25,168,224 mother-child pairs were included measuring for SGA (121 studies), length/height (84 studies), and head circumference (75 studies). These studies were conducted in 43 countries, including low-, middle-, and high-income countries. Most commonly, tobacco use was defined by cigarette smoking measured by self reporting and/or cotinine levels. Active tobacco use during pregnancy is associated with significantly higher rates of SGA (pooled adjusted OR=1.96; 95% CI 1.71 to 2.23).

Conclusions: Active tobacco use during pregnancy is associated with impaired child growth among certain outcomes. Nutrition-sensitive risk factors such as tobacco use during pregnancy should be considered when implementing interventions to reduce child stunting.

Keywords: tobacco, pregnancy, stunting, growth, nutrition-sensitive

144/2108

THE NEED OF FOOD SUBSIDY PROGRAMS TO FULFILL NUTRIENT ADEQUACIES: THE CASE OF INDONESIA

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Background and objectives: The Indonesian family-based conditional cash transfer (CCT) program or locally known as PKH/Program Keluarga Harapan) started in 2007, which target the bottom poorest 10 percent households. The program demanded pregnant and lactating mothers, as well as children under the age of five years attend health check-ups and school age children go to school. In addition, these families are entitled to a cash or 15 kg rice subsidy monthly. However, the two programs have had less effect on the improvement of the quantity and quality of food consumed.

Methods: The authors exercised calculation on the potential macronutrient adequacy of the cash received from both programs, which is amounting to approximately USD 12.00 per month.

Results: Assuming all the money is used to purchase rice, the money is not enough to provide 100% adequacy of energy and protein for pregnant and lactating women. There is still a gap of 6% for energy and 26% for protein for a pregnant woman or equivalent to one small plate of rice and two eggs daily. The gap for a lactating mother and her child age 7 to 11 month is 23% for energy and 40% for protein or equivalent to 2.5 plate rice and three eggs daily. The money, however, should be enough to provide food for a child age 4 to 6 years. The amount of money or food equivalent given to a family with a pregnant woman should be USD 13.00 monthly and for a lactating mother and her child USD 19.00.

Conclusions: Improvement of the programs should be made to guarantee nutritional need for the important first 1000-days-period.

Keywords: conditional cash transfer, nutrient adequacy, food subsidy, Indonesia

144/2111

INTAKE OF DAIRY PRODUCTS REPORTED BY ELDERLY PEOPLE AND SOCIODEMOGRAPHIC AND CULTURAL VARIABLES - SABE SURVEY: HEALTH, WELLBEING AND AGING

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Background and objectives: The feeding behavior may be related to sociodemographic and cultural variables. The elderly intake of dairy products has been considered unsatisfactory by some researchers and this behavior may be related to the living conditions influenced by sociodemographic and cultural variables. The aim of this study was verify the association among elderly intake of dairy products and sociodemographic and cultural variables.

Methods: Cross-sectional study with elderly people (≥60 years), of both sex, from the SABE Survey: Health, Wellbeing and Aging, performed in 2000, in São Paulo/SP city. The variables were self-reported: intake of dairy products (<1x/day); sociodemographic: schooling by years (zero, 1-4, >4), sex (male or female), age group (60-74 or ≥75 years), marital status (married, single, divorced or widower) and company at home (accompanied and living alone); cultural (life in rural area during childhood or adolescence-yes/no); nationality (brazilian or foreign); religion (catholic, evangelical, others). It was used univariate logistic regression, Rao & Scott test (CI=95%;p<0,05) and Stata Version10.1 program.

Results: This research studied 2142 elderly people; 82% reported intake of dairy products ≥1x/day (60% female sex). It was verified positive association between the intake of dairy products <1x/day and: schooling = zero (OR=2,85;CI=1,85-4,40;p=0,000), schooling = 1-4 (OR=1,76;CI=1,17-2,66;p=0,007), life in rural area (OR=1,76;CI=1,27-2,44;p=0,001), male sex (OR=1,50;CI=1,16-1,93;p=0,002) and negative association with: age group ≥75 years (OR=0,63;CI=0,50-0,79;p=0,000) and foreign nationality (OR=0,35;CI=0,19-0,66;p=0,002).

Conclusions: The intake of dairy products was associated with sociodemographic and cultural variables such as schooling, life in rural area, sex, age group and nationality in this brazilian elderly population.

Keywords: Dairy products, feeding behavior, aged, aging

144/2120

EFFECT OF MATERNAL VITAMIN D SUPPLEMENTATION ON VITAMIN D METABOLITES AND MARKERS OF IMMUNE FUNCTION IN UMBILICAL CORD SERUM

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Background and objectives: Low maternal vitamin D status has been associated with increased risk for asthma and autoimmune disease in the offspring. The hormone 1,25-dihydroxyvitamin D (1,25(OH)2D) regulates many inflammatory processes, but the pathways by which insufficient vitamin D during gestation may impact the developing immune system have not been elucidated. The aim of this study was to test the effects of maternal vitamin D supplementation on concentrations of vitamin D metabolites, inflammatory cytokines, and IgE in umbilical cord serum (UCS).

Methods: Pregnant adolescents (n=79) living in Rochester, NY received 200 IU or 2,000 IU of vitamin D3 daily (in addition to a standard prenatal supplement with 400 IU of vitamin D3) from (mean ± SD) 18 ± 5 weeks of gestation until delivery. Maternal serum and UCS were analyzed for 25(OH)D, 1,25(OH)2D, and 24,25(OH)2D using LC-MS/MS. UCS cytokines (IL-2, IL-4, IL-6, IL-10, IL-17, IFN-γ, TGF-β1, and TNF-α), IgE, and IgA (the negative control) were measured by immunoassays. Linear regression was used to test the effect of supplement group assignment on UCS vitamin D metabolites, cytokines, and IgE.

Results: The mothers were 17 ± 1 yrs of age at study entry. The majority (60%) identified as Black race, and 35% had serum 25(OH)D <20 ng/mL at delivery. UCS was obtained from 56 neonates at birth (39.5 ± 1.7 wks' gestation). The prevalence of UCS 25(OH)D <12 ng/mL was 39%. The 2,000 IU group had greater mean UCS 25(OH)D (β=4.6; p=0.02) and 24,25(OH)2D (β=0.42; p<0.01), but there was no effect of treatment group on UCS 1,25(OH)2D. Cytokines and IgE have been measured in 34 UCS samples. IL-6, IL-10, TGF-β1, TNF-α and IgE were detectable in the majority of UCS samples. The mean concentrations of these cytokines and IgE in UCS did not differ by supplement group.

Conclusions: Risk of vitamin D deficiency was prevalent in term neonates born to adolescents living at latitude 43°N. Daily supplementation with 2,000 IU compared with 200 IU of vitamin D3 increased UCS 25(OH)D and 24,25(OH)2D but had no effect on either UCS 1,25(OH)2D or (based on data available to date) select markers of immune function.

Keywords: perinatal nutrition, vitamin D, developmental origins, asthma, allergy

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144/2121

MOTHERS' VIEW ON BREASTFEEDING OF NEWBORNS ON A NEONATAL INTENSIVE CARE UNIT (NICU) AT A HOSPITAL IN CURITIBA, BRAZIL

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Background and objectives: Breastfeeding is the best natural strategy for bonding, affection, protection and nutrition for a child, as well as an important intervention to reduce infant morbidity and mortality. Exclusive breastfeeding is recommended by World Health Organization up to 6 months of age, with continued breastfeeding along with appropriate complementary foods up to two years of age or beyond. Some of the benefits that make breastfeeding feasible are the families engagement to support the mother during the breastfeeding period, the low cost, and the quality of life for mothers and their babies. Nevertheless, many mothers are not knowledgeable on the benefits of breastfeeding. The aim of this research was to analyze the perception of mothers regarding breastfeeding of inpatient newborns on a neonatal intensive care unit (NICU) in the city of Curitiba, Brazil.

Methods: A cross-sectional study (descriptive and observational) was conducted on a group of 10 mothers of newborns, during the months of August and September 2016. A questionnaire was applied and answered individually by each mother, without interference. Furthermore, the research project was approved by the Ethics Research Committee.

Results: Average age of mothers was 31.7 (± 4.71) years, and 60% were graduate or post-graduated. All the mothers (100%) answered that they received information about maternal education through various media, nurses and doctors, as well as family and friends. Half of them (50%) answered that mother can offer the milk to the baby in the first hour postpartum. Cultural level of the mothers is related to breastfeeding in a positive way, breastfeeding in the first hour after the birth of the baby is important for effective breastfeeding, in addition to providing the strengthening of the affective bonds between mothers and their babies.

Conclusions: It is important to recognize that knowledge building about the importance of exclusive breastfeeding is the result of a collective struggle, where quality health professionals should, besides providing adequate guidance, give greater safety to the mothers during breastfeeding.

Keywords: breastfeeding, nursing, breastfeeding promotion.

144/2173

POSTINFANCY GROWTH AND COGNITIVE PERFORMANCE IN EARLY ADOLESCENCE IN FOUR LOW AND MIDDLE INCOME COUNTRIES: YOUNG LIVES

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Background and objectives: Linear growth failure in the first 1000 days is associated with impaired child cognitive development. Using longitudinal data from four low and middle income countries we examined the strength of the pathways by which growth throughout childhood is associated with measures of cognitive performance.

Methods: Data come from the Young Lives study in Ethiopia (N=1275), India (N=1350), Peru (N=1402), and Vietnam (N=1594). Height was measured at participant age 1, 5, 8, and 12 y; height-for-age z-scores (HAZ) were calculated. Cognitive performance was assessed at age 12 y by the Peabody Picture Vocabulary Test and a mathematics test, which were adapted and standardized in each country. We used path analysis to examine associations between HAZ at each age and each test. We adjusted for covariates at the child, parent, household, and community levels.

Results: In all four countries, the total effect of HAZ at each age was positively associated with cognitive performance; 12 of 16 and 10 of 16 associations were statistically significant for vocabulary and mathematics scores, respectively. Collectively, total effects of HAZ explained modest proportions of the total variation in test scores; across countries, partial r2 ranged from 1.8% to 4.0% for vocabulary and 1.1% to 2.5% for mathematics. Across countries, the total effect of HAZ 1 y explained 0.1% to 1.3% and 0.1% to 0.9% of the total variation in vocabulary and mathematics scores, respectively, while HAZ 5, 8, and 12 y combined explained 1.0% to 3.9% and 0.9% to 2.0%, respectively. The relative magnitude of the HAZ associations with cognitive performance were comparable to those of maternal and paternal education, household expenditures, and ethnicity. The proportion of the total effect of HAZ at 1 y mediated through HAZ at older ages ranged from 55% to 100% across countries for vocabulary and 42% to 100% for mathematics.

Conclusions: HAZ was associated with increased cognitive performance at age 12 y, but the proportion of the total variation in test scores explained was modest. While the primary drivers of cognitive performance may not be mediated through growth, increased child growth may confer modest benefits for cognitive performance.

Keywords: growth, height-for-age, cognitive development

MALNUTRITION AND INFANT/YOUNG CHILD FEEDING PRACTICES AMONG PENAN COMMUNITY IN SARAWAK, MALAYSIA

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Background and objectives: The tribal Penan estimated around 16,000 largely settled in rural and remote areas of Sarawak. The objective of this study was to determine the nutritional status and infant young child feeding (IYCF) practices in Penan children, using indicators of minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD).

Methods: Data collection was carried out in 14 Penan villages in Sarawak from August to December 2016. Subjects consisted of 71 young children, aged below 24 months. Malnutrition was assessed using anthropometric measurements of children and categorized according to WHO Growth Standards (2006). Mothers were interviewed using a pre-tested questionnaire based on WHO IYCF Indicators.

Results: Majority (88.7%) of mothers interviewed were below 35 years, with 29.6% having attended primary school and 15.5% secondary school with a household income of less than MYR600 (USD 135) per month. The prevalence of underweight was 33.8%; stunting 49.3% and wasting 9.8%. Prevalence of exclusive breastfeeding under 6 months was 50% while continued breastfeeding up to 1 year was 72.2% and 41.2% at 2 years. Proportion of children aged between 6 to 23 months achieving MDD was 83.1%. Among children of different age groups, MDD achievement was low (71.4%) for those aged 6 to 11 months. For those achieving MDD, 71.2% of children received food from 4 to 5 food groups whilst 11.9% received food from 6 to 7 food groups. Majority of children received food from grain, roots and tubers group (96.6%). Other food groups given were flesh foods and Vitamin-A rich fruits and vegetables. Almost half (49.2%) of the children consumed dairy products and eggs; and MMF achieved was 83.1%. The study also revealed only 59.3% of children aged 6 to 23 months achieved minimum acceptable diet. Overall, the compliance to minimum acceptable diet indicator was low. Consumption of iron-rich foods was satisfactory at 79.7%, however only 57.1% was achieved amongst infants aged 6 to 11 months.

Conclusions: Effort to ensure that appropriate IYCF key messages reach Penan mothers should be strengthened, to further improve the overall nutritional status and feeding practices of this vulnerable group.

Keywords: nutritional status, infant young child feeding, Penan

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NUTRITION RECOMMENDATIONS FOR IMPROVING ADOLESCENT GIRLS' HEALTH AND WELLBEING

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Background and objectives: Over half a billion adolescent girls between the ages of 10 and 19 live in low- and middle-income countries (LMIC), making up nearly ten percent of their populations (UNDESA 2008). The challenge of developing appropriate policies, social and behavior change strategies, effective nutrition education programs, and targeted communication tools to reach adolescent girls is complicated by the lack of specific nutrition guidance for this critical population. While guidelines exist for some adolescent interventions, adolescent girls might also benefit from nutrition interventions that target wider age groups, such as iron supplementation for women of reproductive age. In many cases, however, these interventions have not been prioritized or adapted for adolescent programming. To help provide better guidance, the USAID Strengthening Partnerships, Results:
Methods: Building on recommendations from the 2015 technical expert meeting on adolescent and women's nutrition, co-hosted by PAHO/WHO and SPRING/USAID, a framework reflecting the determinants of and interventions for adolescent girls' nutrition, health and wellbeing was developed through a consultative, interagency process. This framework guided the selection of relevant evidence-informed recommendations from existing WHO guidelines for inclusion in the document.
Results: This product – Nutrition Recommendations for Improving Adolescent Girls' Health and Wellbeing – will provide global guidance for achieving optimal adolescent girls' nutrition in a user-friendly format. It organizes key interventions and related recommendations under categories, including healthy diets;

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micronutrient deficiencies; undernutrition management; antenatal nutrition; water, hygiene and sanitation; physical activity; and sexual and reproductive health.

Conclusions: Global guidance focused on improved adolescent girls' nutrition is needed to protect gains made in child survival and early childhood development, with a focus on the adolescent period as a "second window of opportunity". This WHO product will provide Member States, donors and implementing partners with recommended evidence-informed guidance for adolescent girls' nutrition interventions and programming. It aims to catalyze and focus future investments for prioritization and development of policies, strategies, programs, and tools.

Keywords: Adolescent girls, Adolescent nutrition, Nutrition guidelines, WHO guidelines

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144/2233

CORRELATION BETWEEN CHRONOTYPE AND THE QUALITY OF DIET IN PREGNANT WOMEN

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Background and objectives: The literature shows that chronotype can influence food consumption and individuals with an evening chronotype may consume a lower quality of diet. However, this issue is an unexplored among pregnant women. In this sense, the focus of this study was to correlate chronotype with the quality of diet in pregnant women in the first trimester.

Methods: We evaluated 100 pregnant women, with up to 12 gestational weeks, aged 18 to 40 years, attended at the public health service in Uberlandia city, Minas Gerais, Brazil. Properly trained nutritionists collected information about food consumption by means of three 24HR on non-consecutive days, including one day of the weekend, in order to better reflect the eating habits of the participants. The qualitative dietary assessment was performed using the Brazilian Healthy Eating Index Revised (BHEI-R), from the following components and, or food groups: Total Fruits; Whole Fruits; Total Vegetables; Vegetables Dark Green and Orange Vegetables and Legume; Total Grains; Whole Grains; Milk and Dairy Products; Meat, Eggs and Beans; Oils; Saturated Fat; Sodium; and SoFAAS. Chronotype was derived from the time of mid sleep time on free days at the weekend (MSF), with a further correction for calculated sleep debt – calculated as the difference between average sleep duration at the weekends and weekdays correlation was used and p <0.05 with significant statistic. The data were analyzed using the SPSS.21.0. To evaluate correlations between variables, Spearman's correlation coefficients, adjusted for confounders were used. Correlations were considered weak if r <0.30, moderate if r was 0.30–0.70 and strong if r >0.70. Statistical tests with p < 0.05 were accepted as significant.

Results: We found a significant correlation between the BHEI-R score for the total Fruit components (r=-0.239; p=0.017), Whole Fruits (r=-0.214; p=0.032) and Saturated Fat (r=-0.211; p=0.035) with chronotype.

Conclusions: Our data suggest that pregnant women with an evening chronotype may be more likely to a diet with less fruit and higher saturated fat. Longitudinal studies should be developed to better understand this issue.

Keywords: chronotype, food consumption, pregnance, Quality Of Diet

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144/2243

CONSUMPTION OF NON-ALCOHOLIC SWEETENED BEVERAGES IN YOUNG ADULTS IN URUGUAY

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Background and objectives: Sweetened drinks are one of the ultraprocessed foods that have had the greatest increase in consumption in recent years in Uruguay. A descriptive quantitative study was carried out to determine the consumption of sugar drinks in young adults aged 18 to 35 years and to compare the average amount of sugar from this consumption with the maximum amount of intake recommended by WHO free sugar in the framework of healthy eating (10% of energy needs per day).

Methods: The sample was non-probabilistic, a Google form was applied where it was collected: socio-demographic information, types of beverages consumed, frequency and total quantity for different types. To know the association between variables the chi square test p <0.05 was applied.

Results: Respond 440 young people, 75% between 18 to 29 years and 75% were women, just over half reside in the capital and have university education; 44% study and work. In relation to the frequency of consumption, tea, coffee and soft drinks predominate with a minimum frequency of 5 times per week. More than 70% exceeds the average consumption / day of 200 mL. 34% exceeds 10% of energy from free sugars only with the intake of beverages. There are no significant differences in the sugar energy intake of the drinks between sexes, ages, places of residence, or types of activity (p <0.05).

Conclusions: It is concluded that the habit of young adults to consume tea and coffee with sugar added and the intake of soft drinks, fruit juices and flavored waters contribute to the excessive contribution of free sugars in the study population as a risk factor for the development of diseases prevalent in Uruguay.

Keywords: sugar; drinks, intake

IMPROVING COMPLEMENTARY FEEDING IN RURAL BANGLADESH WITH LOCAL FOOD-BASED RECOMMENDATIONS

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Background and objectives: Poor infant and child feeding practices can lead to adverse growth and development outcomes. This is of particular concern in low- and middle- income countries. Nutrition-sensitive agricultural interventions are uniquely positioned to improve child feeding practices through improved household access to nutrient-dense foods as well as providing a platform for nutrition counseling activities.

Our objectives were to describe current food patterns of 6-23 month old children in the Food and Agriculture Approaches to Reduce Malnutrition (FAARM) trial population, identify problem nutrients which are not being fulfilled with normal dietary patterns, and create local food-based recommendations to address these deficiencies.

Methods: Food consumption patterns were measured as part of the FAARM cluster-randomized trial in Sylhet, Bangladesh. A 24-hour recall was conducted in 864 households (Children 6-8m: n=43; 9-11m: n=59; 12-23m: n=255) from September 2015 to August 2016, with replication in one-third of the sample. Complementary feeding patterns and food-based recommendations were evaluated using WHO Optifood linear programming software, which evaluated 10 micronutrients: calcium, vitamin C, thiamine, riboflavin, niacin, vitamin B6, folate, vitamin A, iron, and zinc.

Results: In all age groups, calcium, riboflavin, folate, iron, and zinc were identified as 'problem nutrients,' defined as not meeting 100% of recommended intake levels with an optimized diet. Thiamine was also identified as a 'problem nutrient' for children 12-23 months of age. Key local foods rich in these micronutrients were identified and included dark green, leafy vegetables (e.g. red amaranth, buffalo spinach), small dried or fermented fish, pulses, and eggs. For 9-11m and 12-23m age groups, increasing dark green, leafy vegetable consumption to two meals per day and consuming fish with eggs or pulses once per day ensured dietary adequacy of 5 and 7 of the 10 nutrients evaluated, respectively. For children 6-8m of age, diets remained inadequate.

Conclusions: Promotion of key foods which are locally available and acceptable is an important to step for effective nutrition counseling of complementary feeding. Methods: **Keywords:** Infant and young child feeding

Complementary feeding
Nutrition
Micronutrients
Optifood

METABOLIC SYNDROME AND DIETARY PATTERNS OF OLDER ADULTS FROM THE HEALTH, WELL-BEING AND AGING SURVEY (SABE)- BRAZIL

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Background and objectives: Metabolic syndrome (MS) is common in elderly people. The feeding influences its prevalence constituting one of the modifiable risk factor with positive impact on disease control.

To investigate the association between MS and dietary patterns of older adults from São Paulo city.

Methods: Cross-sectional study that used data from the SABE survey: epidemiological, cohort based and home-dwelling. The study population included elderlies ($\geq$ 60 years old), both sexes, selected by probability sampling, belonging to three cohorts A/2000 (n = 630), B/2006 (n = 214) and C/2010 (n = 311). The study variables were: gender, age, education, alcohol consumption, smoking, physical activity, number of chronic noncommunicable diseases; MS, identified according to the criteria of the National Cholesterol Education Program-Adult Treatment Panel III. The feeding data were obtained by one food frequency questionnaire with 18 food groups. Dietary patterns were determined by exploratory factor analysis of principal components. Rao & Scott and multiple logistic regression for complex sample were used, with 5% significance level. The statistical software STATA 13.1 was used.

Results: 1155 subjects were studied. The prevalence of MS was 57.9%. Four dietary patterns were identified: pattern 1, composed by fried foods, sausages, canned foods, sweets, tubers, spices/sauces and processed eggs, called inappropriated; pattern 2, composed by low-fat dairy products, whole grain cereals and breads, and light, diet or zero food, called modified; pattern 3, composed by vegetable oils, rice, refined cereals and white bread, meat and legumes, called Brazilian traditional pattern; and pattern 4, fruits, vegetables and tubers, called beneficial. The modified pattern was positively associated to MS. 4th quartile modified pattern older adults had increased in 60% the risk of MS. The beneficial pattern was negatively associated to MS, in the older individuals ($\geq$ 70 y, cohort A). The inappropriated and Brazilian traditional patterns were not significantly associated to MS.

Conclusions: The modified and beneficial dietary patterns were associated to MS. Modified individuals pattern showed in-

creased risk of MS. Beneficial pattern reduced the risk to the oldest older individuals. The modified pattern could be due to dietary changes implemented in the older adults daily life after diagnosis of metabolic abnormalities.

Keywords: metabolic syndrome; aging; food intake; factorial analysis.

144/2288

ABDOMINAL OBESITY ASSOCIATED WITH IN-SUFFICIENT PHYSICAL ACTIVITY IN CLIMAC-TERIC WOMEN OF THE CITY OF SÃO PAULO, SP, BRAZIL

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Background and objectives: To investigate the association between abdominal obesity and demographic, clinical and behavioral variables, a cross-sectional study with 469 women (45-65 years) was conducted in two outpatient public clinics in São Paulo, Brazil.

Methods: The dependent variables were: abdominal obesity according to waist hip ratio (WHR) and obesity according to waist circumference (WC); the main explanatory variable was: climacteric stage (pre- or post-menopause) and the control variables were age; level of education; parity; use of hormone therapy; physical activity and smoking habit. Was performed multiple regression analysis "glm" (general linear model) using Stata 9.2 software for analysis.

Results: According to WHR, abdominal obesity was positively associated with age (PR=1,02; 95% CI = 1,00-1,05), and negatively associated with level of education (PR = 0,76; 95%CI = 0,64-0,92) and physical activity (PR = 0,70; 95% CI = 0,61-0,82). As indicated by WC, abdominal obesity was positively associated with age (PR = 1,02; 95% CI = 1,01-1,03) and parity (PR = 1,21; 95% CI =1,02-1,45) and negatively with physical activity (PR = 0,70; 95% CI = 0,61-0,82).

Conclusions: While physical activity was a protective factor, age, level of education and parity were established as risk factors for the prevalence of abdominal obesity in women of this study group.

Keywords: abdominal obesity; parity; physical activity, climacteric; menopause.

144/2301

STUDY OF THE RELATIONSHIP BETWEEN FATTY ACID INTAKE AND COGNITIVE DEVELOPMENT IN CHILDREN FROM AN ECUADOR SCHOOL

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Background and objectives: There is evidence that the polyunsaturated fatty acids may play a key role in brain development, but the studies on monounsaturated and saturated fatty acids are limited. Therefore, the objective of this research was to explore the relationship between fatty acid intake and cognitive development in schoolchildren.

Methods: It was studied seventy-three children, from 5 to 11 years old, of the EVANES project, in this case, from San Juan school, Ecuador, located at 3240 meters above sea level. To identify levels of verbal comprehension (VC), perceptual reasoning (PR), working memory (WM), processing speed (PS) and full-scale intelligence quotient (FSIQ) the schoolchildren were evaluated using the Wechsler Intelligence Scale for Children four edition (WISC IV). In the target population, a survey was conducted in order to know the total daily consumption of food, and the fatty acids were calculated. The data were analyzed using general linear model, corrected by Bonferroni, and linear regression tests, both adjusted for age, sex and standard deviation (SD) of height. Inside the cognitive development, the sample was divided in normal ($\geq$80 points) and low (<80 points).

Results: The mean and the SD for VC, PR, WM, PS and FSIQ were 79,62 $\pm$ 14.33, 81.30 $\pm$ 13.90, 86.53 $\pm$ 13.73, 89.49 $\pm$ 14.90 and 78.66 $\pm$ 12.11 points, respectively; for intake of saturated, monounsaturated and polyunsaturated fatty acids were 29.82 $\pm$ 18.56, 19.93 $\pm$ 9.88 and 7.19 $\pm$ 3.03 grams per day, respectively. It was found that children with a low VC had a higher intake of saturated and monounsaturated fatty acids. Besides, it was identified a relationship between lower PS and higher saturated fatty acid consumption, and, when we adjusted the model, the association became stronger.

Conclusions: An inverse relationship between the consumption of saturated and monounsaturated fatty acids, and verbal comprehension and processing speed was observed in schoolchildren of Ecuador.

Keywords: Cognitive development; fatty acids; monounsaturated fatty acids; saturated fatty acids.

THE INFLUENCE THAT A LOCAL GOVERN-MENT-LED MODEL WALKING PROGRAM GIVES FOR THE CHANGE OF PHYSICAL STRENGTH AND THE FIGURE

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Background and objectives: The purpose of this study to compare the numerical value of the figure with the physical fitness test before and after the business of this time by the generation and examine an effect to physical training according to the generatio.

Methods: Participants included 74 individuals ≥60years old-(n=58), ≥70(n=16) that participated in "10,000 steps of walking" in residents. The intervention combined a program to improve a physical function program to prevent declines in cognitive function. This intervention was conducted 9 times for 5 months from September 2014 to January 2017. All participants were measured their body composition, body size, physical fitness tests and steps were made at baseline and after 5 months later, and results were than compered. Body composition were measured by a whole-body bioelectric impedance analysis system (MC-780, Tanita Co.Ltd,Tokyo,Japan).And the International Society for the Advancement of Kinanthropometory(ISAK) protocol was used for measuring 5 body parts as follows ; three skinfolds(abdominals and medial calf) and 3 girths (waist, gluteal and mid-calf) on the right side of the objects'body. The statistical difference was determined by two-sided Student's t test, Difference with P<0.05 was considered significant.

Results: As for the steps of 5 months, a man in 70s was 11889±4700 steps of most, 5406±4022 steps of the 70s woman, that there was the least. No significant difference was found for all measurements between 60s and 70s. The long seat body ante flexion, the walking speed significantly increased the man and woman in its 60s, the woman in her 70s in approximately a program, but, as for the man in 70s, a meaningful change was not recognized. A meaningful change was not accepted for the grips between sex generations.

Conclusions: This study indicated that necessity of program not just walking, but to improve physical strength and increase of the quantity of muscle for 60s also.

Keywords: 10,000 steps of walking, elderly person,physical fitness

ARE THERE CHANGES IN THE FATTY ACID PRO-FILE IN BREAST MILK WITH SUPPLEMENTATION OF OMEGA 3 SOURCES? A SYSTEMATIC REVIEW

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Background and objectives: Due to the controversies between the studies, as well as to the importance of the theme for the health of the newborn, this systematic review aims to evaluate the studies that verified the effects of Omega 3 supplementation during pregnancy and/or puerperium on the composition of LH. The bibliographical survey with this theme aims to assist the maternal and child population as well as health professionals, in order to establish the importance of supplementation as well as offering subsidies for its practice. Objective: To evaluate the effect of supplementation of Omega 3 sources on the fatty acid composition of human milk.

Methods: The review consisted of the search for articles published in PubMed, Virtual Health Library and Web of Science databases using the following keywords: "Fatty acids, Omega-3, Human milk and Supplementation"., for which we have used the PRISMA checklist. The following selection criteria were used: articles published in English, Portuguese, Spanish or Italian, published between 2000 and 2015 and carried out in humans, according to the established strategy, resulting in 710 articles.

Results: All studies found a positive relationship between the consumption of Omega-3 sources and their concentration in human milk. The differences in the findings are due to the different methods used such as,for example, the specific moment of Omega-3 supplementation, the type of Omega-3 source offered, as well as sample size.

Conclusions: Although the studies were different in several methodological aspects, it was possible to observe the importance of Omega-3 supplementation in gestation and/or puerperium.

Keywords: Pregnant women; Breastfeeding; Human milk; Omega-3 Fatty Acids; Systematic review.

144/2334

COMPARISON OF TOTAL LIPID AND FATTY ACID INTAKE ACCORDING TO THEIR DAILY DISTRIBUTION: RELATIONSHIP WITH STUNTING IN CHILDREN FROM ECUADOR

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Background and objectives: It must be considered that, in childhood, the contribution of fats is essential for correct growth, vigorous physical activity and optimum intellectual development, and therefore it is necessary to maintain an adequate contribution. Our objective was to compare the daily lipid intake in the different meal times and to link the fatty acids consumption with stunting in schoolchildren of Andean region.

Methods: The study included 100 middle-aged children, 7.8 ± 2.17 years old, from a rural community school in Chimborazo, Ecuador. A nutritional survey was used for the registration of the food intake. The dietary consumption was evaluated, in each food time, and was calculated from the corresponding standard portion size. The total lipid and fatty acid (FA) consumption was determined transforming these data into food volume/weight (gr or ml), as appropriate, and through the latest available information in food-composition tables from Ecuador. The standard deviation score of height, applying the Child Growth Standards of Word Heath Organization (2006 and 2007) and Anthroplus, was used for nutritional status evaluation. Children were classified in stunting (height for age <-2 SD) and normal (height for age ≥-2 SD). The daily intake was analysed using the general linear model, corrected by Bonferroni, which was adjusted for sex, age and body mass index. The children were divided into two groups, stunting and normal stature.

Results: The contribution of fats at breakfast was higher than the other mealtimes, except lunch. The intake of total lipids in the collation at mid-morning (provide by government of Ecuador at school) was greater than middle afternoon, while in the evening collation was lower compared with all meal times. Children also presented a higher contribution of saturated FA in breakfast compared to collation. Regarding nutritional status, the saturated FA intake was higher in schoolchildren who had normal height than these who had stunting.

Conclusions: In schoolchildren from rural communities of Chimborazo, the main lipid intake comes from breakfast. Stunting children have a lower contribution of saturated fatty acids in relation to those with normal stature.

Keywords: fatty acids; mealtimes; saturated fatty acids; children.

144/2335

PERCEPTION OF HEALTHY EATING AND DAILY DIETARY INTAKE IN CHILDREN AND ADOLESCENTS OF FACATATIVÁ, COLOMBIA

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Background and objectives: The perception of healthy eating is a useful tool to identify beliefs, ideas and concepts about this term. In childhood, these factors contribute to eating behaviours and patterns. For this reason, it was analysed the differences in dietary intake according to the perception of healthy eating in children and adolescents.

Methods: It was included 33 children and adolescents (8-14 years old) of Facatativá, Colombia. The perception of healthy eating was obtained through a semi-structured questionnaire, based on the model used in previous studies. The narrative responses were codified and grouped into 6 categories "eating fruits and vegetables", "eating all food groups", "foods that help us grow healthy", "foods that give vitamins", "eating vegetables and proteins", "do not eat sweets or junk food". To determine the daily dietary intake, a food frequency questionnaire with 33 item was used.

Results: The mean of age of population was 9.8 ± 1.7 years, and for fish, milk and gran intake was 8.24 ± 11.77, 244.67 ± 192.65 and 16.01 ± 16.15 grams, respectively. The participants who reported, as healthy eating, "eating fruits and vegetables" had a lower grain consumption than "do not eat sweets or junk food" group (p=0.032). The daily fish and milk intake was higher in children who responded, "do not eat sweets or junk food" than those who said, "foods that help us grow healthy" (p=0.037) and "eating fruits and vegetables" (p=0.003), respectively.

Conclusions: Children and adolescents who consider a healthy eating as "do not eat sweets or junk food" present a higher intake of fish, milk and grain. This suggest that the perception of healthy eating may affect the dietary patterns in these stages of life.

Keywords: Perception of healthy eating; daily dietary intake; fish intake; milk intake; grain intake.

NUTRITIONAL STATUS AND CHILD DEVELOPMENT OF PRE-SCHOOL CHILDREN IN BHUTAN

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Background and objectives: Few nationally representative studies exist reporting on the nutrition and development of Bhutanese pre-school children. Using the National Nutrition Survey (NNS) 2015 and Multiple Indicator Cluster Survey 2010 (MICS-4), we evaluated household-, maternal-, and child-level risk factors for undernutrition among children aged 6 to 59 mo (n=1,506) and examined associations between early development indicators and nutritional status among children aged 36 to 59 mo (n=2,038).

Methods: Prevalences of stunting, wasting, underweight (height-for-age, weight-for-height, weight-for-age Z-scores, respectively,<-2) and overweight (weight-for-height Z-score>2) were estimated adjusting for survey design. Ten-item early child development index (ECDI) scores were created using UNICEF guidelines to assess four domains: literacy and numeracy, learning, physical, and socio-emotional. ECDI was defined as "on track" for children with satisfactory scores in 3 or 4 domains. Logistic regression, adjusting for sampling design, was conducted to identify predictors of undernutrition and its association with development indicators.

Results: The prevalence of stunting, wasting, underweight and overweight were 21.2%, 2.5%, 7.3% and 2.6%, respectively. In multivariable regressions, risk of stunting increased with age: 5.2% at <6 mo (referent), 17.1% at 6-23 mo (OR=3.59; 95%CI: 0.74, 17.4) and 24.9% at 24-59 mo (OR=6.12; 95%CI: 1.40, 26.9) and was lower among children of university-educated (OR=0.05; 95%CI: 0.00, 0.89) compared to uneducated mothers. No examined variables were significantly associated with wasting or overweight. Percentages of children who met literacy and numeracy, learning, physical, and socio-emotional were 25.5%, 99.6%, 61.4%, and 93.2%, respectively; 66.1% children were found "on track". Literacy and numeracy was negatively associated with stunting (OR=0.64; 95%CI: 0.48, 0.86), severe stunting (OR=0.55; 95%CI: 0.36, 0.83), and severe wasting (OR=0.17; 95%CI: 0.03, 1.08) providing a clear linkage between these aspects of development and chronic undernutrition. ECDI was negatively associated with severe stunting (OR=0.66; 95%CI: 0.47, 0.93). No other associations were found between nutritional status and developmental outcomes.

Conclusions: Whereas weight-for-height is superimposed on the WHO referent distribution, one-fifth of Bhutanese preschoolers are stunted, a condition that is negatively associated with children's literacy and numeracy achievement and maternal education. Severely stunted children require remedial care, both nutritionally and to promote catch-up in aspects of their development.

Keywords: stunting; risk factors; early child development index; literacy and numeracy; Bhutan

ANALYSIS OF THE ASSOCIATION BETWEEN NUTRITIONAL STATUS AND DIETARY INTAKE IN CHILDREN AND ADOLESCENTS OF FACATATIVÁ, COLOMBIA

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Background and objectives: The food intake is one of the most important factors that determines the nutrition and health in childhood. For this reason, it was analysed the relationship between the nutritional status and daily dietary intake in children and adolescents of Facatativá, Colombia.

Methods: A descriptive cross-sectional study was conducted, involving 33 children and adolescents (9.8 ± 1.7 years old). The nutritional status was defined according to the standard deviation score of height and body mass index (BMI), using the Child Growth Standards of Word Heath Organization, 2006 and 2007, adapted for the Colombian population in 2016. Taking into account the BMI-for-age, children and adolescents were classified in: thinness (< -2 SD), risk of thinness (≥-2 to <-1 SD), normal (≥-1 to ≤+1 SD), overweight (>+1 to ≤+2 SD) and obesity (>+2 SD). Considering the height, they were divided in: stunting (height-for-age <-2 SD), risk (height-for-age >-2 to <-1 SD) and normal (height-for-age ≥-1 SD). The daily dietary intake was assessed using a food frequency questionnaire with 33 item.

Results: The mean of weight was 32.9 ± 9.5 kg and for height 1.3 ± 0.1 m. The 39.4% of children had risk of stunting and 48.5% normal height; the 63.6% presented a normal BMI and 21.2% excess weight. It was found relationship between the standard deviation score of height-for-age and the butter intake (-0.482, p=0.005). The daily intake of tomato had an inverse association with the weight (p=0.043) and positive with the standard deviation score of height-for-age (p=0.032). The BMI presented a negative relationship with daily carrot consumption (p=0.038), and the intake of sugar was positively associated with the height.

Conclusions: As expected, it has been found relationship between food intake and nutritional status. Tomato and carrot consumption, could have beneficial effects on the nutritional status

of children and adolescents in rural Colombia. Further studies on sugar and butter intake are required to support our results.

Keywords: Perception of healthy eating, daily dietary intake, fish intake, milk intake, gran intake.

144/2342

MANIPULATIVE AND TOTAL INTELLECTUAL QUOTIENT IN ECUADORIAN SCHOOLCHILDREN AND THEIR RELATIONSHIP WITH HEMATOCRIT AND HEMOGLOBIN

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Background and objectives: It is well known that the presence of anemia may affect the development in childhood, including the cognitive functions. However, the evidences on inhabitants of the Andean region are scarce or null. Hence, we studied the association between hematological parameters and cognitive development in children of Ecuador highlands.

Methods: Forty-three preschool children, from 5 to 6 years old, of the EVANES study, were recruited. To evaluate verbal, manipulative and full-scale intelligence quotient (IQ), the Wechsler Preschool and Primary Scale of Intelligence (WPPSI) was used. The scores were classified according to the following criteria: extremely low (<70), borderline (70-79), low average (80-89), average (90-109), high average (>110) and superior (>120). Also, the IQ was grouped in low (<80) and normal (≥80). Blood samples were extracted by venipuncture, and hemoglobin and hematocrit concentrations were determined. Children were divided in anemic (hemoglobin <11.5 g/dL) and non-anemic. The data were analyzed using SPSS statistical software, and General linear model, with Bonferroni correction, and Spearman tests were applied.

Results: The hematocrit concentration was 43.14 ± 2.73% and the hemoglobin level 14.49 ± 0.94 g/dL. The means of verbal, manipulative and full-scale IQ were 86.46 ± 11.55, 96.39 ± 9.96 and 89.25 ± 10.43 points, respectively. No differences were found in subscales and full-scale IQ between anemic and non-anemic children, nor in hemoglobin and hematocrit concentration between normal and low IQ groups. However, it was observed positive correlation of tertiles of hematocrit level with the classification of manipulative IQ (extremely low, borderline, low average, etc.). In addition, the manipulative and full-scale IQ were directly related to hemoglobin concentration tertiles.

Conclusions: A higher hemoglobin and hematocrit concentration is related to an elevated cognitive performance, in preschool children of Andean region of Ecuador.

Keywords: Cognitive development; intelligence quotient; hemoglobin; hematocrit; anemia.

144/2349

SOCIAL AND ECONOMIC CORRELATES OF BMI AND HFA Z-SCORES AMONG FILIPINO ADOLESCENTS

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Background and objectives: Adolescence is a period that provides an opportunity to address problems from early life. Yet, available information on adolescents are scarce, usually limited to sexual & reproductive health and often not disaggregated by sex, age, and other factors. This study aimed to establish the association of BMI and HFA Z-scores among male and non-pregnant, non-lactating female Filipino adolescents. Additionally, to characterize the pattern of growth of male and non-pregnant, non-lactating female Filipino adolescents.

Methods: This research is a cross-sectional secondary data analysis of the adolescent (10.0-19.0 years; n=33,404) data from the 2011 Updating of Nutritional Status of Filipino Children and other Population Groups conducted by the Food and Nutrition Research Institute (FNRI). Selection of social, economic factors in the dataset for inclusion in the analysis was determined a priori based on empirical data as well as those found associated with HFA and BMI Z-scores during bivariate correlations. Associations with Z-scores were determined through multiple linear regression.

Results: Among male and non-pregnant, non-lactating female Filipino adolescents, stunting rates decreased from pre-pubertal to pubertal stage and reverted back to even higher levels before puberty (M:38.5%-36.0%-39.1%; F:35.3%-30.4%-35.0%). An overall decreasing trend was observed for thinness (M:13.5%-9.7%-6.5%; F:15.0%-16.4%-12.6%) and overweight (M:7.2%-5.9%-6.8%; F:9.1%-5.8%-5.0%) as the Filipino adolescent grew older. Wealth index had the highest correlation with HAZ (r=.305, p<.01) as residence locality is for BAZ (r=.125, p<.01) according to bivariate correlations. After controlling for covariates in multiple linear re-

gression, household size showed consistently negative association with z-scores in both physiologic categories. Other strong predictors of z-scores were belonging to the richest quintile and being a widow/widower. Apart from educational attainment of household head and wealth index, there were no other clear trends observed in the associations of the different parameters to the z-scores.

Conclusions: The results of this study underscores the need to improve nutritional status prior to the onset of puberty to maximize vertical growth. On the other hand, interventions focused on sustaining nutritional gains during the post-pubertal stage should be similarly implemented without compromising BMI. Providing interventions that lead to improvement in wealth is a good place to begin with.

Keywords: Adolescent Nutrition, Filipinos, HAZ, BAZ

144/2365

ASSESSMENT OF MALNUTRITION RISK AND NUTRITIONAL STATUS OF OLDER PEOPLE AT HOSPITAL ADMISSION

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Background and objectives: Introduction: Malnutrition in the elderly is of multicausal origin even in hospitals. Objective is to evaluate the nutritional status and risk factors of older adults admitted to the geriatric acute ward of Irma De Lourdes Tzanetatos Hospital (ILTH).

Methods: Methodology: Observational, analytical and transverse study in 94 patients admitted to the geriatric ward of Irma De Lourdes Tzanetatos Hospital. Data were collected from January to March 2016. Included anthropometric measurements, nutritional risk screening according to Mini Nutritional Assessment (MNA), clinical and hospital data, Barthel Index and Charlson Comorbidity (CC); Biochemical data and sociodemographic information. Multivariate logistic regression was used to determine risk factors associated with malnutrition.

Results: Of the 94 patients, 51 (54%) were female, mean age 77.9 ± 8.2 years; 39.4% had cardiovascular disease admission diagnosis, 35.1% presented severe functional disability, 95.8% severe lean mass, according to the arm muscle area (AMA). According to MNA, 50.0% were malnourished; according to BMI, 54.2% were in the low weight category; And according to the CC, 45.7% with high comorbidity. Barthel's index, schooling, triceps skin fold (TSFmm) and arm circumference (ACcm) were significantly associated (R2 = 0.61) with an increased risk of malnutrition according to MNA (OR = 46.5, p = 0.001, OR = 13.8, p = 0.009, OR = 0.78, p = 0.005, OR = 0.73, p = 0.046, respectively). For nutritional status according to BMI, Barthel's index and pre-albumin were significantly associated (R2 = 0.43) with low weight (BMI <23kg / m2), (OR = 14.3, p = 0.003 and OR = 0, 91, p = 0.024, respectively).

A second model to determine low-weight risk according to BMI showed a significant association (R2 = 69) with TSFmm, ACcm, pre-albumin and number of drugs in use (OR = 0.78, p = 0.010, OR = 0.51, P = 0.000, OR = 0.92, p = 0.043, OR = 0.65, p = 0.045, respectively).

Conclusion: Barthel's Index, schooling level, triceps skin fold and arm circumference were associated with an increased risk of malnutrition. Barthel's index, prealbumin, skin fold of the triceps, arm circumference and number of drugs are associated with low weight according to BMI.

Keywords: Older adults, malnutrition, MNA, anthropometry.

144/2368

PRO-INFLAMMATORY TRIGGERS IN SCHOLARS: LEPTIN, IL-6, FIBRINOGEN, AND HIGH-SENSITIVITY C-REACTIVE PROTEIN

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Background and objectives: Obesity is a major health problem shown to be associated with a pro-inflammatory state. Adipocyte dysfunction results in the expression of pro-inflammatory mediators which, in turn, contribute to the development of chronic inflammation states. We documented the serum levels of leptin and their association with markers of systemic inflammation in obese children.

Methods: Cross-sectional study of 46 scholar children (Boys: 45,7%). BMI, waist circumference and body fat percentages were obtained by means of anthropometric and bioimpedance techniques. Leptin, fibrinogen and C-reactive protein measurements were made by recommended analytical protocols in fasting blood samples.

Results: Average BMI was 23,28 ± 4,39 kg/m2. Only 6.5% of the children had elevated CPR values. In sharp contrast with this finding, leptin values were increased in 93,5% of them.

Conclusions: Obesity is associated with increased leptin values. This finding confirms the presence of a state of insulin resistance resulting from adipocyte dysfunction. The increase in leptin values precedes the rise of inflammation markers that will eventu-

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ally lead to endothelitis and atherosclerosis. Obese children are at high risk of cardiovascular disease.

Keywords: Pediatric Obesity; Body Composition; Inflammation; Leptin; Nutritional Assesment

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THE VARIETY AND DIVERSITY OF THE DIET OF BREASTFED INFANTS AND YOUNG CHILDREN FROM THE PROVINCE OF BAJA VERAPAZ IN GUATEMALA IS LOW

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Background and objectives: The WHO recommends exclusive breastfeeding for 6 months, followed by the progressive introduction of safe, nutritious and appropriate complementary foods (CF). Qualitative research in the province of Baja Verapaz indicates both premature and delayed introduction of CF. We aimed to assess the dietary variety and diversity of CF offered to infants and young children (IYC) aged 6 to 23 months old in this setting.

Methods: Convenience samples of IYC aged 6-8 months (n=6), 9-11 months (n=9) and 12-23 months (n=13) were derived from distinct sites and ethnicities across the province of Baja Verapaz. We aim to increase the sample size to 100 in the near future. IYC diets were assessed by means of previous-day dietary recalls collected from mothers. Dietary diversity among breastfed infants was computed using the WHO food groups which include: (i) grains, roots and tubers, (ii) legumes and nuts, (iii) dairy products (milk, yogurt, cheese), (iv) flesh foods (meat, fish, poultry and liver/organ meats), (v) eggs, (vi) vitamin-A rich fruits and vegetables and (vii) other fruits and vegetables. Dietary variety was calculated by adding all food items mentioned within these food groups; non-nutritive beverages and food were not included.

Results: Most IYC had been breastfed the day of the interview (n=23, 82%) and all breasted infants were receiving CF. The most commonly consumed foods were corn-dough tortilla (consumed by 19), banana (n=9), rice (n=8), sweet bread (n=7) and Incaparina® gruel (n=7). IYC consumed a median of 5 food and beverage items, and dietary variety ranged between 2 and 9. Median dietary diversity was 3, and ranged between 1 and 6 food groups. Median dietary diversity was 2, 3 and 3 at for IYC aged 6-8, 9-11 and 12-23 months, respectively. Only 4(14%) of breastfed IYC consumed a minimum dietary diversity, as recommended by the WHO.

Conclusions: No instance of protracted EBF was documented in the 6-8 month period. However, the variety and diversity of CF offered to IYC in Baja Verapaz is alarmingly low and unlikely to be nutritionally adequate. Further investigation into the quality of the diet of IYC is merited.

Keywords: infant and young child feeding, minimum dietary diversity, dietary variety, human milk, Guatemala

Further collaborators

144/2383

BREASTFEEDING AND PRESCHOOL CHILDREN INTELLIGENCE QUOTIENT IN RURAL HIGHLANDS IN ECUADOR

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Background and objectives: The nutrition during the early stages of life, is essential for an adequate neurological development. Beneficial effects of breast milk were reported even in preterm infants. Thus, our objective was to analyse the relationship between breastfeeding and intelligence quotient in children from a rural school in Chimborazo.

Methods: The study included 37 children, belonging to EV-ANES project, aged 5 to 6 years, from San Juan primary school, in Chimborazo, Ecuador. They were assessed using the Wechsler Preschool and Primary Scale of Intelligence (WPPSI™). A survey to parents was applied to identify the duration of exclusive breastfeeding and age of weaning. The breastfeeding parameters were divided into quartiles (Q1: ≤5, Q2: 6-6; Q3: 7-9 and Q4: >10 months, for exclusive breastfeeding, and Q1: ≤12, Q2: 13-18; Q3: 19-24 and Q4: >25, for weaning age). The verbal, manipulative and total intelligence quotient (IQ) was classified as extremely low (<70), borderline (70-79), low average (80-89), average (90-109), high average (>110) and superior (>120). Data analysis was performed by applying Chi-square test. Differences were considered significant at $p < 0.05$. This study was conducted in accordance to the ethical rules of the Declaration of Helsinki and was approved by the Ethic Committee of the San Francisco de Quito University.

Results: The means of total, verbal and manipulative IQ scores were 89.25 ± 10.43, 86.46 ± 11.55 and 96.39 ± 9.96, respectively. Likewise, the value of duration of exclusive breastfeeding

was 7.61 ± 4.34 months and the age of weaning was 17.89 ± 6.28 months. The manipulative IQ registered three levels, low average, average and high average, and there were no extremely low, borderline and superior scores. When we compared the quartiles of duration of exclusive breastfeeding according to the classification of intelligence quotient, it was observed that the average manipulative IQ was more frequent in the higher quartiles, and the low average level in Q1 (p=0.039). Although, no differences for weaning age were found.

Conclusions: The duration of exclusive breastfeeding may be a key factor in cognitive development of preschool children. However, further studies are required since other environmental factors could be influencing the results.

Keywords: Breastfeeding; cognitive development; intelligence quotient; preschool children; highlands.

144/2395

ASSOCIATION BETWEEN HOUSEHOLD FOOD SECURITY AND INFANT FEEDING PRACTICES IN URBAN INFORMAL SETTLEMENTS IN, KENYA

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Background and objectives: Studies in the urban informal settlements show widespread inappropriate infant and young child feeding (IYCF) practices and high rates of food insecurity. These together with unique challenges with regards to child survival in these settings has led to widespread and persistent under-nutrition rates. Globally, few studies have explored the linkage between food security and infant feeding practices. This study assessed the association between household food security and IYCF practices in two urban informal settlements in Nairobi, Kenya.

Methods: The study adopted a longitudinal study design that involved a census sample of 1110 children less than 12 months of age and their mothers aged between 12-49 years. A researcher-administered questionnaire was used to collect information on infant and young child feeding practices (initiation of complementary foods, dietary diversity, frequency of feeding and minimum acceptable diet); household food security; maternal demographic and socio-economic characteristics. Logistic regression was used to determine the association between food insecurity and IYFC practices having controlled for maternal demographic and socio-economic characteristics as these may influence IYFC practices.

Results: The findings showed high household food insecurity as only 17.4% of the households were food secure. Infant feeding practices were inappropriate; 41% of the children attained a minimum dietary diversity; only 27% attained minimum acceptable diet and 76% attained minimum meal frequency. With the exception of the minimum meal frequency, adjusted logistic regression findings showed that infants living in food secure households were significantly more likely to achieve appropriate infant feeding practices than those in food insecure households: minimum meal frequency (AOR 1.26, p= 0.530); minimum dietary diversity (AOR 1.84, p= 0.046) and minimum acceptable diet (AOR 2.35, p= 0.008).

Conclusions: The present study adds to the body of knowledge by showing how household food security relates to infant feeding practices in low-income settings. The findings imply that interventions aimed at improving infant feeding practices and ultimately nutritional status need to also focus on improving household food security.

Keywords: Infant feeding practices, household food security, urban informal settlements, complementary feeding

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144/2414

EFFECT OF IRON-FOLIC ACID SUPPLEMENTATION STARTING DURING EARLY TRIMESTER OF PREGNANCY ON NEONATAL MORTALITY: FINDINGS FROM A LARGE COMMUNITY-BASED RANDOMIZED CONTROLLED TRIAL IN RURAL BANGLADESH

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Background and objectives: Iron-deficiency is the most common nutritional deficiency globally. Due to the high iron requirements, it is highly prevalent and severe in pregnant women. Our objective was to evaluate if iron-folic acid supplementation starting in the first trimester of pregnancy and sustained throughout pregnancy reduces neonatal mortality.

Methods: We conducted a community based, cluster randomized controlled trial in five districts in Dhaka Division, Bangladesh with a combined population of >10 million. In the intervention clusters trained BRAC village volunteers identified pregnant women and provide consenting women with capsules (Eskayef Bangladesh Ltd) containing 60 mg of elemental iron and 400μg of folic acid. We measured ground water iron levels in all study households using a validated test kit [±0.1 mg/L, HACH Iron Test kit, Model IR-18B]. We compared the neonatal mortality rates and their 95% confidence intervals adjusted for clustering in each ground water iron-level group. We used Cox proportional hazards mixed models for mortality outcomes and include ground water iron level as an interaction term in the mortality model.

Results: We recruited a total number of 36,532 pregnant women. Overall the enhanced distribution of iron/folic acid did not reduce neonatal mortality (HR 0.94, 0.78 to 0.1.12, P=0.521). However in sub-population with low ground water iron levels, iron/folic acid significantly reduced risk of neonatal mortality by 42% (HR 0.58, 0.37 to 0.90, P=0.015). Neonatal mortality was not reduced in sub-populations with medium (HR 1.05, 0.83 to 1.32…., P=0.671) or with high ground water iron levels (HR 1.01, 0.74 to 1.38, P=0.940).

Conclusions: In rural populations in Bangladesh where the ground water iron level is less than 0.5 mg iron/L, early antenatal supplementation with iron/folic acid approximately halved neonatal mortality compared with the usual program. This effect was removed with ground water iron levels of >0.5 mg iron/L. Our results indicate a causal role of iron in reducing neonatal mortality in deficient populations. Overall pregnant women in developing countries need sufficient doses of iron in nutrient supplements to maximize reductions in neonatal mortality.

Keywords: iron-folic acid, first trimester , pregnancy, neonatal mortality, ground-water iron

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144/2444

THE CONTRIBUTION OF BEVERAGES TO THE CONSUMPTION OF ADDED SUGARS. REPORTED DIETARY INTAKE IN THE ARGENTINE POPULATION. RESULTS OF ELANS STUDY

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Background and objectives: High intake of added sugar (AS) is a public health concern due to its association to many diseases. The present study aims to identify the amount and main sources of AS in the Argentine population

Methods: Data were obtained from 1266 Argentines participating in Latin American Health and Nutrition Study (ELANS), a multicenter study of a nationally representative randomized sample of urban population of eight LA countries between November 2014 and July 2015. Data from two face to face 24-hour recall (separated by 5 days) were used to identify the intake of the major foods and beverages containing AS. The weighed-proportions formula developed by Block et al (1985) in which the relative contribution (RC) of a given food item/food group is defined as: RC=(Total AS grams from a food item x 100)/Total AS grams from all food items was used, and performed by age, gender, socioeconomic level (SEL) .Descriptive statistical data analysis was performed with SPSS 20.

Results: Median consumption of AS was 80,6 g /day, 15% of total energy (TE). The Sugar Sweetened Beverages (SSB) grouped were the highest contribution of AS intake (76.3%). The foods contributed with 23.7%. Soft drinks (SD) (34.5 %) infusions (27.8%) juice dry mix (7.9%) juice RTD (4.7%), other beverage (1.4 %). In women 32% of the AS was added to the infusions and 28.7% was in SD, while in men, less AS was added to Infusions 24.2% but brings in SD 39.4%. The AS from infusions, increased by age in women (23.8% in 15 to 19y until in 36.7% in 50-65y) in adolescents SD provided 37.2% (41.1% in men and 28.1% in women). In low SEL women, the infusions provided 37.2% of the AS and mainly based on mate (30%) while in men of high SEL the SD raise up to 48.5%.

Conclusions: In Argentina, the consumption of Added Sugars comprised 15% of TE and the main sources are SSBs. In men, main source of AS are soft drinks and the infusions are in women. A local consideration is the proportion of AS coming in mate (19.5%).

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DIETARY INTAKE AND MAIN SOURCES OF FATS IN THE ARGENTINE POPULATION. RESULTS OF ELANS STUDY

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Background and objectives: High fat diets, especially saturated fat is associated with cardiovascular disease. The present study aims to identify the consumption and main food sources of fats in the Argentine's diet.

Methods: Data were obtained from 1266 Argentines participating in the Latin American Health and Nutrition Study (ELANS), a multicenter study of a nationally representative randomized sample of urban population of eight LA countries between November 2014 and July 2015. Data from two face to face 24-hour recall were used to identify the intake of the major foods containing fats. The weighed-proportions formula developed by Block et al (1985) in which the relative contribution (RC) of a given food item/food group is defined as: RC=(Total fat grams from a food item x 100)/Total fat grams from all food items was used, and performed by age, gender, socioeconomic level (SEL). Descriptive statistical data analysis was performed with SPSS 20

Results: The median of energy intake (EI) was 2154 kcal/day (2434 kcal/day in men and 1911 kcal/day in women). Median fat intake was 78.8 g/day representing a 33% of the daily EI, while saturated fats was 27.4 g/day (11.4 % of the EI). Five food groups were identified as major sources of fats: the oils and fats (O&F) (30.4%), meats (27.2%), bakery products (13.6%), dairy (13.3%) and pizza (7.1%). Meats as a source of fats increased with age from 23% (15-19y) to 30.9% (50-65y), becoming the first source in men of 50-65 y. Inversely, the percentage of total fats from dairy and O&F is slightly higher in women than in men. Differences in the source of fats are found comparing low with high SEL: more proportion of fat from meat (27.5% and 21.6% respectively) and O&F (31.5 and 21.6% respectively) in low SEL and higher fats from pizza in high SEL compared to low (16.4 and 8.7 % respectively). No differences were found by BMI.

Conclusions: Argentine identity includes high proportion of fats coming from meats & animal fats, oils, bakery products, and/ or pizza. Public health interventions reinforcing other cultural options based on drivers of food choice could be beneficial.

Keywords: Fats intake, sources of fats, Argentine population

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EFFECTS OF BIOMARKER INFLAMMATORY AND CARDIOMETABOLIC ON QUALITY OF LIFE OF BRAZILIAN OLDER ADULTS: HEALTH, WELL-BEING AND AGING STUDY (SABE STUDY)

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Background and objectives: Scientific evidence shows relationship of chronic inflammation, elevated cardiometabolic biomarker levels and quality of life (QoL). This study verified associate of elevated inflammatory and cardiometabolic biomarker levels, in older adults with impaired quality of life, in different domains.

Methods: Cross-sectional population-based study (SABE Study), including older adults (≥ 60 years-old). The inflammatory and cardiometabolic biomarkers used were uric acid, fibrinogen, C-reactive protein serum levels e glycated hemoglobin, fasting blood glucose, triglycerides and cholesterol, respectively, determined using sensitive regular immunoassays (ELISA). QoL was assessed using the SF12 questionnaire. Socio-demographic information and health conditions used as control variables were: sex, age and educational level; number of non-communicable diseases, self-reported conditions (chronic pains, hypertension, diabetes and cardiovascular disease), functional capacity, body mass index and waist circumference, respectively, determined using specific questionnaire. Multiple logistic regression was used to analyze this association.

Results: From the 1.344 older adults, 1255 were eligible to be part of this study. There was no association of uric acid, fibrinogen, fasting blood glucose, triglycerides and cholesterol with QoL. Older adults with one or more chronic diseases (OR =1.75, p = 0,000), hypertension (OR =2.35; p = 0,000), BMI higher than 30kg/m2 (OR =2.25, p = 0,000), high levels of CRP (OR =2.85, p = 0,000) and glycated hemoglobin (OR =1.31, p = 0,000), were associated with low values in the physical domain of SF12.

Conclusions: The joint associations elevated inflammatory and cardiometabolic biomarker levels have a significant and negative effect on physical domain of quality of life in older adults, demonstrating the importance of control of these biomarkers for better physical well-being.

Keywords: quality of life; chronic inflammation; older adults; cardiometabolic biomarker.

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MOTHERS AND CHILDREN: ARE THEIR DIET'S RELATED? RESULTS OF MINISALTEN STUDY

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Background and objectives: Children's diet composition could be influenced by many factors and It is supposed that mothers have a crucial role during the first years of life. The aim of this study was to determine the relationship between mother's diet and their first grade children.

Methods: The present analysis comprises the baseline assessment (June to November 2015) of the MiniSALTEN Study (an obesity prevention program). All children attending first grade of 12 Buenos Aires Public schools and their mothers were invited to participate. For both mothers (M) and children (CH) were measured: weight and height. A 24 hour recall was collected in a face to face interview with mothers to assess their diet and her kid's. Children's intake was completed with observational information at school. Intake data were entered and analyzed with NDS-R, Nutrition Data System. BMI Z score calculated (WHO 2007). Descriptive statistical data analysis was performed with SPSS 14.0 for Windows. Pearson correlation was calculated between M and children's intake.

Results: Final sample was composed by 188 dyads. Children's mean age was 6.68 y. Prevalence of overweight was 26,3 % and obesity 22 %. Pearson correlations between M and children´s diets were the following: Saturated fats r = 0.481, Total fat r= 0.471, Monounsaturated r= 0.448, Polyunsaturated r= 0.416 and Energy r= 0.359. Both diets were well balanced in macronutrients distribution. M: 52%, 16% and 32% of total energy and CH: 54%, 15% and 31% of total energy. Median total kcals a day were 1682.3 kcals/d (SD 656.3) and 1797 kcals/d (SD 591.7) M and CH respectively. In both cases, saturated fats were 12% of the total energy but more added sugars were part of children diets: 18.4 % and 14.4 % respectively. Additionally, fiber was much more present in mother's diets than in their children (22.4 g and 12 g/d respectively).

Conclusions: Although significant correlations were found between both diets in saturated, total fat and monounsaturated fats, children's diet is higher in added sugars, total energy and lower in fiber than their mothers.

Keywords: Children's intake, Mother's diet, Fats, Total calories, Added sugars

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ENERGY, PROTEIN AND CARBOHYDRATE INTAKE IN RELATION TO ANTHROPOMETRIC PARAMETERS AT DIFFERENT MEALTIMES IN CHILDREN OF EVANES STUDY

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Background and objectives: Indigenous communities, especially in rural regions, are more vulnerable to malnutrition. In rural schools of Ecuador, a fortified collation is provided to children, consisting of biscuit and colada, a typical drink, which is prepared using a flour mixture (quinoa, bean, peas and corn). Hence, our objective was to compare the association between anthropometric parameters and energy, protein and carbohydrate intake at different mealtimes in children from a rural school in Andean region.

Methods: It was included 100 schoolchildren (7.8±2.17 years) from San Juan (indigenous community), Chimborazo, Ecuador, belonging to EVANES study. Dietary intake was evaluated at each mealtime (breakfast, mid-morning collation, lunch, mid-afternoon collation and dinner) using a nutritional survey. Energy, protein and carbohydrate consumption was determined from the corresponding standard portion size, transforming the data into gr or ml, and using food-composition tables from Ecuador. Weight and height were measured in duplicate, and body mass index [BMI, weight (Kg)/height (m)2] was calculated. Standard deviation score of height and BMI were determined, applying the AnthroPlus software, which is based on Child Growth Standards of Word Heath Organization (2007). Data analysis was performed using SPSS, version 20.0, considering statistical significant differences at p<0.05.

Results: No statistically significant relationship were found between anthropometric parameters and energy, protein and carbohydrate intake at breakfast, lunch and mid-afternoon collation. The most important results were observed at the mid-morning collation, which is provided at the school, where the colada is made with fortified flour. At this mealtime, the energy, protein, and carbohydrate intake was inversely related to weight, BMI and standard deviation score of BMI (p<0.05). On the contrary, a positive association was found between weight and caloric and protein consumption (p=0.033) at dinner.

Conclusions: The energy and nutrient intake is related to anthropometric parameters only at school collation and dinner. Our findings prove that, at school, the children who have lower weight and BMI receive more energy, protein and carbohydrates than those with better nutritional status. But, at home, specifically at dinner, the children who intake more energy and protein are the ones with the higher body weight.

Keywords: Energy intake; nutrient intake; anthropometric parameters; mealtimes; children.

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WOMEN'S DIETARY DIVERSITY IN BANGLADESH: COMMUNITY-LEVEL PATHWAYS THROUGH WOMEN'S EMPOWERMENT

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Background and objectives: A majority of women in Bangladesh consume inadequately diverse diets, but the influence of aggregate-level, contextual factors on women's diets is unknown. We examined whether community-level factors, including measures of women's empowerment, influenced women's dietary diversity through direct and indirect pathways.

Methods: We collected panel data in three rounds from urban and rural samples in Bangladesh between February 2015 and October 2016. We collected data on diet, women's empowerment, years of schooling, and household wealth and other demographics from 422 urban and 698 rural households. The urban sample was representative of the poorest three deciles of neighborhoods in Dhaka City Corporations, and the rural sample comprised the control arm of a cluster-randomized controlled trial in Habiganj District. We used exploratory factor analysis, confirmatory factor analysis, and multilevel structural equation modeling to examine relationships between socio-demographic characteristics, measures of women's empowerment, and dietary diversity at the community level.

Results: In our sample, 79% of urban women and 85% of rural women consumed inadequately diverse diets. Factor analysis resulted in three latent variables for women's decision-making, voice with

husband, and freedom of movement. We observed a strong positive association between schooling and dietary diversity at the individual level (β=0.224, p<0.001) but no association at the community level. Schooling was not associated with the community-level latent variables for decision-making, voice with husband, and freedom of movement. However, the disparity in years between a husband's and wife's completed grades of schooling was significantly associated with women's decision-making (β=0.18, p=.002), voice with husband (β=0.12, p=.008), and freedom of movement (β=0.41, p=.033) at the community level. None of these latent variables were associated with dietary diversity at the community level.

Conclusions: This is the first use of multilevel structural equation modeling to examine community-level pathways related to nutrition. The disparity between women's schooling and that of their husbands was associated with all three measures of women's empowerment, suggesting that important relationships may exist at the community level. Further research is needed to better understand the contextual factors influencing women's diets in urban and rural Bangladesh.

Keywords: community-level, contextual, multilevel, women's nutrition, diet

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SERUM PROTEINS AND NUTRITIONAL STATUS IN SCHOOLCHILDREN FROM A RURAL SCHOOL IN YARUQUÍES, CHIMBORAZO

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Background and objectives: The malnutrition is one of the most prevalent problems in underdeveloped countries, which is associated with poverty. Chimborazo is the poorest province in Ecuador, mainly, in rural communities, which are often indigenous. Those populations, are highly vulnerable from a socioeconomic and nutritional point of view. Thus, our objective was to evaluate the nutritional status of children from a rural school, and to explore the association with serum proteins.

Methods: A cross-sectional descriptive study was conducted in ninety-five children (EVANES project), from a rural school in Yaruquíes, Chimborazo. The anthropometric evaluation was performed using standard deviation score of height and BMI, according to Child Growth Standards of Word Heath Organization

(WHO, 2006 and 2007). It was applied the WHO Anthro and AnthroPlus software. Weight and height were measured in duplicate, and body mass index [BMI, weight (Kg)/height (m)2] was calculated. Blood samples were collected by venipuncture. Concentration of total proteins, globulins and albumin was determined. The serum proteins were divided into tertiles. Data analysis was carried out using SPSS software, version 22.0. Statistical significant differences were considered at p<0.05. To stablish the relationship between ordinal variables, the Spearman test was applied, and, to determine differences in quantitative parameters, the one-way ANOVA, corrected by Bonferroni, was used.

Results: The mean of age was 8.36±2.45 years. Only 1.1% of children were undernutrition, 9.5% overweight and 2.1 obesity. On the other hand, the 47.4% of them were stunting. The tertiles of globulins were inversely related to nutritional status determined from the BMI for age, but not to height for age. When the anthropometric parameters were compared according to tertiles of serum proteins, it was observed that the weight and height were lower in tertil 3 of globulins than tertil 2. Also, the standard deviation score of height was higher in tertil 2 compared to tertil 1 of the same protein. No statistically significant differences were found with the other parameters.

Conclusions: The main problem detected in Yaruquíes, a rural community in Chimborazo, was stunting. Only globulins were related to anthropometric parameters. Further studies are required to identify causes and consequences of nutritional status.

Keywords: Serum proteins; nutritional status; children

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IMPACT OF SMS TEXT MESSAGES TO IMPROVE EXCLUSIVE BREASTFEEDING AND REDUCE OTHER ADVERSE INFANT FEEDING PRACTICES IN YANGON, MYANMAR: A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Myanmar has a low exclusive breastfeeding (EBF) rate at 24% and 15% for children under six and at six months. Objective is to implement and evaluate the impact of a SMS intervention on the breastfeeding practices as a first time in Myanmar.

Methods: A two-arm parallel randomized controlled trial with monthly follow-up phone calls between 1-6 months post-delivery was conducted in January-December 2015 at Central Women's Hospital, Yangon, Myanmar. A total of 353 pregnant women, who were 24-38 weeks of gestation with singleton uncomplicated pregnancy, literate and owned a mobile phone, were recruited and randomly as-

signed to intervention or control groups. The intervention group received breastfeeding promotion SMS and the control group received other maternal and child health care SMS from recruitment to six months postpartum. We hypothesized that the EBF rate in the intervention infants would be double that of the control infants at six months. We defined EBF as giving only breastmilk, not even water except medicines. Data was analyzed by intention to treat principle. Poisson regression analysis with generalized estimation equations (GEE) was used to adjust for within person correlation and the effect of time, group and group by time interaction as covariates.

Results: The intervention significantly improved the EBF rate (43% vs 15%; Relative Risk (RR), 2.83; 95% confidence interval (CI), 1.85,4.33), current breastfeeding rate (RR 1.17; CI, 1.08-1.26) and reduced bottle feeding (RR 0.30; CI, 0.17,0.54) and complementary feeding (RR 0.72; CI, 0.52-0.99) among infants at six months and predominant breastfeeding (RR 0.90; CI, 0.60,1.36) at four months. For the overall follow-up period, the SMS intervention significantly reduced acute lower respiratory illness (RR 0.95; 95% CI, 0.91,0.98; P<0.005) and diarrhea (RR 0.95; 95% CI, 0.91,0.99; P<0.008) compared to the control group. Subgroup analysis showed the intervention had a higher effect on women with low breastfeeding knowledge, low self-efficacy to breastfeed and no intention to EBF at recruitment.

Conclusions: Use of SMS text messages was effective in promoting EBF and reducing other adverse infant feeding practices in Myanmar. Further research is recommended to assess this intervention model in other settings including rural areas.

Keywords: m-Health, Intervention studies, Exclusive breastfeeding, Child nutrition, Myanmar.

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VITAMIN A STATUS IN THE THIRD TRIMESTER OF PREGNANCY IN BRAZILIAN AMAZON

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Background and objectives: Vitamin A status during pregnancy has been associated with maternal and child outcomes worldwide, including birth weight, lung function and bone mineralization. The present study describes the predictors of vitamin A status in the third trimester of pregnancy in Brazilian Amazon.

Methods: Prospective study in the urban area of Cruzeiro do Sul, Western Brazilian Amazon. A total of 445 pregnant women, with up to 20 weeks of pregnancy, and who were attending pre-natal care at primary health centers were enrolled in the study. Demographic, socioeconomic, environmental, and clinical characteristics, as well as obstetric history, anthropometric, dietary, and biochemical data were gathered at second trimester of pregnancy (gestational age week: 20.03 ± 2.91). Serum retinol measured by HPLC at third trimester of pregnancy (gestational age week: 27.76 ± 1.61) was the outcome of interest. Multiple linear regression models with hierarchical selection of independent variables were used to evaluate associations with serum retinol. The analysis were adjusted for gestational age at the outcome assessment. Data analysis was performed in Stata 14.0 with $p < 0.05$.

Results: Overall, the following variables explained serum retinol levels at third trimester of pregnancy in the adjusted model (R2-adj=11.22%): menarche age (β: 0.000; 95% CI: 0.000, 0.002), weekly gestational weight gain (β: 0.055; 95% CI: 0.003, 0.141), seasonality (rainy season from November to April: β: 0.018; 95% CI: 0.004, 0.043), weekly consumption of Amazonian carotenoid-source fruits (such as buriti and pupunha) (β: 0.010; 95%CI: 0.000, 0.004), and retinol levels at 16-20 weeks of pregnancy (β: 0.013; 95%CI: 0.001, 0.004) were positively associated; having a smoker at home was negatively associated with the outcome (β: -0.007; 95%CI: -0.027, -0.0001).

Conclusions: In this study, the menarche age, weekly gestational weight gain, the Amazon rainy season and vitamin A status in the mid-pregnancy were predictors of serum retinol levels in the third trimester. Consumption of locally available Amazonian fruits should be encouraged in this population for improving vitamin A status. The passive smoking may play a role on decreasing vitamin A levels as a proxy of smoking exposure in pregnant women.

Keywords: vitamin A; pregnancy; epidemiologic factors; cohort studies; nutritional status.

Further collaborators

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ASSESSMENTS OF SARCOPENIA AND ITS ASSOCIATED FACTORS IN COMMUNITY-DWELLING MALAYSIAN CHINESE MIDDLE-AGED ADULTS AND ELDERLY

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Background and objectives: Sarcopenia is considered as an emerging public health problems and challenges worldwide, including in Malaysia, but very limited information concerning the influence of lifestyle factors and blood inflammation levels on

sarcopenia among community-dwelling older populations in Asia. The aim of the present study was to assess the prevalence of sarcopenia and its associated risk factors of body composition, dietary and lifestyle practices and blood inflammation markers in older adults.

Methods: A total of 232 apparently healthy Chinese older adults aged 50 years and above were included in the study. Validated questionnaires were used to assess dietary and lifestyle practices, whereas pro-inflammatory cytokine status was assessed by blood interleukin-6 concentrations (IL-6). Sarcopenia was assessed by diagnostic criteria of the Asian Working Group for Sarcopenia (AWGS).

Results: The prevalence of sarcopenia was 12.5% among these apparently healthy community-dwelling Chinese older adults. A similar pattern of sarcopenia was found between males and females. Multivariate logistic regression analysis showed that older age and higher concentrations of pro-inflammatory cytokine levels of IL-6 were significantly associated with greater risk of sarcopenia, after adjustments of age, gender and body composition levels.

Conclusions: The present findings indicate that older adults aged 70 years and above and higher inflammation levels had significantly greater sarcopenia risk. Hence, effective dietary and lifestyle intervention strategies should emphasize to reduce the inflammation associated with aging in order to prevent the rapid loss of muscle mass and strength that can lead to sarcopenia. Moreover, prospective studies with large sample size are required to further elucidate the natural progression and predisposing modifiable dietary and lifestyle factors associated with rapid loss of muscle mass and strength that consequently leading to sarcopenia.

Keywords: Sarcopenia, inflammatory, interleukin-6, dietary, elderly

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SELF-PERCEPTION OF LACTOSE INTOLERANCE AND ITS INFLUENCE ON MILK CONSUMPTION

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Background and objectives: Lactose intolerance is not a disease; it is a normal physiological condition. However, the strategy of avoiding milk consumption may lead to an unnecessary nutritional risk. The purpose of this study was to evaluate lactose intolerance self-perception and its influence on milk consumption.

Methods: A population of 2170 individuals between 18-83 years old performed an online survey to gather information on frequency of consumption of dairy products and a preliminary self-report on lactose intolerance. Moreover, participants were asked whether they have been diagnosed as lactose intolerant.

Results: 81.5% of the participants reported a frequent consumption of milk, at least 1 glass per day (200 ml). The main reasons given by the participants who do not consume any milk was dislike for the taste of milk (38.5%) or suffering of intestinal discomfort (28%). 9.3% of the population considers that they are lactose intolerant; however most of them (81.0%) have not been diagnosed. Of this group, 24.0% has permanently ceased to consume milk. 5% of the people in this study choose to consume lactose-free milk. Of this percentage, 79% of people who consume it are those who perceive themselves as lactose intolerant without being diagnosed and those who refer that they don´t like regular milk because they suffer intestinal discomfort after consumption without perceiving themselves as intolerant.

Conclusions: People that are diagnosed as lactose intolerant turned out to be the group with the least consumption of lactose-free milk. This leads to an interesting observation regarding the real market of this product that requires further research. Moreover, there is a group that has permanently ceased to include milk in their diets due to a self-perception of being lactose intolerant or a lack of medical diagnosis. This could be a psychological factor that could expose them to an unnecessary nutritional risk.

Keywords: auto-percepción, self-perception, lactose intolerance, milk consumption.

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DETERMINANTS OF FOOD CHOICE IN IRANIAN ADULTS: A LIFE COURSE PERSPECTIVE

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Background and objectives: Food choice is a vital and common practice in everyday life that all the people deal with it. In Iran, as a country that experiencing nutrition transition, identifying the aspects, thought and contexts of food choice are necessary to design and investigate trends in the quantity and quality of food consumption. This study aimed to understand the causal process of food choice in Iranian adults.

Methods: a qualitative study was carried out using Grounded Theory approach with thirty-three adults aged 30-64 years who were chosen using purposive sampling with maximum diversity (in terms of age, place of residence and socioeconomic status). An in-depth semi-structured interview was conducted with each subject based on Life course approach to explore participants' current and past eating habits from childhood to adulthood and dietary change at different life courses. Data were analyzed by constant comparative analysis. Interview transcriptions were reviewed and imported into the qualitative software, MAXQDA 11, for open and axial coding. Main themes emerged by integrating the categories which explored from axial coding.

Results: The finding revealed that determinants of food choice in Iranian 30-64-year old adults can be categorized into five main themes:

1) Individual mood, traits and habitus (sub-themes: biological traits, childhood habits, mood, food tendency and physical activity level)

2) Ecologic and environmental characteristics (sub-themes: seasonal and environmental conditions, place of living)

3) socio-cultural determinants (sub-themes: Cultural context and patterns, Social Structure and Norms, Household and Family structure, Information Resources and Media, Transition in Nutrition)

4) Perceived desirability (as core variable with sub-themes: economic possibility, meeting needs and satisfaction of children, health),

5) Food characters and features (sub-themes: sensory aspects of food, food safety, food contents)

Conclusions: Different experiences and periods in people lives, including childhood, adolescence, adulthood, parenthood, work, military service, pregnancy, and marriage could be effective in their food selection(s). Some of these determinants might adjust during the lifespan and affect their personal and social contexts.

Keywords: food choice, qualitative, life course perspective, Iran

RECOMMENDED AND INAPPROPRIATE BEVERAGE INTAKE IN MEXICAN INFANTS AND TODDLERS

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Background and objectives: While 94% of Mexican infants receive breastmilk before 6 months, only 14% are exclusively breastfed, and inappropriate beverages are often concurrently given. Recent research among 6-11m shows that 34% are fed sugar-sweetened beverages (SSBs) and cow's milk is introduced to approximately one-third of infants before 12 months of age. The objectives of this study were to examine the consumption of age-appropriate beverages among 0 to 2 years of age Mexicans and to evaluate whether SSBs or inappropriate milks were substituting for age-appropriate milks.

Methods: Dietary intake data were collected via one proxy-reported 24-hr recall in the 2012 Mexican National Health and Nutrition survey among 0-5m (n=182), 6-11m (n=229), and 12-23m (n=538) old. Beverages were classified as breast milk, infant formula, cow's milk, water, 100% fruit juice and SSBs. These categories were then grouped as age-appropriate or age-inappropriate beverages based on national and international feeding recommendations.

Results: While 66% of 0-5m olds exclusively consumed breastmilk and/or infant formula, 30% were concurrently fed water (mean=56g) and/or other age-inappropriate beverages (mean=127g) such as 100% fruit juice, cow's milk, and SSBs.

Among infants 6-11 months, recommended beverages include breastmilk and infant formula, along with the introduction of water and 100% fruit juice. Only 45% of met recommended beverage guidelines. Compared to 0-5m olds, a higher percentage of 6-11m old were fed water (36%), but a large percentage also consumed age-inappropriate beverages, including cow's milk (29%) and SSBs (34%). Infants 6-11m consumed 2.7 times more cow's milk compared to water and nearly the same amount of SSBs compared to water. After 1 year of age, the World Health Organization and the Mexican Norm on Nutrition recommend the consumption of water ad libidum, introduction of cow's milk, a limited amount of 100% fruit juice and SSBs. Among 12-23m olds, 54% consumed milk, 62% consumed SSBs and 45% consumed water.

Conclusions: Many infants and young children are not compliant with Mexican and international complementary feeding recommendations. Communication about the guidelines and parental education on age-appropriate beverage feeding could be improved.

Keywords: complementary feeding, infants, milks, beverages, Mexico

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THE MEDIA INFLUENCE ON BODY IMAGE OF BRAZILIAN TEACHERS

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Background and objectives: Sociocultural influences can influence individuals of all ages, especially women, to desire a slimmer body and they can feel unsatisfied with their bodies. The difference between the actual body and a body which is considered "ideal", can provoke low self-esteem, thus triggering several eating disorders. OBJECTIVE: To evaluate how satisfied teachers in infants and primary private schools of Sao Paulo are with their own body image and analyse their possible messages given to students about health, weight and eating habits.

Methods: It was a transversal study about infant and primary teachers in 4 schools in the city of Sao Paulo. Teachers were submitted to an anthropometric evaluation: weight, height, Body Mass Index (BMI) and body fat percentage. To evaluate the corporal image the Figure Rating Scales by Kakeshita (2009) was translated and validated. The sociocultural attitude questionnaire was applied to check how media can influence the individual's appearance (SATAQ-3) (Amaral, 2011). The present study followed ethical values and was approved by the ethic, research committee at the Centro Universitário São Camilo.

Results: Fifty-five teachers with mean age of 37,49 years old took part in the study. The mean BMI was 26,6Kg/m2 and the average percentage of body fat was 41,9%. Eighty-nine percent of the teachers showed dissatisfaction with their body image, mostly the older ones and with children. Teachers who were more influ-

enced by the media were older, had a higher socioeconomically status and a higher percentage of body fat. It was discovered that the longer the professional period the lower the SATAQ (p=0,030) score.

Conclusions: The results showed a high level of body dissatisfaction of schoolteachers with great influence on social media. It is possible that teachers reveal their dissatisfaction to their students in the classes, as they are behaviour models to them, triggering eating disorders.

Keywords: Teachers. Body image. Eating disorders. Social Media.

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MATERNAL OBESITY DETERMINES THE OFFSPRING'S METABOLIC PROFILE AT BIRTH

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Background and objectives: The effects of maternal obesity on the metabolic and inflammatory state of their offspring at birth remains to be fully defined. The aim of this study was to compare cord blood levels of insulin, leptin, adiponectin and cytokines in offspring from normal weight and obese mothers, and relate these to maternal and neonatal biological characteristics.

Methods: A group of healthy pregnant women, with BMI >30 kg/m2 (obese) and BMI between 18.5- 24.9 kg/m2(normal weight) at the first trimester of pregnancy and their healthy neonates were recruited at the time of delivery (36 - 41 wks) after signing an informed consent. Umbilical cord blood samples were obtained at birth. The concentration of insulin, leptin, cytokines (Milliplex® Human Cytokine/Chemokine and Human Adipokine, Merck Millipore, Billerica, MA, USA), and adiponectin (ELISA, HMW & Total Adiponectin ELISA. ALPCO, USA) were determined in umbilical cord plasma. Distribution of variables was assessed with Shapiro-Wilk test. The comparison between groups

was done using t-student and Chi2 tests. Multiple linear regression models were used to examine the association between the neonatal outcomes and maternal BMI. p-value <0,05 was considered statistically significant. A power of >80% for leptin and adiponectin was calculated.

Results: Offspring from obese mothers had higher birth weight (3585 g vs. 3446 g) and ponderal index (2.92 vs. 2.78). When comparing the gender of the neonates from obese mothers, boys exhibit higher birth weight (g) (3726 vs. 3423) and height (cm) (50.3 vs. 48.9) Neonates from obese mothers had higher concentrations of leptin (ng/mL) (57.0 vs. 36.6), adiponectin (ug/mL) (33.9 vs. 29.0) and IL-12p40 (pg/mL) (117.3 vs. 98.3). Girls from obese mothers had higher leptin than girls from normal weight mothers (71.8 vs. 47.6) and boys from obese mothers (71.8 vs. 44.1). Boys from obese mothers had higher adiponectin than boys from normal weight mothers (34.6 vs. 28.5). Cytokines did not exhibit a significant differential pattern among groups.

Conclusions: Offspring from early gestation obese mothers had higher leptin and adiponectin. Maternal obesity affects principally the metabolism in girls and the size at birth in boys.

Keywords: Maternal obesity
Leptin
Adiponectin
Umbilical cord blood
Cytokines

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TRENDS ON BREASTFEEDING INDICATORS IN BRAZIL IN THREE DECADES

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Background and objectives: Objective: we aim to study the breastfeeding indicators trends in the last 3 decades, using informations recently obtained from the 2013 National Health Survey (Pesquisa Nacional de Saúde, in Portuguese).

Methods: this is a time series study with secondary data obtained from 4 national surveys with breastfeeding information (from years 1986, 1996, 2006 e 2013). The following WHO standardised indicators were studied: prevalence of exclusive breastfeeding in children under 6 months of life (EB6mo); prevalence of breastfeeding in children under 2 years old (BFtotal); continued breastfeeding at 1 year (BF1y); and continued breastfeeding at 2 years (BF2y).

Results: prevalences of EBF6mo, BFtotal and BF1y had an increasing trend until 2006 (from 4.7%, 37.4% and 25.5% in 1986 to 37.1%, 56.3% and 47.2% in 2006, respectively), followed by a rel-

ative stabilization in 2013 (36.6%, 52.1% and 45.4%, respectively). The BF2y indicator had a relatively stable prevalence from 1986 to 2006 (around 25%) followed by a subsequent increase, reaching 31.8% in 2013.

Conclusions: The time series of breastfeeding in Brazil had an increasing trend from 1986 to 2006, with stabilization in 2013 of three out of four indicators studied. These results can be considered an alert sign to stakeholders, indicating the need of reevaluation and strengthening of existing breastfeeding promotion, protection and support policies and programs. New strategies should be considered to retake the breastfeeding uptrend seen in the previous decades.

Keywords: breastfeeding, time series studies, population surveys, epidemiology.

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FASTING DURING THE SUCKLING-WEANING TRANSIENT PERIOD IN RATS INDUCES METABOLIC ABNORMALITIES IN ADULTHOOD

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Background and objectives: Nutritional status during developmental stages could be associated with subsequent development of metabolic abnormalities. This theory is known as the Developmental Origins of Health and Disease (DOHaD). Many studies have reported the relationship between nutritional deficiency during developmental stages and metabolic abnormalities in animal models including intrauterine calorie restriction (IUCR) in their mothers in the last week of rat pregnancy. In this study, we have examined whether malnutrition by fasting for 3 days in the weaning period alters glucose tolerance in adulthood.

Methods: Male Sprague-Dawley rats were fasted from 18 to 21 days after birth, and subsequently they are fed a high-fat, high-sucrose (HF) or low-fat, high-starch (LF) diet for 14 weeks from 17wk of age. The mRNA levels of inflammation-related genes in the peripheral leukocytes were measured at 0 h and 2 h after oral glucose load at 30 wk of age. Serum monocyte chemoattractant protein-1 (MCP-1) concentration and the mRNA levels of inflammatory cytokine and related genes were assessed in mesenteric adipose tissues were at 31 wk of age. Furthermore, the mRNA levels of the genes related to lipid and sugar metabolism related genes were assessed in the liver.

Results: At 16 wk of age, body weight and glucose tolerance in rats fasted for 3 days in the weaning period were similar to those in control rats. At 31 wk of age, the animals fasted in the weaning period showed a higher MCP-1 protein concentration when they were fed a LF diet but not when they were fed a HF diet. HF diet-induced increase in the mRNA levels of tumor necrosis factor-α, interleukin-1β and S100 proteins in peripheral leukocytes

at 2 h after glucose load was greater in rats fasted in the weaning period than controls. In the animals fasted in the weaning period, liver triglyceride contents were enhanced in adulthood when they were fed a HF diet, and the expression of gluconeogenesis-related genes were enhanced in adulthood when they were fed a LF diet.

Conclusions: These results suggest that malnutrition in the weaning period induces an enhanced inflammation and impaired glucose tolerance in adulthood.

Keywords: DOHaD, Metabolic abnormalities, Malnutrition, Inflammation.

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ASSOCIATION BETWEEN PROTEIN INTAKE AND FRAILTY IN THE KOREAN ELDERLY OF KFACS

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Background and objectives: With a rapidly aging population, frailty defined as geriatric syndrome that increases the risk of falls, disability, hospitalization and mortality, is a major health concern. Malnutrition, which is very prevalent in geriatric populations, is one of the main risk factors for the onset of frailty. Previous studies suggest that protein supplementation is an effective dietary strategy to decrease frailty by positively influence aspects of sarcopenia in elderly. However, protein intake for preventing or delaying development of frailty is still a controversial issue. The present study was investigated to evaluate the association between protein intake and frailty in the elderly.

Methods: This study was approved by the Institutional Review Board of Hanyang University (HYI-15-228). A total of 265 free-living elderly aged between 70 and 85 years were recruited at three senior citizen welfare centers in Seoul, Korea. The inclusion criteria were ability to communicate independently, and no medical conditions affecting protein intake, such as chronic kidney or liver disease. The frailty status was assessed with the Cardiovascular Health Study (CHS) frailty criteria (weight loss, exhaustion, low physical activity, slowness and low handgrip strength), and three day of 24-hr dietary recall and the Mini Nutritional Assessment (MNA) were evaluated.

Results: Elderly participants were categorized into 4 groups: non-frail (n=82), frailty score 1 (n=90), 2 (n=58) and 3-4 (n=35). The daily intakes of energy and protein, protein intake per bodyweight, physical activity, grip strength and gait speed were negatively associated with frailty score. Protein intake was significantly lowered in frailty stage 3-4 than frailty state 1 and non-frail group after adjusting for energy intake. There was significantly less well-nourished elderly (MNA score ≥24) in frail or pre-frail elderly. Intakes of energy, protein, protein per bodyweight, body mass index, frailty score and physical activity were significantly higher in well-nourished elderly than malnourished elderly.

Conclusions: Protein intake was significantly inversely associated with frailty and MNA score in Korean elderly, suggesting that protein intake may play an important role for prevention of frailty.

Keywords: Protein intake. Frailty. Malnutrition. Elderly

Further collaborators

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EVALUATION OF METAPHORS (LIFE AND SELF) OF OBESE & OVERWEIGHT PEOPLE IN COMPARISON WITH THE PEOPLE WITH NORMAL WEIGHT

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Background and objectives: Overweight and obesity have become an epidemic and a community health problem . In Iran, the prevalence of obesity is increasing dramatically. While the cost for obesity treatment on health is increasing, accordingly, the presence & nature of the relationship between obesity & mental health is less obvious. Metaphors are found in everyday human thoughts & action; they reflect the person's thinking process& ultimately, affect the performance . In this study the relationship between the severity of obesity and healthy behaviors and beliefs was studied.

Methods: 120 women randomly selected from nutrition and diet therapy clinics in North of Tehran. All patients who fulfilled the selection criteria divided in to 3 groups (obese, overweight and normal weight). Demographic questionnaires were completed by volunteers. Osgood semantic differential test questionnaire and GHQ mental health questionnaire were completed by the interviewer for each participant. After completing the questionnaires, quality control was re-examined and in case of a problem questionnaires were completed again.

Results: On this basis, women with obesity have more negative "self metaphor" than the general population (56.3% vs 42.3%) and

this women have more negative "life metaphor" (62.5% vs 38.5%) than the general population. 37.5% of obese individuals used negative emotional concept metaphors to describe themselves. Most codes with more negative metaphorical content have more repeat in obese subjects than normal weight subjects that psychological condition is very different in obese people.

Conclusions: The findings of this study show that overweight and obese individuals have more negative perceptions of their conditions of life,and the intensity of the negative perceptions increase along their weight increase. Negative and closed concepts of the metaphors suggest lack of freedom and mastery in individuals' lives. Their unpleasant subjective sensation of living and feeling stuck are clearly reflected in metaphors.In all groups there is a direct relationship between their attitude to life and to themselves(-self) and overweight and obesity, and the more negative their attitude is, the weight control is more difficult. Other studies have confirmed these results.

Keywords: Obesity, Metaphors, Mental health

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NUTRITION THROUGH LIFE COURSE - NUTRITION DURING PREGNANCY (TIME OF CONCEPTION TO DELIVERY) - A CASE STUDY IN TESHIE, A SUBURB OF ACCRA

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Background and objectives: The "Life Course Perspective" proposes that environmental exposures, including biological, physical, social, and behavioral factors, as well as life experiences, throughout the entire life span, influence health outcomes in current and future generations. Nutrition, from preconception to adulthood, encompasses all of these factors and has the potential to positively or negatively shape the individual or population health trajectories and their intergenerational differences. A well-balanced diet is important for adequate nutrition to address common nutrient deficiencies among pregnant women that include iodine, iron, vitamin A and zinc.

Methods: The research sought to gain a better understanding of the importance of nutrition during pregnancy. The study adopted a phenomenological case study approach. The voices of pregnant women were used in a form of narratives. The experiences of these women, during pregnancy forms the basis of this study.Twenty-five (25) participants were purposively sampled for the study, aged between 18 and 45. Both primary and secondary data were used. The study was conducted through one-on-one interviews using semi-structured interviews and women's focus group discussion in Teshie, a suburb of Accra in the Greater Accra region of Ghana.

Results: The research findings revealed different foods eaten by these pregnant women during pregnancy. Almost 75 percent of women between the ages of 18 – 25 years were eating what they were able to buy, whilst the remaining 25 percent were following the prescribed menu from the antenatal clinics. This confirms what Right (2014) said about poverty contributing to the kind of diets people eat. Other findings were the social-cultural practices in that community.

Conclusions: Adults should consume a balanced diet to maintain a healthy and active lifestyle. This is essential for preventing various diet-related non-communicable diseases such as diabetes, hypertension, and cardiovascular diseases. Taking a life course perspective, consuming a balanced diet has great potential for improving the health and nutritional well-being of the population. While nutrition education remains important, a balanced diet can only be achieved if healthy alternatives are available, accessible, might meet the nutritional needs as well as be affordable for all at all times.

Keywords: Nutrition, deficiency, balanced diet, life cycle and environmental exposures

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LEVELS OF VITAMIN B12 AT EARLY PREGNANCY AND THE RISK OF EXCESS WEIGHT AT BIRTH

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Background and objectives: Vitamin B12 (VitB12) during pregnancy plays a key role in the development of the newborn. There is some controversy about the effect of VitB12 levels on newborn weight. Recently, some authors observed that VitB12 deficiency is related to excess birth weight (Sukumar et al., 2016). Objective: To describe the prevalence of VitB12 deficiency in the first trimester of gestation and its association with the weight of the newborn in the Mediterranean population.

Methods: Prospective study in healthy pregnant women from week 12 of gestation until delivery. Mother data collected: clinical history, anthropometry, socioeconomic level, parity, ethnicity, age, smoking and alcoholic habits and food consumption.) At week 12, VitB12 was determined by electrochemiluminescence and was classified as optimal levels (>220pmol/L) and deficiency (marginal (150-220pmol /L) and low levels (<150pmol /L)) (Allen, 2009; de Benoist, 2008). Newborn data collected: sex, gestational age (GA) and birth weight. Birth weight was classified as: macrosomia (>4000g) or low birth weight (<2500g); and large-for-GA (>P90) or small-for-GA (<P10) according to the reference tables (AEP, 2008; DGSP, 2008).

Results: 301 pregnant women of age 30.8+/-4.9, 80.1% Caucasian, 58% medium-high educational level, 20.6% smokers and 7.1% alcoholics and with a BMI 24.9+/-4.3kg/m2 were enrolled. The intake of VitB12 was 4.7+/-1.7µg/day. At week 12, the 65.2% had optimal VitB12level (a mean of 298.5+/-64.7 pmol /L; the 29.1% marginal-levels (192.8+/-19.2pmol/L) and the 5.7% low levels (122+/-25.0pmol/L). The percentage of VitB12 supplementation was 15.5%, 12.8% and 5.9% respectively. According to VitB12 levels, the risk of macrosomia was: a 4.7% in optimal level group, a 10.5% in marginal group and a 17.6% in low level group; and the risk of a large-for-GA was 11.1%, 7.3% and 29.4% respectively. In logistic regressions adjusted, vitB12 deficiency (marginal+low levels) were associated with an increased risk of macrosomia (B=1,833; p=0.01) and large-for-GA (B=1.508;p=0.004) in newborn.

Conclusions: The prevalence of vitB12 deficiency in the first trimester of pregnancy affects 34.8% of the women in a Mediterranean country. This deficiency is related to a lower supplementation of this vitamin and a higher risk of macrosomia and large-for-GA in the newborn.

Keywords: Vitamin B12, pregnancy, birth weight

Further collaborators

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BREASTFEEDING AND COGNITIVE DEVELOPMENT DURING THE FIRST YEAR OF LIFE

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Background and objectives: Breastfeeding (BF) confers numerous benefits on the developing infant in both the short and the long term including psychological development, but there are multiple other factors that must be taken into account when these relationships are studied. To analyse how breastfeeding during the first 4 months of life affects infant cognitive development (CD) at 6 and 12 months in a group of healthy infants from a Mediterranean Spanish city considering many important potential confounds.

Methods: Prospective longitudinal study. A total of 154 healthy infants were evaluated by Hospital Paediatric Unit in Spain.

Data collection: at birth, at 6 and 12 months of age.

Were assessed: Clinical history and sociodemographic data (Hollingshead index) of mothers. Obstetrical and perinatal data (Infant gender, gestational age at birth). Newborn data: Type of feeding (months of breastfeeding and/or infant formula), anthropometry (weight, height and cranial perimeter), iron status (haemoglobin by Coulter, serum Ferritin by turbidimetric immunoassay) and Mental Development Index (MDI) and Psychomotor (PID) by Bayley Scale of Infant Development.

Student's t-test, one-way ANOVA post-hoc test (Scheffé) were used; and also Multiple Linear Regression Models were applied adjusting for prenatal, perinatal and postnatal confounds potential Maternal age, maternal education and socioeconomic status, prenatal nicotine exposure, infant gender, mode of delivery, gestational age at birth, anthropometric measurements, iron status).

Results: 46% of whom were boys. At 4 months, 24% of infants received BF, 50% infant formula and 26% mixed feeding (MF). At 6 moths, exclusive BF during the first 4 months of life increased PDI by 7.712 points (p=0.019), while MF increased PDI by 6.393 points (p=0.039).

At 12 months, exclusive BF during the first 4 months of life increased PDI by 7.223 points (p=0.033). We also observed that high haemoglobin levels at 6 months increased PDI (p=0.015). BF did not affect MDI at 6 nor 12 months.

Conclusions: In conclusion, after the adjustment of important potential confounds, BF during at least four months and adequate infant iron status are related to better psychomotor development during the first year. No associations were found between BF and mental development.

Keywords: Breastfeeding; Mental and Psychomotor Development; Infant Iron Status

Further collaborators

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ROLE OF THE BREASTMILK MICROBIOME IN COLONISATION OF THE INFANT GUT: A SYSTEMATIC REVIEW

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Background and objectives: The gut microbiome has been associated with a wide range of chronic diseases including obesity, diabetes and cardiovascular disease, inflammatory and neurological diseases. Early colonisation of the infant gut may be key to the development of gut microbiome in later life but our understanding of the factors which determine the colonisation process and how that links to later/adult health is still incomplete. Many studies have suggested that the human milk microbiome contributes significantly but it is unclear how the bacteria detected in breastmilk are derived and if they survive in the infant gut. We explored the evidence in a systematic review.

Methods: A systematic review was carried out to answer 'What evidence exists with regards to early colonization of the infant gut by bacteria coming from breast milk?'

Search terms included: (("Microbiota"[Mesh] OR "Metagenome"[Mesh] OR "Dysbiosis"[Mesh]) AND "Anti-Bacterial Agents"[Mesh]) AND ("Infant"[Mesh] OR "Infant, Extremely Premature"[Mesh] OR "Infant, Extremely Low Birth Weight"[Mesh] OR "Infant, Low Birth Weight"[Mesh] OR "Infant, Very Low Birth Weight"[Mesh] OR "Infant, Small for Gestational Age"[Mesh] OR "Infant, Premature"[Mesh] OR "Infant, Postmature"[Mesh] OR "Infant, Newborn"[Mesh] OR "Infant, Premature, Diseases"[Mesh])and (microbiota OR bacteria OR microflora OR microbes) AND (dysbiosis) AND (infant OR neonate OR baby) AND (health) AND (disease) AND (birth OR parturition) AND (breastmilk OR breast milk OR human milk) AND (breastfeeding OR breast feeding OR breastfed) AND (formula fed OR infant formula OR bottle fed OR bottle feed) AND (lactation). Searches were carried out using PUBMED, OVID, LILACS and PROQUEST.

Results: After initial removal of duplicates and not-relevant papers, 66 papers remained for detailed review. This was carried out independently by three authors before final evaluation of the evidence. Papers were considered for information on sample collection, avoidance of contamination procedures, specified bacterial analysis methods and kits used, and if they discussed maternal and infant events that may influence colonisation including mastitis and antibiotic use.

Conclusions: Many studies reported a range of different bacteria in breastmilk. There remains a need to understand the breastmilk microbiome and the modifiable factors which influence this to support health promoting microbial development in the offspring.

Keywords: gut microbiome, breastmilk, bacteria, breastfeeding, infant

Further collaborators

BINGE EATING DISORDER IN ADULT WOMEN

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Background and objectives: Binge Eating Disorder (BED) is a psychological disturbance characterized by recurrent episodes of eating large quantities of food, feeling loss of control during the binge; experiencing shame, distress or guilt afterwards and not regularly using unhealthy compensatory measures. It is associated with severe obesity, psychiatric morbidity, and increased risk for cardiovascular diseases. The aim was to determinate the proportion of BED on a sample of women residing in Buenos Aires.

Methods: Observational cross-sectional study achieved by a voluntary self-administered survey among women between 30 - 65 years old in a community-based site during july – august 2016. It was evaluated BED by Binge Eating Scale (BES), biological stage (pre and postmenopause) by self-reference, body mass index (BMI) (being altered when $\geq$ 25 kg/m2), cardiometabolic risk according to waist circumference (WC) (very high risk when > 88 cm), regular physical activity according to WHO recommendation, BED frequency and favorite kind of food and mood perceived during the binge. Data was describe by mean (SD) or percentage and comparisons were made by X2 and Fisher test (α= 0,05) by statistical software SPSS 19.0.

Results: The sample (n=101) had a mean age of 43,3 ± 11,1 years old and a mean BMI of 25,3 ± 5,27 kg/m2. The 41% were in post menopause and the 15,8% presented moderated BED. The 48,5% presented overweight and 49,5% high cardiovascular risk by WC. The 37,5% had binges occasionally. The 71,3% did not practice regular physical activity. The most chosen foods were baked food and deli-meat/cheeses. It was found statistically significant association between BED and biological stage (p=0,013) and between BED and anxiety (p=0,03), but not with the rest of the variables studied.

Conclusions: Perimenopause indeed may be a vulnerable period for the development of an eating disorder. Nutritional education and psychotherapy should be considered to minimize the associated risks.

Keywords: binge eating disorder, women, perimenopause, anxiety, overweight.

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FEEDING SKILLS DEVELOPMENT IN CHILDREN WITH FEEDING DIFFICULTIES – CROSS SECTIONAL STUDY IN A BRAZILIAN REFERENCE CENTRE

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Background and objectives: Background: Delays in gross motor development, sensory processing issues, organic and behavioral problems are known to interfere in the development of feeding skills; and – therefore - in the success of the whole process of feeding a child. Children with feeding difficulties (FD) commonly present inadequacy of feeding skills. Objectives: Assessment of five feeding skills (FS) in Brazilian children with Feeding Difficulties (FD), and search of possible associations with different types of FD.

Methods: Cross-sectional study with 70 children below 10 years old. Data was obtained from medical records: age, gender, age at texture transitions, feeding phase (breastfeeding, weaning to solids or full solids) at first complaint; characteristics of the meal (duration, environment and shared meals with adults), self-feeding practices, use of feeding equipment and bottle, mouthing, feeding position and type of FD. Skills were categorized according to standards for age. Chi-Square, Anova Test (or non-parametric

equivalent) and Multinomial logistic regression tests were used, with a significance level of 5%.

Results: There was no difference in FS (p>0,05) or in the number of FS inadequateness (p=0,84) according to FD diagnosis. The majority (94%) of children presented at least one delayed development of FS; and 1/3 presented delays in more than half of the FS evaluated. Feeding complaints first appeared at 10,9m ± 11,4, and picky eating was the most prevalent type of FD (37,1%). Most children were fed in inadequate environments (55,2%), in inappropriate feeding positions (78%), without the company of adults (78%); did not practice self-feeding (97,7%), although used proper feeding equipment (65,2%); used prolonged bottle feeding (56,9%). Transition to solid foods occurred at 16m ± 5,6. Multinomial logistic regression showed no difference in likelihood of presenting any type of FD compared to picky eating, according to FS. Age at texture transition both from breastfeeding to complementary feeding (p=0,95), and from complementary feeding to solid foods (p=0,43) to did not vary according to FD diagnosis.

Conclusions: Feeding skills development or number of FS inadequateness did not vary according to FD diagnosis. Identification of these inadequacies could help the discussion for multi-professional treatment of patients with FD.

Keywords: feeding difficulties, feeding skills, childhood, complementary feeding, feeding behavior

Conflict of Interest Disclosure:

• The PI of the project (Mauro Fisberg) conferences in events such as – Abbott, CPW, EMS, Danone, Nestlé, Nutrociencia, PIC-ME, Sanofi, Wyeth; scientific board member of Danone Institute International, Danone Research, Mondelez. Supports research projects at Abbott, CNPq, Coca-Cola, CPW, Danone Institute International, Danone Research, Fapesp, Fap Unifesp, Nestlé.

• Priscilla Maximino consults for Hyproca Nutrition Nutrição Infantil Ltda.

• Authors have no participation in food, nutrition or pharmaceutical companies, and there is no influence of any company in any of the projects, conferences or publications conducted.

Further collaborators: Dr. Patrícia Junqueira, who participated in the data collection

PREVALENCE OF EXCLUSIVE BREASTFEEDING IN THE FIRST MONTH OF LIFE IN CRUZEIRO DO SUL, ACRE

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Background and objectives: Early life feeding practices can directly affect nutritional status, growth, development, and child survival. The prevalence of exclusive breastfeeding up to 6 months of age is fundamental for monitoring actions to promote, protect and support breastfeeding. The present study aims to investigate the prevalence of exclusive breastfeeding in the first month of life in Cruzeiro do Sul, Acre.

Methods: Cross-sectional analysis of data from the MINA-BRAZIL birth cohort study in the urban area of Cruzeiro do Sul, Acre state, Western Brazilian Amazon. Mothers of babies born from July 1, 2015 to June 30, 2016 at the only maternity hospital in the region were enrolled in this study (n=1,328). Women were interviewed soon after giving birth and by telephone at 30-45 days postpartum. For this analysis, the outcome of interest was exclusive breastfeeding in the first month, classified according to the World Health Organization guidelines when the baby receives only breast milk, including milk expressed or from a wet nurse, without other liquids or solids, except for drops or syrups containing vitamins, oral rehydration salts, mineral supplements or medicines. Information on breastfeeding practices was used to calculate the prevalence of exclusive breastfeeding, using Stata software 14.0.

Results: Data on breastfeeding practices in the first month were obtained from 964 mothers and their babies (72.6% of eligible participants). Reasons for the 344 losses of follow-up were: six dropouts (0.45%), 11 without telephone (0.82%), 327 the call was not answered (24.6%), three children (0.22%) and one mother (0.07%) died, two moved out of the municipality (0.15%), and 15 moved to the rural area (1.12%). Although 97.7% (n=942) of the study babies were breastfed at the first month of life, the prevalence of exclusive breastfeeding was 33.1% (n=319), predominant breastfeeding (breastmilk with water, pounded cassava, juice or tea) was 32.6% (n=314), and 32% (n=309) were receiving breastmilk and other type of milk.

Conclusions: The exclusive breastfeeding rate in the first month of life in Cruzeiro do Sul was considerably below the World Health Organization recommendations. These preliminary findings highlight the need of intensive actions for promotion, support and protection of breastfeeding before the first month of life.

SUSTAINABLE UNDERNUTRITION REDUCTION IN ETHIOPIA (SURE) PROGRAMME EVALUATION (2016-2019): CROSS-SECTIONAL BASELINE SURVEY

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Background and objectives: Sustainable Undernutrition Reduction in Ethiopia (SURE) program is the first Government-led multi-sectoral integrated health and agriculture sector program for nutrition outcomes. The program will deliver an enhanced Community-Based Nutrition (CBN) program. The objective was to establish baseline characteristics at the outset of the program and assess the comparability in intervention and comparison districts.

Methods: A cross-sectional survey was carried out in four agrarian regions of Ethiopia from April to July 2016. The survey used multistage cluster sampling at the village and household levels. The sample size calculations for the survey was based on detecting a change at end line in nutritional status and key IYCF practices that can be attributed to the SURE intervention. A total of 4980 children 0-47 months old in 4299 households were involved in the survey. The survey covered 36 intervention and 36 comparison districts, a total of 72 districts.

Results: The prevalence of stunting among children 6-23 months old was 31.3% and 27.9%; whereas underweight prevalence was 19% and 16.5% and wasting was 9% and 8% in the intervention and comparison districts, respectively. Among children 24-47 months old, stunting prevalence was 46.9% and 40.5%, underweight was 23.7% and 21.6% and wasting was 4% in the intervention and comparison districts, respectively.

Breastfeeding was nearly universal in both groups. Over 60% of children initiated breastfeeding within an hour of birth and nearly 80% of children in both arms were exclusively breastfed. About three-quarters of all children initiated complementary feeding between 6 to 9 months of age but 4.5% and 7.8% of all children had access to the minimum diversified diet in the intervention and comparison districts, respectively. About 41% and 45% of all households were food insecure in the intervention and comparison districts, respectively. About 5% in intervention and 8% in comparison districts of all mothers interviewed had access to minimum diversified diet.

Conclusions: The intervention and comparison districts are comparable in most of the demographic and socio-economic characteristics. The prevalence of undernutrition, child feeding practices, food insecurity and women dietary diversity practices are more or less comparable between the two groups.

Keywords: Complementary Feeding, Dietary diversity, Stunting, Ethiopia

Further collaborators

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FOOD CONSUMPTION SOURCE EVALUATION OF CALCIUM, IRON AND OMEGA 3 DURING PREGNANCY IN MOTHERS IN LABOR INTERNED IN SANATORIO DE LA TRINIDAD

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Background and objectives: Women's nutrition during pregnancy is vital for her and the baby in gestation; an inappropriate nutritional status, both preconception and pregnancy, will impact negatively on the ability to carry out that pregnancy and also the health of the mother and the child.

This study aims to determine the percentage of adequacy for calcium, iron, and Omega 3 and determine if it covers requirements for the biological moment, in mothers in labor interned in Sanatorio de la Trinidad.

Methods: Quantitative, descriptive, observational, cross-sectional, retrospective; sample non probabilistic of 328 women in labor interned in Sanatorio de la Trinidad. The information was collected through a structured questionnaire of consumption frequency of foods source in calcium, iron and Omega 3.

Results: 75% of the sample does not cover the calcium requirements with an average consumption of 666,56 mg (±16, 6), mean percentage of adequacy of 55.5%. The total sample does not cov-

er the recommendation for iron, noticing that 96% of the sample does not reach 50% of adequacy. Only 2.4% of the sample covers the requirements for Omega-3, and 31.1% refers not to consume it at all.

Conclusions: A well qualitatively and quantitatively fed mother, is capable of providing sufficient energy reserves, micro and macronutrients for protection and normal development of the fetus. Prior and during pregnancy nutritional assessment and relevant food education should be routine practices incorporated obstetric consultation and also to the education of the population in general, to improve the conditions of pregnancy and puerperium of the mother as well as to achieve optimum embryo development.

Keywords: Pregnancy, Requirements, Calcium, Iron, Omega 3.

Further collaborators: Service of nutrition sanatoriums of the Trinidad Palermo, Ramos Mejia and San Isidro.

MODIFIABLE RISK FACTORS PRESENT FROM CONCEPTION TO AGE 2 YEARS AND THEIR ASSOCIATION WITH OBESITY AT 5 YEARS OLD

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Background and objectives: The origins of childhood obesity can be found as early as the "first 1,000 days". The main goal of this investigation is to study some modifiable risk factors present from conception to age 2 years and their association with obesity at 5 years old.

Methods: Multistage stratified random sampling was used for the selection of children. Public kindergartens of Montevideo-Uruguay were randomly selected and then, a group randomly selected from each school. Trained team measured weight using an electronic scale(SECA) and height non-elastic measuring tape(SECA). From health services, we registered maternal gestational weight, birthweight and weight and height at the age of 6,12,18,24 and 36 months. Dependent variable was current obesity BMI/Age≥2SD(WHO). Analyses were adjusted by high maternal pre-pregnancy BMI(≥25kg/m2), prenatal tobacco exposure, maternal excess gestational weight gain(IOM criteria), high infant birthweight(≥4000 g), short breastfeeding(<9 month), introduction of solid food intake(<4 months) and accelerated infant weight gain(Z-score-change greater than 0.67 in Weight/Age since birth to 24 months).

Results: We studied 452 children, 5.9±0.3 years old, approximately half was boys (51.8%). We observed high prevalence of obesity 17.5%(13.6-20.6). Obesity was significantly higher for children which mothers had high pre-pregnancy BMI 24.4%(14.9-33.9), excess gestational weight gain 21.2%(14.2-28.1) and smok-

ing during pregnancy 28.0%(13.3-30.6); those born with high birthweight 20.0%(14.2-28.1) and introduced solid food intake before 4 months 26.3%(14.5-48.1). Obesity wasn't significantly higher in children breastfed less than 9 months.

Accelerated weight gain was the higher obesity risk. Children who upward weight percentile change since birth to 24 months had between 2.6 and 10 times higher likelihood obesity than their non-accelerated weight gain counterparts OR:5.1(IC 95% 2.6-10.1)p<0.001. On other hand, early introduction of solid food intake OR:3.5(IC 95% 1.05-11.92)p=0.041; prenatal tobacco exposure OR:2.5(IC 95% 1.2-5.0) p=0.014 and high maternal pre-pregnancy OR:2.3(IC 95%1.1-4.6)p=0.022 also were significant childhood obesity risk.

Conclusions: The present results indicate that accelerate weight gain during the first 1,000 days is the main risk for obesity at 5 years old. It´s necessary to prevent accelerated weight gain by good infant feeding practices and to optimize maternal diet and composition before and during pregnancy.

Keywords: Obesity, Accelerated growth

Further collaborators

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HIGH RISK PREGNANCY: EVIDENCE FOR THE NUTRITIONAL APPROACH

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Background and objectives: Pregnancy is characterized by changes in the standards physiological and metabolic, may reflect in the nutritional status (NS). This natural process can be surrounded by pathological outcomes associated with the NS.

The present study aimed investigating the alterations in the NS along the pregnancy in women assisted in a reference prenatal care service.

Methods: Cross section study accomplished in a reference prenatal care service, in the Espirito Santo (Brazil), in which 122 pregnant women participated. For the classification of the body mass index before-pregnant (BMIBP) and BMI pregnant (BMIP) was used the proposed by Atalah (1997). For the statistical analysis was used the program SPSS version 21.0. Significance was set at p<0.05. This study was approved by the local Ethics Committee (CEP – CCS/ UFES; CAAE 45328215.4.0000.5060).

Results: Pregnant women had age between 13 and 44. Among these 25,4% were adolescents and 74,6% were adult. It was observed that the average weight gain gestational was higher among pregnant women who started pregnancy with low weight (11,10 ± 5,99). When comparing the BMIBP with BMIP, bivariate analysis showed result significant (p<0,001). It was observed that 18% (22) of pregnant women have changed NS, and half (11) gained weight and the other half lost weight. These 22 pregnant women who have changed of NS, it was observed that 15,6% (19) this change was undesirable. When compared this modification in the NS with the demographic variables, just age obtained result significant (p=0,051).

Conclusions: The results point to the need for monitoring the NS in high risk pregnancy. It is also necessary to establish specifics nutritional care protocols in this prenatal care service, in order to contributing for reduce unfavorable outcomes in this group.

Keywords: High-risk pregnancy.
Nutritional status.
Weight gain.

144/2720

AGREEMENT OF EXCLUSIVE BREASTFEEDING DURING THE FIRST 6 MO BY MOTHER'S RECALL VERSUS THE DOSE-TO-MOTHER ISOTOPE DILUTION METHOD

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Background and objectives: Exclusive breastfeeding (EBF) for the first six months is promoted worldwide for infant feeding, especially in developing countries. WHO/UNICEF used mother's recall of whether their infants were exclusively breastfed or not. Evidence from small scale studies showed inconsistent finding when using the deuterium oxide dose-to-mother (DTM) method. The objective of this study was to investigate the agreement between the reported EBF and EBF by the DTM method.

Methods: Lactating women who reported that they were EBF at 3 months were recruited in 8 participating countries. Mothers reported whether they were EBF using a questionnaire. The EBF was verified using the (DTM) technique. Ninety-one mother-infant pairs from 4 countries were included in the present analysis. Breast milk intakes and non-milk water (NMW) were calculated using the Bayesian approach. The cutoffs used to define EBF were <25 g according to IAEA recommendation, or 82.6 g from the unpublished study using DTM and home observation (Houghton, et al).

Results: The result showed that at 3 month, from 91 mother-infant-pairs, only 12.1% and 58.2% were confirmed as EBF using the DTM technique at cutoffs <25 and <82.6 g NMW. At 6 months, 54 mothers recalled they were EBF, and only 5.6 and 18.5%, by respective cutoffs were confirmed as EBF.

Conclusions: There was very low agreement in mother's recall of EBF and that by the DTM method, both at 3 and 6 months. This has an important implication to monitoring and program evaluation of breastfeeding promotion.

Keywords: exclusive breastfeeding, recall, isotope dilution, agreement

Further collaborators: Munirul Islam, Ermin Katrin Winarno, Tetra Fadjarwati, Enkhzul Purevsuren, Tran Thuy Nga, Christine Slater and Alexia Alford

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ESTIMATION OF THE DIETARY REQUIREMENT FOR VITAMIN D IN PREGNANCY: A DOSE-RESPONSE, DOUBLE-BLIND, RANDOMIZED PLACEBO-CONTROLLED TRIAL

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Background and objectives: Pregnancy-specific dietary recommendations for vitamin D have not been established to date, owing to a lack of sufficient experimental evidence to confirm whether an increased vitamin D intake is required during pregnancy. Given the high prevalence of vitamin D deficiency reported among gravidae and neonates worldwide, estimation of the dietary requirement to prevent maternal and neonatal deficiency is a research priority. The aim of this study was to provide the experimental evidence to determine the nutritional requirement for vitamin D during pregnancy and the early neonatal period.

Methods: The DMAT Study (Nutritional Requirements for vitamin D in Pregnant Women, NCT02506439) was a three-arm, parallel, dose-response, double-blind, randomized trial of vitamin D3 versus placebo. One-hundred and forty-four healthy pregnant women were randomly assigned to receive either 10 or 20 μg vitamin D3/d or placebo from ≤18 weeks' gestation until late gestation. Vitamin D metabolites in maternal sera at a mean gestational age of 14, 24 and 36 weeks' gestation and in cord sera were quantified by liquid-chromatography-tandem mass spectrometry. A curvilinear regression model was used to predict the total vitamin D intake required to maintain serum 25-hydroxyvitamin D (25(OH)D) above a range of predefined thresholds (25, 30 and 50 nmol/L).

Results: Mean baseline serum 25(OH)D was 54.9 ± 10.7 nmol/L. Serum 25(OH)D increased in all groups from the first to the final visit, and mean ± SD maternal concentrations at 36 weeks' gestation were 24.3 ± 5.8 and 29.2 ± 5.6 nmol/L higher in the 10 and 20 μg/d groups, respectively, than in the placebo group (P < 0.001). The estimated vitamin D intakes required to maintain serum 25(OH)D > 25, 30 and > 50 nmol/L in 97.5% of gravidae were 12.4, 15.1 and 29.5 μg/d, respectively. At a minimum maternal threshold of 44 – 55 nmol/L, neonatal circulating 25(OH)D concentrations did not fall < 25 – 30 nmol/L.

Conclusions: A vitamin D intake of at least 29.5 μg/d is sufficient to maintain serum 25(OH)D concentrations ≥ 50 nmol/L in 97.5% of women throughout gestation, which in turn will prevent neonatal deficiency at the 25 – 30 nmol/L threshold.

Keywords: Vitamin D, pregnancy, requirements, RCT, dose-response

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144/2735

MATERNAL PROTEIN RESTRICTION INDUCES SALT SENSITIVITY AND ALTERS RENAL DNA METHYLATION OF THE PTGER1 GENE IN SHRSP OFFSPRING

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Background and objectives: We have previously reported that maternal protein restriction during pregnancy increases the salt sensitivity in stroke-prone spontaneously hypertensive rat (SHRSP) offspring. By a genome-wide methylation analysis in the offspring's kidney, we have revealed that the highly methylated regions were located in the gene of prostaglandin E2 receptor (ptger1), which is known to be associated with hypertension. This study evaluated DNA methylation in the ptger1 gene region by bisulphite sequencing and expression of the ptger1-related genes.

Methods: Female SHRSP rats during pregnancy were fed a 20% casein diet (CN group) or a 9% casein diet (LP group). After birth, male pups were reared on a commercial diet and water ad libitum. They were given water (W group) or 1% saline solution as drinking water (S group) from 10 weeks of age. Kidneys were collected after 12 weeks from birth, which were used for mRNA expression analysis by RT-PCR and DNA methylation analysis of ptger1 (+1315-1614 region) by bisulphite sequencing.

Results: In response to saline drinking, the blood pressure of pups in LP-S was significantly elevated compared to that in CN-S. There was no significant difference in the blood pressure between CN-W and LP-W. The expression of ptger1 in LP-S and LP-W were significantly increased compared to that in CN-S and CN-W, respectively. DNA methylation of the Ptger1 of LP-S and LP-W showed markedly hyper-methylated state compared with CN-S and CN-W,

respectively. Moreover, in LP-S the expression of enacα (epithelial sodium channel α, ENaC α), which encodes a sodium channel, was significantly decreased compared to that in CN-S.

Conclusions: These results indicate that maternal protein restriction during pregnancy may alter renal DNA methylation of the ptger1 in SHRSP offspring. Our findings also suggest that the DNA methylation changes in the ptger1 might be associated with the regulation of ptger1 gene expression. In addition, a Ptger1-mediated down-regulation of ENaC α may be involved in the enhancement of salt sensitivity.

Keywords: hypertension, maternal protein restriction, DNA methylation

144/2739

ASSESSMENT OF PERCEIVED SOCIAL SUPPORT, FOOD INSECURITY AND NUTRITIONAL STATUS OF THE ELDERLY IN THE SAGNARIGU DISTRICT OF THE NORTHERN REGION, GHANA

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Background and objectives: Despite a growing elderly population, there is a paucity of information on the living conditions of elderly persons in Ghana. With limited institutional social support services and declining extended family support systems, elderly Ghanaians may be vulnerable to food insecurity and malnutrition. We assessed social support, food security and nutritional status of elderly persons in the Sagnarigu District of Northern Ghana.

Methods: Cross-sectional survey with a randomly selected sample of 120 elderly persons categorized as young-old (60-64y), middle-old (65-70y) and old-old (>70y) from 3 communities in the Sagnarigu District. Structured questionnaires were used to interview participants about their socio-demographic characteristics, food security situation (using USDA household food security module-short form) and perceived social support. Additionally, participant's weights and heights (or armspan) were measured and BMI or BMA computed and participants categorized as being

Underweight (BMI or MBA< 18.5kg/m2), normal weight (BMI or BMA 18.5-24.9kg/m2) or overweight/obese (BMI or BMA >25kg/m2). Descriptive statistics, bivariate associations and logistic regression for predictors of food insecurity and nutritional status were used to summarize the data.

Results: Mean age of participants was 69.5 ± 7.7yrs, 38% were young-old (60-64y), 24.2% middle-old (65-70y) and 37.5% old-old (70y+). There were more females (56.7%) than males (43.3%) and the majority (55.9%) were married. Although a majority (58%) of participants perceived themselves as having strong social support, fewer females than males had strong perceived social

support (48.6% vs. 51.4%; χ2=4.48; P=0.03). Prevalence of food insecurity was 61.7%. Mean BMI and BMA were 22.3 ± 4.8kg/m2 and 20.0 ± 4.2kg/m2, respectively: Approximately 18.3% of participants were underweight and 24.2% were overweight or obese. Prevalence of underweight was significantly (P=0.006) higher among the old-old participants while women (58.6%) were more likely than men (41.4%) to be overweight or obese (P=0.005). Current income above 250 Ghana cedis but not social support was protective against food insecurity (OR=-1.4: P= 0.029).

Conclusions: Cash transfers to elderly persons may help curb the prevalence of food insecurity among the elderly persons in this district. Overweight and obesity was more prevalent than underweight in this elderly population.

Keywords: nutritional status, elderly, food security, perceived social support, Ghana

144/2751

CHALLENGES AND OPPORTUNITIES IN DESIGNING WEEKLY IRON AND FOLIC ACID SUPPLEMENTATION PROGRAMS FOR ADOLESCENT GIRLS IN AND OUT OF SCHOOL IN 3 AFRICAN COUNTRIES

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Background and objectives: The 600 million adolescent girls living in developing countries have to become a focus of anemia reduction efforts to reach the WHA target of a 50-percent reduction in anemia by 2025. Despite the 2011 WHO recommendation for weekly iron folic acid supplementation (WIFAS), national policies and operational guidelines are lacking and national programs are not being implemented in most African countries. Our objective was to design demonstration programs informed by context specific formative research, to assess feasibility of delivery platforms that could inform national scale up to reach adolescent girls in and out of school system in Ethiopia, Kenya, and Senegal.

Methods: Formative research protocols were adapted for each country and studies were implemented with local partners in 2016 and 2017 to identify contextual opportunities for reaching adolescent girls with WIFAS and factors that could influence coverage and adherence. Purposive sampling guided the selection of adolescents, teachers, health workers, decision makers and influencers. Methods included focus group discussions (FGDs) and in-depth interviews (IDIs): Ethiopia–30 FGDs and 85 IDIs; Kenya– 45 FGDs and 36 IDIs; and Senegal–83 FGDs and 301 IDIs.

Results: As adolescent girls have low access of the health system for preventative services, the delivery of WIFAS through the school system was the most efficient platform for greatest reach in all settings. Engagement of teachers and school attendance have the greatest influencers on coverage and adherence. Attendance is often much lower than enrollment due to family and community pressures and a lack of basic amenities, such as female-friendly latrines and safe water. Reaching disperse out-of-school girls with health extension workers will be more resource and time intensive. Awareness of anemia is high, yet misconceptions are common. WIFAS benefits that motivate adolescent girls are related to current school performance, strength and health, rather than future reproductive potential; yet, distinct segments exist within adolescent girls.

Conclusions: Reaching adolescent girls with WIFAS requires multi-sector collaboration between health and education. Impact of these anemia reduction efforts requires overcoming gendered barriers to school attendance and youth-specific barriers to the health system, while recognizing the specific motivators of diverse adolescents in each country.

Keywords: Adolescent Nutrition, Anemia, Weekly Iron Folic Acid Supplementation, Formative Research, Program Design

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144/2756

PRENATAL NUTRITION, STIMULATION, AND EXPOSURE TO PUNISHMENT ARE ASSOCIATED WITH EARLY CHILD MOTOR, COGNITIVE, AND SOCIOEMOTIONAL DEVELOPMENT IN DAR ES SALAAM, TANZANIA

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Background and objectives: Despite growing evidence that early life experiences and exposures can impact child development, there is limited research on prenatal determinants in resource-limited settings. This study examines the association between prenatal factors, birth outcomes, and early life stimulation with motor, cognitive/language and socioemotional development in Tanzania.

Methods: We assessed motor, cognitive/language and socioemotional development among a cohort of 198 children aged 18-39 months in Dar es Salaam, Tanzania, whose mothers were previously enrolled in a randomized, placebo-controlled trial of prenatal vitamin A and zinc supplementation. Linear regression models were used to assess standardized mean differences in child development scores for randomized prenatal regimen and pregnancy, delivery, and early childhood factors.

Results: Children born to mothers randomized to prenatal vitamin A had significantly lower motor scores in minimally adjusted and multivariate analyses (-0.28 SD; 95% CI: -0.53- -0.03; p=0.03) as compared to children whose mothers did not receive vitamin A. There was no significant effect of randomized prenatal zinc on child development. In terms of observational factors, greater caregiver-child stimulation was associated with better cognitive/language scores (p<0.01), while children who experienced both verbal and physical punishment were reported as 0.29 SD (95% CI -0.53- -0.06; p=0.02) lower in socioemotional development than their peers who did not experience both verbal and physical punishment. Further, children of mothers who were <155cm tall had 0.27SD (95% CI -0.54- -0.01; P=0.05) lower scores on the cognitive/language subscale when compared with children of mothers who were ≥155cm tall.

Conclusions: Prenatal vitamin A supplements in a setting with low levels of vitamin A deficiency may not provide child development benefits. However, integrated environmental, educational, parenting, and stimulation interventions may have positive implications across child development domains in resource-limited settings.

Keywords: Early child development, Low-income countries, Prenatal Supplementation, Vitamin A Psychosocial Stimulation

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144/2765

CHARACTERIZATION OF UNDERNUTRITION AND ASSOCIATED FACTORS AMONG CHILDREN AGED 6 TO 24 MONTHS IN RURAL MALAWI

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Background and objectives: Given the high prevalence of child undernutrition in Malawi, this study aimed to examine the burden and risk factors of stunting and wasting using data from an impact evaluation study collected at baseline.

Methods: Using a cross-sectional dataset for 2,364 children, multivariable logistic regression analysis was conducted to identify risk factors of stunting and wasting at household, maternal, and child level separately among infants (6-<12 mo; n=778) and children (12-23 mo; n=1586). In all 42 risk factors were examined.

Results: The prevalence of stunting (LAZ<-2) was 45.3% and 56.4%, and wasting (WLZ<-2) was 1.6% and 3.0% among infants and children (12-23 mo), respectively. Among infants, stunting was positively associated with male sex (OR=1.66), age (OR=1.12), having no toilet (OR=1.65), and inappropriate hand washing (OR=1.32) [all 95%lower limit (LL)>1.0] and negatively associated with mother's age≥25 y and <35 y (OR=0.62; referent: age<25 y) [all 95%upper limit (UL)<1.0]. These variables were found also to be risk factors, except for having no toilet, among children (12-23mo): male sex (OR=1.58), age (OR=1.06), inappropriate hand washing (OR=1.30) (all 95%LL>1.0) and mother age≥25 y and <35 y (OR=0.77; referent:<25 y) (95%UL<1.0). Perceived small birth size (OR=1.41), having no TV (OR=2.01), previous child death (OR=1.53), not breastfeeding within 1-hour of life (OR=1.55) (all 95%LL>1.0) and housewife mother (OR=0.65; referent: farming) (95%UL<1.0) were additional risk factors for stunting among children (12-23 mo). Among infants, wasting was positively associated with having no kitchen (OR=7.45) and pre-lacteal feeding (OR=14.89) (all 95%LL>1.0) and negatively related to owning land for producing foods (OR=0.16) (all 95%UL<1.0). Of these variables, having no kitchen (OR=2.31) was only related to wasting among children (95%LL>1.0). Having no mobile phones (OR=2.85), unsafe water source (OR=0.38), having ≤2 rooms (OR=2.16), mother age>35 y (OR=2.27; referent:<25 y), and perceived small birth size (OR=2.02) were additional risk factors for wasting among children (all 95%LL>1.0).

Conclusions: More risk factors for stunting and wasting were found related to socio-economic status, size at birth, and mothers' feeding behaviors among children in their second year of life than in infancy in rural Malawi. Understanding age-specific risks of undernutrition would help refine approaches and interventions for prevention.

Keywords: stunting, wasting, risk factors, children, Malawi

of the age; as the body composition changes (increase of fat mass, decreased lean mass and loss of functionality) next to distinctive pathophysiological factors that are added to the base nutritional status. To recover nutritionally an elderly deteriorated is very difficult, hence the importance of valuing nutritionally this group and detecting early risks to take measures of action.

To assess the risk and nutritional vulnerability and functionality of musculo-skeletal tissue, in elderly hospitalized in Sanatorio La Trinidad during February – March, 2017

Methods: Quantitative research, descriptive, observational and cross-sectional.

Population: Adults ≥ 75 years interned in Sanatorio La Trinidad, excluding patients who had pathologies that by itself altered the base nutritional status.

Sample= 141, non probabilistic.

The selected sample was evaluated by different methods and tools: Mini Nutritional Assessment Questionnaire (MNA), Geriatric Nutritional Risk Index (GNRI), Nutritional Vulnerability Survey and grip force by dynamometry, subsequently data was tabulated and carried out an analysis of the same.

Results: Average age 82 years (SD±6). 61% was female. 74% lived with relatives and/or caregivers at the time of the internment, 25% lived alone and 1% in private geriatrics. The Nutritional Risk obtained by MNA: 43% normal, 45% risk and 12% malnutrition; according GNRI: 50% without risk, 18% under, 20% moderate and 11% high.

Nutritional Vulnerability Degree: 3% didn´t present, 91% mild, 6% moderate.

Grip Force: 41% weak, 38% normal, 21% strong.

Conclusions: Detecting the needs and the difficulties and challenges that the elderly live to procure food; along with the nutritional status evaluation and functionality of muscle-skeletal tissue, is essential for the decision-making during the internment and patient following after hospitalization.

Keywords: Food Vulnerability; Malnutrition; Muscle-skeletal functionality.

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RISK ASSESSMENT AND NUTRITIONAL VULNERABILITY AND SERVICEABILITY OF MUSCULO-SKELETAL TISSUE, IN ELDERLY HOSPITALIZED IN SANATORIO LA TRINIDAD DURING FEBRUARY – MARCH, 2017

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Background and objectives: Malnutrition situation is very common in the elderly and the risk increases due to conditions

144/2773

OMEGA6:OMEGA3 FATTY ACIDS IN THE DIET: RESULTS FROM A POPULATION-BASED STUDY

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Background and objectives: Although the effect of diet on health status is widely recognized, few Brazilian studies have evaluated the profile of fat consumption by the Brazilian population. The imbalance in the consumption of omega-6:omega-3 (n6:n3) fatty acids is related to inflammatory processes that increase the risk of developing non-communicable chronic diseases.

The aim of this study was to analyze the associations between the ratio of n6:n3 fatty acids and sociodemographic variables, health related behaviors and morbidity.

Methods: This is a cross-sectional population-based study, with a sample stratified by clusters and in two stages, conducted between 2008-09, in the city of Campinas, SP, Brazil. Fat intake was estimated using the 24-Hour Recall, and data were entered into the Nutrition Data System for Research software. In the analysis, the means of the n6: n3 ratio were calculated according to the independent variables, using simple and multiple linear regression, with a significance level of 5%. The food records of 3,303 individuals, aged 10 years or more, were analyzed.

Results: Lower values of the n6: n3 ratio were found in the strata of adults and the elderly, in those who ate fruit and milks daily, and in those who were physically active at leisure. The prevalence of inadequate omega 3 in the diet reached 13% of the population, and the omega 6 reached 100% among adult women.

Conclusions: The results reveal that the groups most vulnerable to the inadequate intake of omega-6 and omega-3 fats were adolescents, those who did not eat fruit and milk every day and those who did not practice physical activity at satisfactory levels. These findings show a concomitance of unhealthy behaviors and may contribute to the elaboration of strategies aimed at the adoption of changes in lifestyle.

Keywords: Fatty acid omega 6; fatty acid omega 3; ratio omega6:omega3; sociodemographic profile; dietary surveys.

144/2799

IMPACT OF ANTIBIOTICS ON MICROBIOME DEVELOPMENT & INSTEAD OF LATER HEALTH

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Background and objectives: Neonatal colonization drives postnatal gut maturation and induces the immune system, thus possibly impacting (long term) health. The exact impact of early life factors on later intestinal microbiota colonization and health remains unclear especially when disruptive factors like antibiotic use come into play. This study aims to provide insights into the development of the early life microbiome, especially for infants that received antibiotic treatments during the first week of life.

Methods: We will investigate the early life microbiome composition with 16S Illumina sequencing within the observational cohort of the INCA study. In this study, stool samples were collected from 450 term infants, of whom 150 had received an antibiotic treatment during their first week of life. Fecal samples and clinical outcomes were followed up until the age of 2 years, including 9 time points. Around the time of birth, the mothers also collected a fecal sample and both parents sampled the skin and oropharynx with a swab. Additional metagenomics studies will be used to study the transmission of micro-organisms from the parents to the infant.

Results: An overview will be made of the microbial development of the gut during the first 2 years of life, especially after short (2-3 days) or long (7 days) antibiotic treatment during the first week of life. A comparison based on the delivery mode (vaginal delivery, primary or secondary caesarean section) and the feeding mode (breastfed or formula fed) will be included.

Conclusions: Possible clinical effects of early life conditions like antibiotic use could be demonstrated with this data set. Such findings could help with the development of pre-, pro- and synbiotics to support an ecological balance in the infant gut microbiota when some life conditions are not optimal. This could resolve disease in later life, especially because of the tight interplay of the gut and immune system's development.

Keywords: Gut microbiota, Early life, Antibiotic use

Conflict of Interest Disclosure: Jan Knol and Ruurd van Elburg work for Danone Nutricia Research, part of the Danone Group and Danone Nutricia Research financed part of this study.

144/2800

MATERNAL NUTRITIONAL ADEQUACY AND GESTATIONAL WEIGHT GAIN IN VIETNAMESE PREGNANT WOMEN

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Background and objectives: Nutritional demands significantly increase during pregnancy to support healthy fetal growth and development. Understanding nutritional adequacy during pregnancy may help to identify appropriate approach to promote optimal nutrition for better pregnancy outcomes. The objective of the present study was to describe maternal nutritional adequacy and gestational weight gain among pregnant women in Vietnam.

Methods: A total of 226 singleton mothers aged 20 to 35 years at 26 to 29 weeks gestation took part in a prospective, multicenter, randomized controlled trial, parallel design with two treatments: (A) daily maternal nutritional supplementation containing macronutrients and a variety of micronutrients starting from 26 to 29 weeks gestation (i.e. baseline) to 12 weeks postpartum and a breastfeeding program (experimental group) or (B) standards of care which is to continue taking iron and folic acid supplementation daily until delivery (control group). Maternal nutritional intake was assessed at baseline using a standardized 24-hour diet recall method. Gestational weight gain during the first and second trimesters was calculated by subtracting pre-pregnancy weight from weight at 26 to 29 weeks.

Results: Ninety-five percent of the pregnant women had concurrent inadequacies for more than five nutrients and approximately one in two (i.e. 44%) pregnant women had concurrent inadequacies for more than ten nutrients at baseline. Almost two-thirds (i.e. 62%) of the pregnant women did not meet the recommended gestational weight gain defined by the Institute of Medicine. Infants in the maternal nutritional supplementation group had significantly higher birth weight, birth weight-for-age z-score, and birth head circumference-for-age z-score, compared with those in the iron and folic acid supplementation group (all P ≤0.049).

Conclusions: Nutrient inadequacies are very common in pregnant women in Vietnam and often occur as concurrent inadequacies across multiple nutrients. The high percentage of women who failed to meet recommended gestational weight gain during pregnancy is of concern. Maternal nutritional supplementation which provides macronutrients and various micronutrients is more effective than the routine iron and folic acid supplementation and can be used as a means to promote maternal nutritional status in order to improve birth outcomes.

Keywords: Pregnancy. Nutritional adequacy. Gestational weight gain. Maternal nutritional supplementation. Birth outcomes.

144/2805

BODY SELF-IMAGE OF ADOLESCENTS UNDER THE INFLUENCE OF THE MEDIA

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Background and objectives: The study aimed to evaluate a body self-image of adolescents under the influence of the media, and how much this influence alters your perception of your body.

Methods: Twelve adolescents between the ages of 15 and 18 participated in the study, at the High School of the Redentor College in Itaperuna, who returned to the Duly signed Free and Informed Consent Form. Two questionnaires were applied: a body self-image test, based on the self-image scale, developed and validated by KAKESHITA et al, 2006. The test was constructed by three self-image scales, each scale being 9 silhouettes, each silhouette corresponding to an average BMI, where the Teenager indicated on the scale 1, the figure that best represented the silhouette of his own body at the moment, and at scale 2, he indicated which silhouette he would like to have. Weight and height of each adolescent were collected to define their BMI, Thus defining the image that represented the real silhouette of the same. Afterwards, a questionnaire containing 29 questions was applied in order to evaluate the influence of the media on the body self-image, developed and validated by AMARAL et al, 2015. Subsequently, Pearson correlation analysis, ANOVA and Tukey, with significance of p < 0.05, between each scale and the questionnaire questions. The three self-image scales, S1, S2 and S3, were also compared for the determination of distortions between them. After the application of the test and questionnaire, an educational lecture was given, where the topics "Fashion Diets" and "Eating Disorders" were discussed.

Results: The TV was defined, according to the results, as an object of greater influence, followed by Magazines, Movies and Movie Stars. As predicted, this influence is stronger in females, but there is a distortion of body self-image in both sexes, suggesting dissatisfaction with body image also in both.

Conclusions: From the results found, it is concluded that the influence of the media in the self-image of adolescents is existing and very significant in both Sexes.

Keywords: body image; media; Teenagers

Further collaborators: This study was supported by scientific comittee of REDENTOR University

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144/2818

ANTHROPOMETRY AND BIOIMPEDANCE ANALYSIS: COMPARISON IN PREDICTING INTRA-ABDOMINAL FAT

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Background and objectives: Abdominal obesity, more specifically increased intra-abdominal adipose tissue, is strongly associated with increased risk of metabolic disease. Bioelectrical impedance analysis (BIA) may provide a better reliability non-invasive measure of visceral fat level (VFL) than anthropometric assessment of waist circumference (WC) considering the possible intra-observer and inter-observer technical errors which can be presented by this latter. The aim of this study was the evaluation of anthropometric measurements in comparison to multifrequency tetrapolar BIA in adult women.

Methods: Cross-sectional study of 406 women, attending a nutritional consultation at the Metabolic and Endocrine Diseases Research Foundation (Buenos Aires City, Argentina). An anthropometric profile was assessed by body mass index (BMI) and WC, considering increased values greater than or equal to 25 kg/m2 and greater than 88 cm, respectively. The VFL analysis was performed in a 3-h fast, by a four-way multifrequency bioelectrical impedance analyzer (model InBody 570). Statistical analysis with SPSS 19.0 using Spearman correlation, Mann Whitney test and chi2 test (p value <0.05).

Results: The mean age was 41.1 (SD = 15.2) years, stratified into two groups: 20-39 years (n = 220) and 40-65 years (n = 186). Mean BMI values for each group were: 25.4 (SD = 4.6) kg/m2 and 27.6 (SD = 4.9) kg/m2, respectively. WC was 81.1 cm (SD = 11.1) and 87.7 cm (DS = 11.0) for each age group, respectively. The prevalence of altered VFL was 50.0% (95% CI, 43.5-56.5%) and 76.9% (95% CI, 70.3-82.3%) respectively (p = 0.000). The greater age range the higher VFL. The correlation between VFL and WC was high positive (r= 0.84, p <0.0001). In the total of the sample 31.8% presented altered WC, while 62.3% presented VFL altered by bioimpedance and both variables were not independent (p <0,001). Stratifying by BMI, neither showed independence (Overweight/obese p=0,02; Normal weight p= 0,01). In overweight or obese women, 53.4% had altered WC, and 94.4% presented VFL altered by bioimpedance. In normal weight women, 4,07% had altered WC, and 18.6% had altered VFL by bioimpedance.

Conclusions: Positive correlation was found between WC and VFL and both variables were not independent beyond the nutritional status.

Keywords: anthropometry, bioelectrical impedance, intra-abdominal fat, women

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ADOLESCENT MOTHERS' HEIGHT AND BMI GROWTH VELOCITY IN CHILDHOOD PREDICT NEXT GENERATION'S ANTHROPOMETRICS IN ETHIOPIA, INDIA, PERU AND VIETNAM: A THREE-GENERATIONAL APPROACH

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Background and objectives: Previous studies have shown maternal birth weight and childhood growth predicts next-generation birth weight; few have considered adolescent mothers or have examined associations across three-generations, including children, mothers and grandmothers.

Methods: "Young Lives" is a longitudinal study of children growing up in poverty in Ethiopia, India, Peru, and Vietnam. We used data from 285 girls of the older cohort who had been visited at ages 8, 12, 15 and 19 approximately, and had given birth, in order to examine the predictive value of their body size and growth between 8 and 15 years on their infants anthropometrics. We analyzed height-for-age z-scores (HAZ), body-mass-index-for-age-z-scores (BMIZ) and conditional HAZ growth (measured as residuals in regressions of HAZt on HAZt-1, denoted cHAZ) and conditional BMI z-score (BAZ) growth (denoted cBAZ) on their infant's on infant's birth weight, birth weight z-score (BWZ), and conditional growth in weight-for-age-z-score (cWAZ), and HAZ. We also examined the grandmaternal BAZ and HAZ, as predictors of third-generation anthropometrics. We included controls for all three generations.

Results: One standard deviation increase in cHAZ growth between ages 8 and 15 years predicted 128.5g higher third-generation birth weight, 0.30 standard deviation higher BWZ, and 0.41 standard deviation higher cWAZ, but not third-generation HAZ.

Maternal BMI z-score (BAZ) aged 8 was associated with 0.21 higher BWZ (and birth weight, though at p<0.10), but not with third-generation cWAZ or HAZ growth. Maternal cBAZ predicted third-generation cWAZ and HAZ. Grandmaternal BAZ and HAZ did not predict the grandchild anthropometric outcomes that we measured but grandmaternal schooling did predict higher grandchild birth weight and BWZ (p<0.05).

Conclusions: Adolescent mother's size and growth during childhood predicted their offspring's birth weight, BWZ, HAZ and cWAZ. Grandmaternal schooling, but not size, predicted third generation anthropometrics.

Keywords: Adolescent growth, offspring anthropometrics, three generations, "Young Lives" study

144/2825

OPPOSING PREDICTIONS OF BIRTHWEIGHT AND PRE-PUBERTAL ANTHROPOMETRICS FOR AGE AT MENARCHE IN INDIA, PERU AND VIETNAM, RESULTS FROM THE "YOUNG LIVES" STUDY

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Background and objectives: Evidence on the associations of birthweight and pre-pubertal nutritional status with age at menarche for low- and middle-income countries is limited.

Methods: "Young Lives" is a longitudinal study of children growing up in poverty. We used data from 2001 Indian, Peruvian and Vietnamese girls of the younger cohort, born 2001-2002, who had been visited at approximately ages 1, 5, 8 and 12 years. We investigated the relation between birthweight and pre-pubertal anthropometrics, and age at menarche. Weibull survival models estimated hazards of earlier menarche based on birth weight z-scores (BWZ), and age 8-years BMI-for-age z-scores (BAZ) and height-for-age z-scores (HAZ). Estimates controlled for potential individual-, mother- and household-level confounders, and for changes in anthropometry between 1 and 8 years.

Results: In adjusted models, BWZ predicted later age at menarche (Hazard Ratio, HR=0.90, 95%CI: 0.83 - 0.97). Conversely, HAZ (HR=1.66 95%CI 1.5 - 1.83) and BAZ at 8 years (HR=1.28, 95% CI: 1.18 - 1.38) predicted earlier menarche. Changes in HAZ and BAZ between 1 and 8 years were not associated with earlier menarche. Associations were consistent across the three countries, though with variation in estimated magnitudes. The girl's mother's height and age were associated with later menarche.

Conclusions: This evidence points to consistently robust and opposite associations of birthweight versus pre-pubertal attained height and BMI with age at menarche age in three diverse settings in terms of nutrition, ethnicity and socio-economic status.

Keywords: Birthweight, menarche, nutritional status, prepubertal growth

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EFFICACY OF A COGNITIVE BEHAVIORAL TREATMENT VERSUS A TRADITIONAL INTERVENTION TO REDUCE ADIPOSITY WITHIN A NUTRITIONAL INTERVENTION PROGRAM IN OBESE SCHOOL CHILDREN

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Background and objectives: Obesity is a major health issue right now. The overwight epidemic worldwide has a fast growth, in rich and poor countries, and among all segments of society for the last decades. There is an urgent need for efficient methods to prevent and treat obesity among children. The aim of this study was to compare the efficacy of a cognitive behavioral treatment [CBT] versus a traditional intervention [TI] trials to reduce the adiposity within a nutritional intervention program in obese children.

Methods: A clinical trial to reduce the adiposity and to modify the dietary and physical activity habits was conducted in 25 obese children attending an elementary school in Guadalajara, Mexico. They were randomly assigned to TI or CBT intervention groups. The outcome variables of this report were measured at times 4, 8 and 12 months of intervention

Results: Most of the differences were found intra-group. Adjusted BMI value with z scores showed a decrease in the intervention group almost at all times (basal vs. 4months p=0.048, vs. 12months p=0.013 and vs. 16months p=0.018) and an increase for the control group at four months (p=0.021). Arm fat index had a significant decrease for the intervention group (basal vs. 12 months p=0.041), and after adjusting the arm anthropometric indicators with z scores, a significant increase of the muscular area (basal vs. 12months p=0.030) was observed along with a decrease in the fat index (basal vs. 16meses p=0.023). The energy adequacy percentage revealed changes mostly in the intervention group with an energy intake decrease at basal vs. 4 months (p=0.013) and vs. 16 months (p=0.013), and the lipids intake (basal vs.4. months p=0.046). The evaluation of PA by the EUROFIT battery test adjusted values with age and sex percentiles showed practically no differences.

Conclusions: The effectiveness of the intervention showed higher intra-group statistical differences in the intervention group

with a decrease of the values of adiposity and energy intake. The inter-group comparison showed practically no statistical difference. The null hypothesis could not be rejected entirely because the differences were mostly intra-group, however, results have clinical relevance due to the decrease of adiposity and energy consumption.

Keywords: Cognitive Behavioral Treatment, obesity, children, food habits, physical activity habits

Further collaborators: Juan Ramón Vallarta Robledo. Nutritionist. Human Nutrition Institute. University of Guadalajara. Mexico.

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DIETARY HABITS AND LIFE-STYLE FACTORS INFLUENCE THE HEALTH-RELATED QUALITY OF LIFE AND THE LEARNING ATTITUDE IN SCHOOLCHILDREN

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Background and objectives: Since the Food Education Basic Law "Shokuiku" was enacted to promote childhood nutrition education, nowadays many "Shokuiku" programs are performed in school. Recently, many common health problems such as a decline in physical strength, underweight, or obesity in Japanese children and adolescents are caused by their polarized amount of exercise. The purpose of this study was to elucidate the influence of the dietary habits and life-style factors on quality of life and the learning attitude in schoolchildren.

Methods: From March to May 2015, the survey was conducted in 941 schoolchildren (459 boys and 482 girls aged 9–13 years) from nine schools in Miyazaki. Dietary habits and life-style factors were anonymously assessed through a self-administered questionnaire and brief self-administered diet history questionnaires for 10-year-olds (BDHQ10y) and for 15-year-olds (BDHQ15y). Quality of Life (QOL) were assessed by KidKINDL for children and adolescents. We performed statistical analysis by Chi-square test, factor analysis by the least-square method, and covariance structural analysis. This study has been approved by the research ethics committee of the University of Miyazaki.

Results: QOL of "self-esteem score" and "school score" were lower in 12-13y old groups. By the factor analysis by the least-square method, three factors were extracted and named "interest in cooking", "importance of food" and "enjoyment of sports". According to each category score, the children were divided into high- and low-score groups. Food intake and nutrient intake were mainly better in the high score group of "interest in cooking". QOL total score was higher in the high score group of "importance of food" and "enjoyment of sports". "Interest in cooking" or "importance of

food" had the strong effects directly and indirectly on QOL total score and on improvement of "desire to learn and learning attitude" by covariance structural analysis.

Conclusions: The present analytical results indicated that teachers and parents should work together to develop an "interest in cooking" and "importance of food" as "Shokuiku" program in schoolchildren so as to promote their healthy growth and development.

Keywords: dietary habit, life-style, QOL, schoolchildren, interest in cooking

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CODEX: PROTECTING INFANT AND YOUNG CHILD HEALTH OR FACILITATING THE MARKETING OF FOODS FOR INFANTS AND YOUNG CHILDREN?

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Background and objectives: The UN body, Codex Alimentarius, with parent bodies, World Health Organization (WHO) and Food and Agricultural Organization (FAO) sets standards for food products and food commodities including infant formulas and foods for infants and young children. Codex is mandated to promote fair practices in the trade of food and the protection of public health. However in implementing these two mandates, Codex frequently finds itself facing conflicting priorities in its decision making to set food standards.

Although the participants in the process include government representatives of the UN member states, the parent organizations WHO and FAO and non-governmental organizations (NGOs), it is the latter where large numbers of industry based "NGOs" primarily consisting of food and drinks industries exert extensive influence on Codex standards. In effect outcomes routinely reflect and support the trade and marketing interests of the food and drinks industries.

Methods: The presentation will focus on the standard setting of infant formulas and foods for infants and young children to highlight the conflict of public health protection and, in this case the globe's most vulnerable population, infants and young children and the facilitation of trade in baby foods. The presentation will demonstrate how trade priorities marginalize the protection of health and safety and in the special case of setting standards for formulas and baby foods, the protection of breastfeeding.

Results: Codex Standards are the benchmarks for the World Trade Organization and in effect are mechanisms for harmonizing trade in foods, with resultant loss of national regulatory and policy setting. In the special case of infant formulas and foods for infants and young children, national regulatory loss may result in a government's lack of ability or willingness to implement legislative measures - the International Code of Marketing of Breastmilk Substitutes, the WHA resolutions and other key safety mechanisms to protect breastfeeding and subsequent maternal and child health.

Conclusions: Examples will be presented to demonstrate the impact on measures to protect infants and young child health.

Keywords: Codex. breastfeeding. health. protection. policy.

SUSTAINABLE UNDERNUTRITION REDUCTION IN ETHIOPIA (SURE) PROGRAMME EVALUATION (2016-2019): CROSS-SECTIONAL BASELINE SURVEY

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Background and objectives: Sustainable Undernutrition Reduction in Ethiopia (SURE) programme is the first Government-led multi-sectoral integrated health and agriculture sector programme for nutrition outcomes. The programme will deliver an enhanced Community-Based Nutrition (CBN) program. The objective was to establish baseline characteristics at the outset of the programme and assess the comparability in intervention and comparison district.

Methods: A cross-sectional survey was carried out in four agrarian regions of Ethiopia from April to July 2016. The survey used multistage cluster sampling at the village and household levels. The sample size calculations for the survey was based on detecting a change at end line in nutritional status and key IYCF practices that can be attributed to the SURE intervention. A total of 4980 children 0-47 months old in 4299 households were involved in the survey. The survey covered 36 intervention and 36 comparison districts, a total of 72 districts.

Results: The prevalence of stunting among children 6-23 months old was 31.3% and 27.9%; whereas underweight was 19% and 16.5% and wasting was 9% and 8% in the intervention and comparison districts, respectively. Among children 24-47 months old, stunting prevalence was 46.9% and 40.5%, underweight was 23.7% and 21.6% and wasting was 4% in the intervention and comparison districts, respectively.

Breastfeeding was nearly universal in both groups. Over 60% of children initiated breastfeeding within an hour of birth and nearly 80% of children in both arms were exclusively breastfed. About three-quarters of all children initiated complementary feeding between 6 to 9 months of age but only 4.5% and 7.8% of all children had access to the minimum diversified diet in the intervention and comparison districts, respectively. About 41% and 45% of all households were food insecure in the intervention and comparison districts, respectively. Only about 5% in intervention and 8% in comparison districts of all mothers interviewed had access to minimum diversified diet.

Conclusions: The intervention and comparison districts are comparable in most of the demographic and socio-economic characteristics. The prevalence of undernutrition, child feeding practices, food insecurity and women dietary diversity are more or less comparable between the two groups.

Keywords: Infant and Young Child Feeding Practices, Complementary Feeding, Dietary diversity, Stunting, Ethiopia

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Track 3: Public Health Nutrition and Environment

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SOCIOECONOMIC DISPARITIES IN THE CONSUMPTION OF UNPROCESSED FOOD (FRUITS AND VEGETABLES): NATIONAL SURVEY OF THE NUTRITIONAL STATUS IN COLOMBIA, 2010

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Background and objectives: Establish the prevalence and frequency/day and estimate inequalities in consumption of fruits and vegetables (F&V).

Methods: Design. Multilevel analysis based on cross-sectional data from the National Survey of the Nutritional Situation (EN-SIN-2010)

Setting. Colombia.

Subjects. Adults between 18 and 64 years old (n=5,217) and geodemographic units (n=33).

Results: 88.7% and 72.7% respectively consume fruit juice and cooked vegetables. At the individual level the consumption of whole fruits and juice in women is no different than men; Adjusted prevalence ratio (PR), 0.91 (95% CI; 0.75 to 1.10) and PR=0.91 (95% CI; 0.71 to 1.17), respectively. In women the consumption of raw and cooked vegetables is higher, PR=1.28 (95% CI; 1.05 to 1.56) and PR=1.27 (95% CI; 1.08 to 1.50), respectively. Women reached the highest frequency/day of consumption in fruit juice, 1.02 (95% CI; 0.98 to 1.07), and the smallest man in the consumption of cooked vegetables, 0.31 (95% CI; 0.28 to 0.33). At the ecological level results on consumption they are similar. At the individual level the Gini coefficient for the prevalence was between 0.09 and 0.16 and for frequency/day between 0.51 and 0.62. At the ecological level, the Gini index for the prevalence was between 0.04 and 0.14, for frequency/day between 0.03 and 0.11.

Conclusions: Colombian population does not meet the recommendations of F&V consumption. Men and women prefer drinking fruit juice. Inequality is evident in the consumption of vegetables, to the disadvantage of men. The poorest consume fewer fruits and vegetables. Reducing poverty would increase the frequency/day of consumption.

Keywords: Consumption, Fruits and Vegetables, disparities, unprocessed food.

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WAIST-TO-HEIGHT RATIO AND ITS RELATION WITH CARDIOMETABOLIC RISK FACTORS IN CHILDREN FROM BUCARAMANGA, COLOMBIA

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Background and objectives: Currently, the waist-to-height ratio has emerged as a practical and useful indicator for identifying cardio-metabolic risk in child and adolescent population. Objective: To evaluate the association between the waist-to-height ratio and the cardiometabolic risk factors in a cohort of children in Bucaramanga, Colombia.

Methods: Analytical cross-sectional study. Child population between 6-10 years old from Bucaramanga (n = 1,282). Independent variable: waist-to-height ratio. Dependent variables: hypertension, pre-hypertension, overweight/obesity, impaired glucose, insulin resistance, dyslipidemia. The association between dependent and independent variables was evaluated using logistic regression models. Data analyzed in Stata 12.0.

Results: 9.77% of the children presented a waist-to-height ratio of risk (95% CI: 8.19 to 11.52). After adjustment for age, sex, socioeconomic status and physical activity, the waist-height index of risk was significantly associated with lower HDL levels and higher levels of triglycerides, insulin resistance, hypertension and prehypertension (OR=2.95 IC 95%: 1.82 to 4.79, p=0.000, OR=2.60 IC 95%: 1.59 to 4.26, p=0.000, OR=10.68 IC 95%: 4.88 to 23.36, p=0.000, OR=8.36 IC 95%: 1.99 to 35.15, p=0.004 and OR=2.98 IC 95%: 1.66 to 5.36, p=0.000, respectively).

Conclusions: Children with waist-to-height ratio of risk were more likely to develop high levels of blood pressure and triglycerides, insulin resistance and lower levels of HDL. Interventions are needed for cardio-metabolic risk prevention in children and teenagers.

Keywords: Child. metabolic syndrome x. waist-height ratio.

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FOOD SECURITY NUTRITION AND HEALTH: THE PLIGHT OF NEGLETED MAJORITY IN A DEVELOPING COUNTRY

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Agricultural Economics.

Background and objectives: The world has more than enough food, yet many are food insecure in sub Saharan Africa, Agriculture plays a key role in providing abundant food and fiber nationally in agricultural based countries and providing food for

all. Food security is in operation when all people at all times have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary need and food preference for an active and healthy life. Food consumption at the household level is often influenced by the amount and varieties of food produced and available, income levels of households and nutritional knowledge of the people in each household. Food insecurity is operating in a number of countries in sub Saharan Africa. Research has shown that lack of access to food has affected the development of and prevention of medical condition and diseases This paper explored the human health risks associated with changing environment and strategies toward sustainable nutritional food.

Methods: The methods used for this study were compilation of secondary data and copious research literature in order to come up with required strategies for sustainable food with good nutritional status that can be adopted in most Saharan Africa

Results: The research revealed that food waste occurred at all stages of production process, post harvesting and preservation. These were evidences that shown that the value chain of food products were under developed There were human health risks associated with environmental issues. These included increased rainfall that multiplied the spread and incidence of vector. Peak flow contributed to widespread malaria.

Conclusions: The paper concluded among others that efforts should be made to promote food value chain in sub Saharan Africa. Producers of food should be encouraged to plant environmental resistant seeds and food essential nutrients should be promoted for consumption

Keywords: Food, Health Nutrition and Environment

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DIAGNOSTIC ACCURACY OF WAIST TO HEIGHT RATIO IN SCREENING OF INSULIN RESISTANCE

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Background and objectives: To explore the sensitivity and specificity of waist to height index as indicator of insulin resistance in pediatric age and to obtain cut-off points to simplify the diagnosis.

Methods: One thousand and two hundred and eighty two child population between 6 and 10 years were analyzed. Anthropometric measures were taken (height, weight, waist circumference and skinfolds thickness), and waist to height ratio (WHR), insulin resistance, body mass index (BMI) and fat percentage were

calculated. ANOVA test was used to evaluate the performance of anthropometric variables during the growth period. ROC curve analysis (Receiver Operating Characteristics) was applied using WHR as test variable and insulin resistance status as criterion variable. The sensitivity and specificity values, areas under the curve (AUC), confidence intervals 95%, and cut-offs points were obtained. The statistical and graphical procedure was performed using Stata® 12.0.

Results: WHR does not vary with age. AUC ranged from 0.7490 (boy) to 0.7515 (girls) indicating that the WHR has a high predictive power to identify the subjects previously classified as insulin resistance using considered criteria.

Conclusions: WHR proved to be an appropriate and acceptable predictor of insulin resistance in children between 6 and 10 years. Cut-offs points of WHR that identify insulin resistance are: 0.46 (AUC=0.7504) in males and 0.46 (AUC=0.6680) in girls.

Keywords: Waist to height ratio, ROC curves, insulin resistance, Schoolchildren, Colombian population

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DIETARY PATTERNS AND BONE MINERAL DENSITY AMONG LONG TERM USERS OF DEPOT MEDROXYPROGESTERONE ACETATE COMPARED TO NON HORMONAL CONTRACEPTIVE USERS, KAMPALA- UGANDA

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Background and objectives: Depot medroxyprogesterone acetate (DMPA) use is greatly associated with decline in bone mineral density (BMD). Although the role of individual nutrients on bone health has been well elucidated, no study among African women has analysed the dietary patterns associated with BMD among DMPA users who are at a higher risk of bone loss especially that of the lumber spine (LS). The aim of this study was to determine whether certain dietary patterns are associated with low BMD of the lumbar spine among DMPA users and non-hormonal contraceptive users in a group of African women.

Methods: We conducted a comparative observational study among 151 women recruited from three family planning clinics in Kampala of whom 100 were long term DMPA users and 51 were non-hormonal contraceptive users. Socio demographic, clinical and dietary intake data were collected using pretested questionnaires. Dietary patterns were derived using principal component analysis (PCA) from a 60-item food frequency questionnaire. Dietary pattern scores for each dietary pattern were computed and categorised into two; low and high. The association between the dietary patterns and LS BMD was investigated using multivariate logistic regression at the 95% Confidence Interval (CI).

Results: LS BMD was classified as low and normal; where low represented osteopenia and osteoporosis. The prevalence of low LS BMD among DMPA users and non-hormonal users was 52.0% and 35.3% respectively. Four dietary patterns were derived: the bread, cereal and milk (BCM) pattern, plant and animal protein pattern, Fruit and vegetable pattern and the traditional Ugandan pattern. After adjustment for potential confounders, low consumption of the BCM pattern was associated with higher odds of low LS BMD among DMPA users (AOR: 10.6, 95%CI: 2.00, 56.73; p=0.006) and not in non-hormonal contraceptive users. We found no significant association between the other dietary patterns and low LS BMD.

Conclusions: Low LS BMD is highly prevalent in DMPA users compared to non-hormonal contraceptive users. However, our findings suggest that increased consumption of bread, cereals and milk could ameliorate the effects of bone loss in the lumbar spine among women who use DMPA.

Keywords: Dietary patterns, BMD, DMPA, contraceptives, Kampala

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CREATIVE AND FUN EDUCATION TO IMPROVE KNOWLEDGE OF NUTRITION IN SCHOOL CHILDREN IN BEKASI, INDONESIA

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Background and objectives: The lack of fruits and vegetables consumption occurs in the entire population of Indonesia, that occurred from children to adults. Lifestyle and growing fast food and lack of knowledge about nutritious foods make dietary changes that are not healthy and nutritious dietary pattern. This study aims to improve the knowledge on elementary school children through nutrition education interesting and creative.

Methods: The study design was cross-sectional. The total sample was 78 in elementary school at Bekasi City. The sample was divided into two groups and given the same education. Before education, student was taking pre-test to determine their prior knowledge. Furthermore, education is given in the form of games and dances. Games and dances was conceptualized so that students can understand the nutrition, particularly of fruits and vegetables. After educating students directly given post-test. The nutritional status of students is determined by measuring the weight, height, and BMI for age and was analyzed by WHO Antro. Differences of knowledge were analyzed with SPSS.

Results: Samples were children aged 8-10 years. Most of the samples were girl (71.8%). Based on BMI for age, 6.4% are obese children, 28.2% are underweight and 11.5% are severe underweight. Research found that proportion of less knowledge (pre-test) in underweight and severe underweight children was 54,5% and 88.9%. The average pre-test score was 63.62 and the average score of post-test 82.43. There are differences in the average value of pre and post test with p <0.05.

Conclusions: The provision of nutrition education by games and dancing can improve children's knowledge. This study suggests needs further evaluation and measuring the children's knowledge on a regular basis to ensure knowledge of nutrition has not disappeared.

Keywords: Nutrition Education Knowledge School Children

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IS SALT CONSUMPTION IN LOCAL FOODS A PUBLIC HEALTH CONCERN AMONG MAURITIAN ADULTS?

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Background and objectives: Salt is the main source of sodium in the diet. A small amount of salt is important for good health. However, salt consumption has increased nowadays and most of the sodium we eat comes from processed, ready-to-eat foods and this can lead to high blood pressure in sensitive individuals. The main objectives of this study are to investigate whether or not Mauritians are aware of the local recommendations of salt to be consumed per day based upon the World Health Organisation (WHO) recommendations; to know the attitudes of Mauritian adults towards salt consumption and its recommended daily intake; and to evaluate the reported daily consumption of salt among Mauritian adults.

Methods: A cross-sectional study was carried out to evaluate the reported daily consumption and to know the attitudes towards salt consumption and its recommended daily intake. The study was carried out among 300 respondents chosen at random, aged between 30 and 60 years old and consisted of both males and females. A survey-based questionnaire was designed to carry out the investigation, and the results obtained were interpreted and analysed using the Statistical Packages for Social Sciences (SPSS 20.0).

Results: The results obtained showed that 51.3 % of the respondents were aware of the local daily salt intake recommendation, and reported putting 1 teaspoon (5 grams) of salt during their food preparation. 85.7 % of the respondents also found this recommendation adequate. However, another 27.4 % of respondents were neither aware of the fact that 1 teaspoon of salt is the daily recommended amount to be consumed nor did they consume the 5 grams of salt as recommended. Furthermore, the food frequency questionnaire included in the survey revealed that the consumption of highly salted processed foods was quite high among the respondents.

Conclusions: The study demonstrates that nutrition education programmes need to be set up so as to raise awareness on the recommended daily intake for good health as well as on the risks associated with excessive intake of highly salted processed foods given that we have noted that it is the consumption of these foods which is the major culprit.

Keywords: Salt, high blood pressure, highly salted processed foods.

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MEAL QUALITY AND SOCIODEMOGRAPHIC CONDITIONS ASSOCIATIONS DIFFERS ACCORDING TO LOCATION OF MEAL PREPARATION

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Background and objectives: The choice of foods that are consumed in the same meal occurs in a very complex way, being modulated by several determinants, such as sociodemographic conditions, gender, age, nutritional status, place of consumption, food preparation, and cultural habits. In this context, the study aims to estimate the association between sociodemographic conditions and nutritional quality of main meals consumed by Brazilian adults, stratifying by the location of meal preparation (home/away from home).

Methods: We used individual food consumption data (food intake record) of 16,096 adults, of both gender, from the National Dietary Survey/Brazilian Household Expenditures Survey. The main meal was defined as the meal with the highest contribution to overall energy intake. In this case, it was lunch, classified by period of consumption (11AM-15PM). To evaluate the meal quality, we applied the Main Meal Quality Index (MMQI), 0 to 100 points, which consists of 10 items of equal weights; the items were the following: fruits (in grams), vegetables (excluding potatoes, in grams), animal protein/total protein ratio, fiber (in grams), carbohydrate (% of energy), total fat (% of energy), saturated fat (% of energy), processed meats (in portions), sugary beverages and desserts (in portions), and energy density. The association between main meal quality and each variable was measured by multiple linear regression models, adjusted by main meal energy.

Results: MMQI was positively associated with males and age; and negatively associated with years of education, family income and meals prepared away from home. Meals prepared at home (58 points) maintained the association with gender, age and family income; while meals prepared away from home (55 points), with years of education.

Conclusions: Main meal prepared away from home had a worse quality. Furthermore, we found different associations between MMQI and sociodemographic conditions between the locations of meal preparation.

Keywords: meal quality; nutrition; eating away-from-home, sociodemographic conditions.

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ASSOCIATION BETWEEN BODY MASS INDEX AND INFANT BIRTH WEIGHT AMONG PREGNANT WOMEN FROM A RURAL AREA IN NIGERIA

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Background and objectives: Maternal anthropometry is a significant determinant of fetal outcomes. Suboptimal and excessive maternal weight gain (MWG) during pregnancy is a risk factor for poor pregnancy outcomes. For example, suboptimal MWG is reported to be associated with low birth weight (LBW); a risk factor for slow cognitive development, onset of chronic disease in adulthood, neonatal morbidity and mortality. Because the relationship between maternal body mass index (BMI) and fetal outcomes differ by race, we explored the relationship between MWG among pregnant women and infant birth weight (IBW) from a rural setting located Southwestern part of Nigeria.

Methods: 603 singleton pregnant women who attended two ante-natal clinics from 2008-2014; in Ibarapa East local government area of Oyo State Nigeria were systematically sampled, with a retrospective review of case records and retrieval of socio-demographic and obstetric information by trained health professionals, using a pre-defined protocol after due ethical considerations. Pearson's correlation ($p<0.05$) was applied to assess the relationship between MWG, BMI before delivery and IBW.

Results: About 10.4% were adolescent women (ADW) at conception (18.0 ± 1.1 years) and mean age of adult women (ALW) was 27.0 ± 5.0 years at conception. MWG was significantly higher ($t=2.0$, $p=0.04$) among ADW (5.5 ± 3.4kg) compared to ALW (4.8 ± 3.1kg). Contrariwise, mean IBW was significantly lower ($t=-4.1$, $p=0.000$) among infant delivered by ADW (2.9 ± 0.4kg) compared to those of ALW (3.1 ± 0.5 kg). Furthermore, the prevalence of LBW (IBW<2.5kg) was higher ($\chi2=3.5$, $p=0.06$) among infant delivered by ADW (10.0%) compared to those of ALD (4.8%). IBW positively correlated with BMI ($r=0.1$, $p=0.004$) after adjusting for age, parity and MWG.

Conclusions: While Optimal MWG is necessary for optimal fetal outcomes, excessive MWG is also associated with LBW. Further research is necessary to determine the range of MWG suitable for optimal maternal health and fetal outcomes in this setting.

Keywords: Maternal weight gain, Infant birth weight, Rural area, Nigeria.

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MORTALITY ATTRIBUTABLE TO OVERWEIGHT AND OBESITY IN PARAGUAY, PERIOD 2010-2014

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Background and objectives: Due to the high prevalence of overweight and obesity currently present in our country, this study aims to describe the mortality attributable to overweight and obesity in people older than 15 years in Paraguay, according to sex and age group, between 2010 and 2014.

Methods: For the purpose, secondary data sources were used: the National Survey of Risk Factors and Non-Communicable Diseases (NSRF) in 2011 and the vital statistics for that period. For the estimation of mortality attributable to overweight and obesity, the prevalence-dependent method was used, based on the calculation of the Population Attributable Fraction (PAF).

Results: The main results indicate that during the study period, 13,359 people died (2672 deaths per year) due to causes attributable to overweight and obesity, which corresponds to 10.0% of the total deaths occurring during the 5 years of study. 7.4% and 13.5% of the deaths attributable to excess weight correspond to men and women respectively. The main cause of death attributable is diabetes, accounting for 74.1% and 73.3% of deaths in males and females respectively. The cause of death coded by ICD-10 as obesity showed a progressive increase from a couple of cases during 2010 to more than 50 cases per year for both sexes in 2014.

Conclusions: This study shows that almost 1 in 10 deaths occurring in the country are associated with being overweight. It is an important data for public health to estimate costs and plan more radical intervention strategies in this area.

Keywords: Mortality, overweight, obesity, non-communicable diseases.

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A SOCIO-ECOLOGICAL EXAMINATION OF WEIGHT-RELATED CHARACTERISTICS IN HOME ENVIRONMENTS OF FAMILIES WITH YOUNG CHILDREN

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Background and objectives: The prevalence of childhood obesity is a great public health concern. Obesity's pervasiveness is due, in part, to myriad socio-ecological factors (i.e., intrapersonal, interpersonal, and environmental) that are modifiable via public health interventions. The home environment and lifestyle patterns are understudied, yet critical to childhood obesity prevention. Thus, this study aimed to systematically examine the home environment and lifestyle patterns using a socio-ecological framework.

Methods: Parents (n=489; 93% female; 32.3±5.7SD yr) of preschool children completed an online survey that comprehensively assessed weight-related intrapersonal, interpersonal, and environmental factors using valid, reliable instruments.

Results: Healthy intrapersonal dietary behaviors identified in this study population were parent and child intakes of 100% fruit/vegetable juice in amounts congruent with recommendations and low intakes of sugar-sweetened beverages. In contrast, milk intake was low and parent fat intake was high. The home environment's food supply supported healthy intakes of juice and low sugar-sweetened beverage intakes, but also provided little milk and generous amounts of salty/fatty snacks. Physical activity levels, time spent in sedentary activity, and the home's physical activity and media environment were not ideal. Environmental supports for active play inside homes were modest and were slightly better in the yard area outside homes and the neighborhood. Screentime greatly exceeded recommendations likely because homes had abundant media equipment and parents put few limits on children's use of media that promoted sedentary behavior. Most parents met sleep recommendations, whereas children did not. Family interpersonal/social interactions had several positive qualities, including frequent family meals eaten in a positive environment. However, parents were neutral about modeling healthy eating to their children and infrequently modeled physical activity behavior. Parents had considerable self-efficacy with regard to their ability to perform food- and physical activity-related childhood obesity protective practices.

Conclusions: In this study, an array of intrapersonal, interpersonal, and environmental factors in the family home environment placed young children at increased childhood obesity risk. Public health professionals should target these factors in interventions aiming to help parents create home environments and lifestyle practices that promote optimal child development and health while reducing children's risk for obesity.

Keywords: home environment. parent. child. obesity. socio-ecological framework

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SEMANTICS OF THE SUSTAINABLE DEVELOPMENT GOALS 2015-2030 FOR NUTRITION: THE CONNOTATION GAINED (OR LOST) IN TRANSLATION FROM ENGLISH TO SPANISH

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Background and objectives: It is generally recognized that goals 1-6, 12, and 17 of the Sustainable Development Goals 2015-2030 (SDGs) are related to human nutrition. In her introduction to the keynote address of the 2015 SLAN meeting organized by Dr. Francesco Branca on the topic of the SDGs, its president, Dr. María-Nieves, noted that the English word "sustainable" could be translated into Spanish as either "sostenible" or "sustentable", a debate that had not been totally resolved within UN circles. Intrigued by whether this is an important or trivial distinction for the Spanish-speaking world, we sought here to explore and rationalize the contextual semantic connotation and consequences in each translation of "sustainability."

Methods: We undertook to parse the differential meanings of "sostenible," which connotes "persisting-through-time" (enduring) as in "a sustainable monthly payment" and "sustentable," which connotes "supported-by-congruent-reasoning" (coherent) as in "the motion by the defense lawyer is sustained". Connotation will differ profoundly in Spanish semantics depending on the translated format. We performed an inquiry among key-informants from grass-roots-based organizations in western Guatemala to explore the latter connotation in practical and theoretical contexts.

Results: The Mayan-Cosmovision worldview ("Cosmogónico"), which underpins the archetypical intrinsic-spiritual-historic guidance for quotidian life, seeks equilibrium with the environment. As such, the perspective of the informants was generally holistic and emancipatory (from foreign-language discourse), with commentaries favoring a preference for "sustentable" connotation (logically-coherent).

Conclusions: Although likely that SDGs' UN framers saw the word sustainability in terms of repetition of the actions and their benefits in a context that itself allows the environment to endure (sostenible), the ambiguity with the connotation of logically-coherent (sustentable) adds richness and depth to the discussion of the nutrition SDG-interventions across the next decade and a half.

Keywords: Sustainable Development Goals, Spanish semantics

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GLOBAL NUTRITION 1995-2015: A SHRINKING HUNGRY, AND EXPANDING FAT WORLD

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Background and objectives: Following its publication in 2008, the global nutritional index (GNI) has been updated from 1995-2015 to show the world trends in malnutrition, as it alone penalizes a country for over-nutrition.

Methods: We have re-calculated the GNI according to the methodology of the human development index, using geometric means, based on three indicators of nutritional status: deficits (DALY rates due to nutrition deficiency), food insecurity (FINS) (prevalence of undernourishment) and excess (prevalence of female obesity). GNI (range 0-1) was calculated for 184 countries classified into seven groups according to the World Bank and WHO.

Results: The collective world GNI increased progressively from 0.816 for 1995 to 0.836 for 2015. In all 7 country groups there was a decrease in deficits and FINS, and an increase in obesity. These trends caused a shift from the leading ranking country group in 1995 – high-income countries (0.869, 0.821-0.900) – to European low- and middle-income countries (LMIC) (0.841, 0.823-0.857) in 2005, and South-East Asian LMIC (0.851, 0.822-0.903) in 2015. African LMIC were the lowest ranking groups for GNI in 1995 (0.654, 0.558-0.745) and 2005 (0.716, 0.652-0.778), but were replaced by American LMIC in 2015 (0.741, 0.724-0.772). Among the top 20 ranking countries, the number of LMIC increased from 3 in 1995, to 13 in 2015; among the bottom 20 ones, no high-income countries were listed in 1995, while 5 countries appeared in 2015 and the number of African LMIC decreased from 13 to 7. Over these 20 years, African LMIC (0.654, 0.558-0.745 to 0.757, 0.703-0.801) and South-East Asian LMIC (0.794, 0.612-0.831 to 0.851, 0.822-0.903) improved significantly (P<0.001); while high-income countries (0.869, 0.821-0.900 to 0.813, 0.749-0.851), American LMIC (0.790, 0.745-0.811 to 0.741, 0.724-0.772) and Eastern Mediterranean LMIC (0.760, 0.733-0.827 to 0.744, 0.669-0.770) worsened significantly (P<0.01). European LMIC (0.823, 0.795-0.863 to 0.830, 0.807-0.855) and West Pacific LMIC (0.767, 0.605-0.818 to 0.781, 0.481-0.891) remained stable (P>0.500).

Conclusions: From 1995 to 2015, under-nutrition decreased, whereas over-nutrition increased steadily to become the main cause of malnutrition worldwide. The next Sustainable Development Goals should include alongside zero hunger – reduce obesity.

Keywords: global nutrition index, obesity, nutrition deficiency, food insecurity, time trend (1995-2015)

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FACTORS INFLUENCING ON SOFT DRINKS CONSUMPTION PATTERNS AMONG SAUDI POPULATION MEASURED BY PRINCIPAL COMPONENT ANALYSIS

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Background and objectives: Introduction: Soft drinks are considerable liquid sources of added sugars in diet which may lead to obesity and type 2diabetes. Saudi Arabia is identified as the largest consumer of soft drinks in Middle East and this market increases continuously.

Objectives: To assess the soft drinks consumption patterns and identify the association between different factors influencing on these patterns among adults Saudis.

Methods: A cross-sectional study conducted from July – September 2016 in KSA. 1194 eligible Saudi participants answered an online questionnaire. Data collected was on socio-demographic characteristics, patterns of soft drinks consumption, and factors influencing these patterns including availability, affordability, social gathering, TV/electronic device use, advertising, social gathering, eating out or at home. Response categories used a 5-points Likert scale. Statistical analysis was performed using SPSS to assess the correlation between different factors. Principal component analysis (PCA) (orthogonal rotation, varimax option) was applied to ascertain influencing factors. Barlett's test was significant and KMO test=0.8.

Results: 16% of the participants reported that they consume soft drinks either daily or usually (3-6 times/week). Frequency and quantity of soft drinks consumed were significantly and positively associated (R2= 0.4 and p<0.0001). Significant and positive correlation were found between availability and social gathering, eating out of home and habits, and eating at home and watching TV. PCA revealed two component explaining 57.8% of variance labeled as: 1- "individual" grouping eating at home and watching TV/electronic device use, 2- "social-environmental" grouping the rest of the factors.

Conclusions: Messages aiming to limit soft drinks consumption should consider both frequency and quantity. Reducing soft drinks consumption needs a comprehensive approach considering the following: 1- Increasing population awareness about the negative consequences of increased soft drinks consumption, 2- promoting favorable environment by making soft drinks less affordable (increasing its price), 3- Providing healthy and competitive alternatives and 4- controlling advertising.

Keywords: Soft drinks consumption, Adult, Saudi Arabia, PCA

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ASSOCIATION BETWEEN FOOD INSECURITY AND OBESITY IN MIDDLE AND LOW INCOME HOUSEHOLDS IN CASABLANCA, MOROCCO

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Background and objectives: Food insecurity is usually associated with poor nutritional status. Still, reports revealed that food insecure populations are at increased risk of obesity. This study aims to investigate the prevalence of food insecurity in middle and low income households in Casablanca and examine the relationship between food insecurity and overweight.

Methods: A cross-sectional survey was conducted between 2011 and 2013 among low and middle income households from the South-East communities of Casablanca, Morocco. Data were collected for 607 households using a standardized and validated questionnaire. A total of 424 adult women and 183 adult men participated to the survey. Food insecurity was evaluated using a set of nine questions adapted from the the Household Food Insecurity Access Scale (HFIAS) developed by the Food and Nutrition Technical Assistance project (FANTA). Anthropometric measurements (weight, height, waist circumference) were taken according to the World Health Organization's guidelines and obesity was identified as a Body Mass Index (BMI) $\geq$ 30 kg/m^2.

Results: Food insecurity affected 63.2% of the households at different levels; data revealed that food insecurity was light in 12.6%, mild in 20.2% and severe in 30.4% households. Obesity was found in 40.8% of the population; 24.6% in men and 47.9% in women (p <0.001). Food insecurity was associated with gender; more households where we interviewed women (70.9%) were classified as food insecure than households where we interviewed men (43.7%) (p < 0.001). Obesity was higher in food insecure (42.7%) than in food secure people (37.7%) [odds ratio (OR) = 1.95]. Food insecurity was associated with an increased risk of obesity for women (OR = 2.5) but not for men (OR = 0.73).

Conclusions: Food insecurity is associated with an increased likelihood of obesity in adults from low and middle income households in Casablanca and the risk is greatest in women.

Keywords: Food insecurity, obesity, gender, Morocco.
Further collaborators:

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Background and objectives: Adolescence is a period in which physical activity (PA) shows a great decline. PA in adolescence may be important to improve cognitive function and academic outcomes. The hippocampus, which plays a major role in learning and memory, is among the brain areas more affected by PA. We explored the association of PA and sedentary time at 16y with a number of academic indicators in the transition from high school (HS) to higher education, in youths from Santiago, Chile.

Methods: Observational study in an infancy cohort. In a sample of n=632 adolescents (52% males), we measured PA, accounting for exercise (Physical Education and extracurricular sports) , active play and active commuting; and sedentary time, accounting for screen and sitting (excluding study time) hours. To measure this, we used a questionnaire that was validated in a previous study using accelerometry-based activity monitors in Chilean high schoolers. Academic results included HS completion, repeating a grade in HS and taking exams for college. Multivariate logistic regressions tested the relation of academic variables with PA or sedentary time, after adjusting sex, family background, type of secondary education (academic vs. vocational) and health-related confounders.

Results: In students devoting <2 h/week to exercise, the odds of HS completion (OR: 0.39; 95% CI: 0.21-0.73) and taking college exams (OR: 0.51; 95% CI: 0.33-0.79) were significantly lower compared to students allocating >4h/week for exercise. Also, the chances of repeating a grade in HS were negatively associated with time devoted to exercise. Last, in students devoting ≥8 h/day to sedentary activities, the odds of HS completion (OR: 0.48; 95% CI: 0.28-0.84) were significantly lower compared to students with <8h/day of sedentary activities.

Conclusions: In this sample, exercise was positively related with academic outcomes whereas the relation of sedentary time and academic results was negative. Results: **Keywords:** Physical activity, sedentary activities, exercise, academic performance, adolescents

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Background and objectives: "All food systems are sustainable" is the central feature of the UN's Zero Hunger Challenge, and an explicit feature of Sustainable Development Goal 2. The long title of SDG 2 also captures the essence of sustainable diets: End hunger, achieve food security and improved nutrition, and promote sustainable agriculture. Characterising food systems is complex, with interplay involving human, economic, social, environmental and political factors, and requiring multiple indicators for effective measurements. This paper seeks to harmonize four different methodological frameworks proposed for assessing sustainable diets and food systems.

Methods: Several divergent methodological frameworks, indicators and indices, and model systems for characterising sustainable diets and sustainable food systems have been proposed, with little or no attempt to harmonise, standardise or align. Each is assessed for relevance, reliability, advantages and limitations. Case studies on traditional food systems of indigenous peoples and model national dietary patterns (e.g., the Mediterranean diet) provide examples for testing/validation.

Results: Existing methodologies each have their own advantages; and commonly used indicators have importance in areas where data are sufficient in both quality and quantity. Each also has limitations related to data availability from the relevant sectors (health, agriculture, environment), and applicability in different ecosystems.

Conclusions: Weaknesses in the evidence base compromise the ability to effectively address the issues of sustainable diets and food systems. Nevertheless, current evidence is sufficient to warrant the development and implementation of multi-sectoral policies, programmes and interventions. A harmonised methodological approach will allow more and better data, and facilitate comparisons across nations, ecosystems and peoples, to better inform policies and actions, and ultimately to achieve the SDGs.

Keywords: Sustainable diets, methodologies, sustainable food systems, indigenous peoples, Mediterranean dieta.

PROSPECT OF FOREST FOODS TO ADDRESS HUMAN NUTRITION IN THE CONGO BASIN FOREST DEPENDENT COMMUNITIES OF DR CONGO, CAMEROON AND GABON

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Background and objectives: The potential to use forest foods from timber tree species as an effective entry point for improving human nutrition in the Congo Basin appears to be high. These products are widely accessible, culturally acceptable and typically under the control of communities

Methods: The most consumed forest foods were documented and examined the nutrient content and nutraceutical properties of most consumed forest foods and determined their contribution to human nutrient intake

Results: In Cameroon out of the 206 identified forest food species, Irvingia gabonesnsis and Baillonella Toxisperma were the most consumed. In DR Congo, out of the 272 forest foods, caterpillars were the most important and are frequently found on tree species; Entandrophragma cylindricum and Erythropleum suaveolensis. In Gabon, the most consumed species were: Baillonella toxisperma and Poga oleosa. These species contained significant levels of vitamins C and E, essential minerals and nutraceutical properties such as flavonoids, polyphenols, phytic and proanthocyanes. Nutrient intake findings indicate that if a child aged 1-3 years and a non-pregnant non-lactating woman consumed 500gms and 750gms daily respectively, their daily total vitamin C requirement of 30mg/100g for children and 45mg/100g for adults would be met by either Baillonella toxisperma, Pentaclethra macrophylla and Trichoscypha abut forest tree species.

Conclusions: In light of benefits of vitamins, minerals and nutraceutical properties, there is an urgent need for protecting and promoting nutrient and nutraceutical properties rich forest plant foods species, particularly those having the greatest acceptability and production potential.

Keywords: Nutrition, Nutraceuaticals, Nutrient composition, Congo Basin

Further collaborators:

DEMOGRAPHIC AND SOCIOECONOMIC CHARACTERISTICS ARE ASSOCIATED WITH DIETARY AND NUTRITIONAL PATTERNS IN RURAL BUT NOT URBAN AREAS IN WEST JAVA, INDONESIA

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Background and objectives: Since the risk of chronic diseases involves dietary factors, understanding determinants of dietary/nutritional intake patterns would be of help for effective intervention programs. However, few studies have explored the urban-rural difference in determinants of dietary/nutritional intake patterns in developing countries. The objective of this study was to examine whether the relationships between individual characteristics and dietary/nutritional patterns in urban and rural areas are different in West Java, Indonesia.

Methods: A three-day weighed dietary record survey was conducted for 92 participants in Bandung (an urban area) and 202 participants in Sumedang (a rural area), together with questionnaire-based interviews and anthropometric measurement. Total energy intake and energy intake from protein, fat and carbohydrate were calculated, food items were grouped into dietary categories based on the main ingredients and energy intake from each category was calculated. The association between individual characteristics and dietary/nutritional intake was examined with the Kruskal-Wallis equality-of-populations rank test and Spearman's rank correlation test.

Results: In Sumedang, all the dietary/nutritional pattern indicators (total energy intake, energy intake from protein, carbohydrate, fat, grain/tubers, vegetables/legumes, meat/fish) were significantly related to individual characteristics such as age, sex, occupation, educational level and income, while on the other hand in Bandung, energy intake from vegetables/legumes and meat/fish were significantly related to age, occupation or income but neither total energy intake, energy intake from protein, carbohydrate, fat, nor grain/tubers were related with any of the assessed factors.

Conclusions: The results suggested that the relationship between demographic and socioeconomic characteristics and dietary/nutritional patterns are different between rural and urban areas in West Java, Indonesia. The lack of a relationship in the urban area suggested that the area has moved beyond a phase in the nutrition transition where dietary/nutritional intake patterns change drastically along with social and economic development. Different strategies are needed in each area to identify and focus on the population at risks of diet-related diseases.

Keywords: Nutrition transition, Nutrition, Diet, Urban/Rural, Indonesia

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CORRELATES AND TRENDS OF OVERWEIGHT AMONG CHILDREN, ADOLESCENT GIRLS AND WOMEN IN SOUTH ASIA: AN IN-DEPTH ANALYSIS OF DATA FROM ELEVEN NATIONAL SURVEYS IN SIX COUNTRIES OVER EIGHTEEN YEARS

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Background and objectives: The majority of the world's undernourished live in South Asia while the number of overweight and obese in this region is growing. This study aimed to determine the correlates and trends of overweight among pre-school age children, adolescent girls and adult women in South Asia.

Methods: Data from 11 national surveys from 6 countries were pooled. Generalized linear mixed models were used to analyze relationships.

Results: Three percent of pre-school age children were overweight (weight-for-height z-score (WHZ) > 2SD) with a mean WHZ (SD) of -0.79 (1.36). Children of overweight mothers had a higher mean WHZ [-0.36 (1.36) v. -0.83 (1.35)] and a greater likelihood of being overweight [AOR: 1.52, p <0.01] than children of mothers who were not overweight.

Four percent of adolescent girls were overweight (body mass index (BMI) ≥25.0 kg/m2 based on the International Obesity Task Force adjusted BMI values). Household wealth and urban residence were positively associated with overweight among adolescent girls (APR: 2.63, p<0.01 and 2.16, p<0.01, respectively). The strength of these relationships differed by country. Eighteen percent of women were overweight (BMI ≥25.0 kg/m2 based on International Classifications). Household wealth (1.96, p<0.02), formal education (1.49, p<0.01), and urban residence (1.75, p<0.01) were positively associated with an increased likelihood of being overweight. In Bangladesh, India and Nepal the prevalence of overweight among adolescent girls and women increased over time. However, the strength of the association between predictors and outcomes attenuated over time among women.

Conclusions: The condition of being overweight is becoming more prevalent across South Asia and requires immediate attention. Once a condition of the wealthier, more educated and urban, rates of overweight are increasing among poorer, less educated and even rural women.

Keywords: South Asia, overweight, children, adolescent girls, women

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EFFECT OF FOOD INSECURITY ON CHILD'S BEHAVIOR RESIDING IN SLUMS OF KARACHI, PAKISTAN

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Background and objectives: Household food insecurity (HFI) has been paced up as a major public health problem worldwide but more so in South Asia. South Asians with food insecurity may find it difficult to bring up their children as socially desirable causing behavioral problems in them. Scarcity of literature was found on assessing relationship of household food insecurity and child behavior in urban families. Therefore, our objective was to determine prevalence of HFI and its effect on behavioral problems in children of mothers residing in urban slums of Karachi, Pakistan

Methods: A cross sectional study was conducted in different towns of all six districts of Karachi using multi-stage sampling methods. Selection of households was made using systematic random sampling. The Interviewers collected data from mothers of children aged 3 -11 years. The structured and validated questionnaire included household food insecurity access scales (HFIAS) and child behavior questionnaire (CBQ) related information. Factor analysis was applied to find common behavior of children. Generalized linear regression analysis was performed to determine relationship between scores of food insecurity and child behavior.

Results: Overall 67% of household were found to be food insecure. 70% of households expressed concern and showed anxiety on the quantity of food being available to them, 84% of households actually had insufficient quantity of food and 95% of households consumed insufficient quality of food during the previous month at the time of interview. Overall 70% mothers from food insecure households reported different behavioral problems in their children. The two most common among these behaviors were; being aggressive and not socializing or playing with other children. Followed by behaviors that were related to; avoiding going to school, stress, impulsiveness, having fear, bully and lacking confidence. The association between household food insecurity and child behavioral problems were found to be significantly positive and with each food insecure household the likelihood of childhood behavioral problems will increase by 26.7% in urban slums

Conclusions: Public health strategies must be designed to assist families to cope with behavioral problems in children as well as in solving their food security related issues.

Keywords: Household food insecurity, child behavior, urban slum, Pakistan

NUTRIENT INTAKE IN FRENCH ADULTS: EVOLUTION DURING THE LAST 10 YEARS BETWEEN THE TWO FRENCH NUTRITION AND HEALTH SURVEYS (ENNS 2006, ESTEBAN 2016)

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Background and objectives: In France, the French National Nutrition and Health Programme (PNNS) aim to reduce chronic diseases associated with nutrition by establishing various health activities. The evaluation of its effectiveness requires studying the evolution of dietary intake in the French population. The objective of this paper was to compare the dietary intake in terms of nutrients during the last 10 years, in two national samples of 18-74-years-old adults, especially according to French recommendations.

Methods: Studies were based on two cross-sectional population-based surveys using a multistage sampling design: the ENNS study realized in 2006 (n=3115 adults) and the Esteban study in 2016 (n=2834 adults). Dietary information were collected through three 24h recalls realized by internet or by phone, monitored by dieticians. The two samples have been compared by linear regression and chi-2 test (gender-stratified, weighted and standardized data).

Results: Since ten years, the mean energy intake without alcohol (EIWA) increased significantly in women (1600.8 to 1675.9kcal/d, p<0.01) but not in men (2180.0 kcal/d vs 2155.8kcal/d in Esteban). Globally, lipids intakes (%EIWA) increased at the expense of proteins in men and women. Among men, 25.1% consumed less than 35% EIWA of lipids while they were 19.8% ten years later (p=0.02). Proportion of people eating less than 12.5% EIWA of simple carbohydrates from sweet products decreased significantly in both gender (80.6 to 68.9% in men, p<0.0001; 69.1 to 61.3% in women, p<0.001). Women had currently more often calcium intake lower than recommended compared to data ten years ago (68.8% in ENNS to 74.5% in Esteban, p<0.01). Adherence to the French recommendation regarding to fibre (>25g/d) tended to increase in men and women, but adherence regarding to salt consumption (<8g) decreased significantly in women (82.9 to 72.0%, p<0.0001) and tended to decrease in men (43.1 to 38.2%, p=0.07).

Conclusions: These results show that nutritional objectives of the PNNS are not achieved in the French population. As a whole, food consumption and dietary intake get worse during the last 10 years. So nutrition should be subject to next priorities of public health in France by strengthening actions of the PNNS.

Keywords: Nutrient, intake, evolution, France, epidemiology

PREVALENCE OF OVERWEIGHT AND OBESITY IN FRENCH POPULATION: EVOLUTION DURING THE LAST 10 YEARS BETWEEN THE TWO FRENCH NUTRITION AND HEALTH SURVEYS (ENNS-2006 AND ESTEBAN-2016)

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Background and objectives: Worldwide, overweight and obesity are becoming ever more frequent, leading to an increase of chronic diseases associated. Therefore, it is necessary to promote health public policies to reduce this burden. In France, it is one of the objectives of the French National Nutrition and Health Programme (PNNS) developed since 2001 by the Ministry of Health. To assess the nutritional status of the population according to the PNNS indicators, national nutrition and health surveys were implemented in 2006 (ENNS) and 2016 (Esteban). This paper studies the prevalence of overweight and obesity among French adults and children during the last 10 years.

Methods: Data from two cross-sectional population-based surveys, using a multistage sampling design, were used: ENNS-2006 (nadults=2388 and nchildren=1314) and Esteban-2016 (nadults=2467 and nchildren=1099). Anthropometry was measured according to standardized procedures from WHO recommendations. Body Mass Index was use to classify adults according to their status ($\geq$25kg/m^2 overweight; $\geq$30kg/m^2 obesity). For children, the IOTF BMI cut-offs were used. The samples have been compared by linear regression and chi-2 test (gender-stratified, weighted and standardized data).

Results: The mean BMI was not significantly different between the two studies in adults (men: 26.1 vs 26.0kg/m^2; women: 25.1 vs 25.7kg/m^2; between ENNS and Esteban). In men, prevalences of overweight and obesity were 41.0% [36.7-45.5] and 16.1% [13.2-19.6], respectively in ENNS vs 37.1% [33.5-40.9] and 16.9% [14.2-19.9] in Esteban. In women, prevalence of overweight was 23.8% [21.2-26.7] in ENNS and 26.8% [23.8-30.1] in Esteban. Obesity reached 17.6% [15.2-20.3] and 17.4% [14.8-20.4], respectively. In boys, 13.6% [10.5-17.5] in ENNS were in overweight vs 11.8% [8.4-16.3] in Esteban, and 2.6% [1.5-4.5] to 4.1% [2.1-7.7] in obesity respectively. In girls, overweight was prevalent in 15.0% [11.6-19.2] in ENNS vs 14.2% [10.7-18.7] in Esteban, and obesity 4.0% [2.3-6.8] vs 3.8% [2.1-6.7] respectively.

Conclusions: These results show a stability of overweight and obesity in France over ten years among French adults and chil-

dren. However prevalence of these burdens remains important. Nutritional status requires also continuous attention and different actions to reverse the trend and reduce the incidence of overweight on health.

Keywords: Overweight, obesity, France, epidemiology, nutritional status

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COLOR-CODED FRONT OF PACK NUTRITION LABELS – A MEANINGFUL OPTION FOR US PACKAGED FOODS?

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Background and objectives: Background: With more than two thirds of the diet of the average American deriving from packaged food and beverages, the implementation of a standardized front-of-pack-labeling (FoPL) scheme would likely be a useful tool for many consumers trying to improve the healthiness of their diets. The UK Department of Health's "traffic light" FoPL scheme has consistently come out as one of the top schemes in both consumer preference and its ability to support consumers in identifying healthier choices.

Objective: To apply the traffic light labeling scheme to packaged foods and beverages in a large nutrition label database and determine the proportion of products with each front-of-pack label rating and the nutritional profile of products covered, overall and by food category.

Methods: Data for this study are from Label Insight's Open Access branded food database and were extracted in December 2016. Nutrient levels and the proportion of products classified as "Red" (High), "Amber" (Medium) or "Green" (Low) in total fat, saturated fat, total sugar and sodium were examined. The proportion of products in each category that had each possible combination of traffic light colors, and met the aggregate score for 'healthy' was examined.

Results: Out of 175,198 products, >50% of all US packaged foods received a "Red" rating for total sugar or for sodium. 'Confectionery' had the highest mean total sugar (51.9g/100g) and 'Meat and meat alternatives' the highest mean sodium (781mg/100g). The most common traffic light label combination was "Red" for total fat, saturated fat and sodium and "Green" for sugar. Only 30.1% of products were considered "healthy".

Conclusions: Over 50% of US packaged foods contain high levels of salt and sugar. A color coded traffic light scheme appears to be a good option for implementation across the US packaged food supply to support consumers in making healthier food choices.

Keywords: food labels; processed foods; public health nutrition; nutrient profiling.

Conflict of Interest Disclosure: Dagan Xavier is the Co-Founder at Label Insight.

A MIXED METHODS STUDY PROVIDING INSIGHTS ON WHY TARGETS ON CHILD WELFARE CLINIC ATTENDANCE AND GROWTH PATTERNS OF PARTICIPATING CHILDREN ARE UNMET IN GHANA

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Background and objectives: Growth monitoring and promotion (GMP) programmes, delivered at Child Welfare Clinics (CWC) promote child health and survival and serve as delivery channel that enhances coverage for other crucial nutrition-specific interventions. This study compared community-based and facility-based GMP programmes with respect to attendance rates, children's nutritional status and health workers/clients' perceptions on factors influencing utilization.

Methods: Explanatory sequential mixed methods design conducted in four CWCs in Ga West municipality, Ghana. The study comprised a 12-month secondary data analysis using GMP registers of 220 infants aged 0-3 months enrolled in community-based (n=104) and facility-based (n=116) CWCs, cross-sectional survey involving 232 caregiver-child pairs accessing community-based (n=104) and facility-based (n=116) services, and in-depth interviews with ten community health workers and 15 mothers using phenomenology and case study designs. Quantitative data were analyzed with SPSS version 20 and thematic content analysis performed with the qualitative data using ATLAS.ti 7.0.

Results: Mean annual attendance to both programmes was similar with an average of six visits per year. Only 13.6% attained the Ghana Health Service target of nine visits. Targets on underweight proportions were neither met at baseline (community-based:8.7% vs. facility-based:19.8%, p=0.022) or end of follow-up (community-based:11.5% vs. facility-based:15.5%, p=0.436). Overall, weight-for-age scores (WAZ) of ≥60% children improved during participation. Significant determinants for improved WAZ were being underweight at baseline (AOR:11.1, CI:4.0-31.0), recording annual attendance of at least six (AOR:2.2, CI:1.1-4.1) and nine (AOR: 4.65, CI:1.4-15.1) visits. Significant proportions of facility-based users (57.4%) were ever visited at home compared to their community-based counterparts (31.5%). Over half were dissatisfied with services received citing long waiting times, negative staff attitude and extortion of money. Regarding perceptions

on factors hindering service utilization, emerged themes included extremes of maternal age, high parity, postpartum socio-cultural beliefs and practices, financial constraints, health system challenges, unprofessional staff behaviours and high premium on meeting vaccination targets at the expense of GMP.

Conclusions: The association of increased attendance with improved growth reaffirms the need to sensitize caregivers on the role of GMP to child growth and development, increase contact tracing through home visits and strengthen primary healthcare systems to function effectively-

Keywords: Utilization. Growth monitoring and promotion. Underweight. Children under-five. Ghana.

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EATING HABITS AND TASTE SURVEY OF NIKKEI RESIDENTS LIVING IN PARAGUAY

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Background and objectives: The purpose of this survey is to conduct surveys on dietary habits and health status for the Nikkei (people of Japanese descent and their descendants) the first, the second, the third living in Paraguay, investigates the eating habits.

Methods: We conducted a nutrition and preference survey for Nikkei residents living in Itapua prefecture of Paraguay from December 2016 to January 2017.The nutrition survey was a brief self-managed diet history questionnaire (BDHQ), and a self-reported questionnaire was used for preference survey. The final analysis compared it between two groups of Nikkei first (hereinafter called NK1) and the Nikkei the second, the third (hereinafter called NK2-3).

Results: We distributed 50 questionnaires to Nikkei, the collection rate was 27 (54.0%). The analysis was 25 (92.3% of the number collected). NK 1 was 12 personas (4 males, 6 females) NK2-3 was 13 personas (2 men, 11 females). The most frequent place was Kochi prefecture (33.3%) followed by Hiroshima prefecture (25.0%) in NK1 birth in Japan. The place where NK2-3 ancestry was born in Japan was Kochi Prefecture (38.5%) was the most frequent, followed by Hokkaido (26.3%). "What Japanese food are you eating at least once a week" was miso Soup (19.1%), simmered dish (12.8%), rice (10.6%) at NK1. In NK2 -3, miso soup (20.4%), rice (12.2%), simmered dish (10.2%), pickle (10.2%). The average number of items answered was NK1 3.9 items, it was 3.8 items of NK 2-3. There was no significant difference when we tested whether there was a difference in the average number of items between the 2 groups (p = 0.88).

Conclusions: Nikkei Paraguay turned out to always eat Japanese food in every generation. Nutrition intake situation is currently being analyzed. In the future, expand the scope and conduct similar survey.

Keywords: Nikkei Paraguay, Eating habits, Japanese food
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LIFESTYLE HABITS OF HEALTHCARE PROFESSIONALS IN URBAN CITIES IN ABIA STATE, NIGERIA

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Background and objectives: Health professionals have a role to play in the promotion of physical activity in order to prevent the ever-increasing burden of diseases associated with physical inactivity. Obesity is gradually becoming a problem among the health workforce due to sedentary lifestyle and unhealthy dietary practices. This study investigated physical activity and other lifestyle habits in a sample of health professionals in major urban cities in Abia State, Nigeria.

Methods: In this cross sectional survey, a total of 353 health professionals were randomly selected from various public health facilities in major cities in Abia State. The survey included questions on demographics, dietary and lifestyle habits. Self reported physical activity was assessed with an adapted version of International Physical Activity Questionnaire-Short Form (IPAQ-SF), and the level of physical activity was determined using the metabolic equivalent of task (MET)-minutes per week indicators. Height and weight were measured and used to calculate Body Mass Index (BMI). Chi square was used to examine the association between obesity (BMI$\geq$30kg/m2) and physical activity.

Results: Respondents were doctors (20%), nurses (38.2%) and other health professionals (41.4%), comprising 59.8% males and 40.2% females. Mean years in practice for the total group was 10.2 ($\pm$1.2) years, and average age was 45.5$\pm$0.7years,. Obesity was 22.8% in males and 17.9% in females. Only 29.2% consumed breakfast daily, while 61.8%, 54.9% and 41.9% consumed fast foods, carbonated drinks and alcoholic beverages 3 or more times a week, respectively. Nurses reported high physical activity levels than the other health professional groups (p>0.05), while females were significantly more active than males (p<0.05). No significant relationship was observed between obesity and physical activity levels (X2=0.781; p>0.05).

Conclusions: Despite the high and moderate levels of physical activity, the prevalence of obesity was still high. This could be due to other factors which further studies would need to address.

Keywords: Physical activity, dietary habits, health professionals

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NUTRITION KNOWLEDGE AND BREAKFAST HABITS OF A GROUP OF ADOLESCENTS IN PUBLIC SECONDARY SCHOOLS IN ANAMBRA STATE, NIGERIA

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Background and objectives: Breakfast is often regarded as the most important meal of the day. Breakfast skipping and consumption of unhealthy food may lead to micro-nutrient deficiencies and poor nutritional status. Studies have shown that children and adolescents who habitually skip breakfast are at higher risk for skipping other meals, snacking, being less physically active and being overweight and obese. The purpose of this study was to describe nutrition knowledge and breakfast habits of a group of adolescents in Anambra State, Nigeria.

Methods: A validated questionnaire was administered to 259 adolescents (comprising 184 males and 75 females) randomly selected from 6 public secondary schools in the state to obtain information on nutrition knowledge, breakfast eating habits, consumption patterns, content of breakfast. Descriptive statistics (frequencies and percentages) and Chi square analysis were performed using SPSS version 20.

Results: The mean age of the adolescents was 12.1($\pm$5.3) years. The percentage that reported eating breakfast daily was 69% and this was significantly higher in males (p<0.05), those who skipped cited lack of appetite (35.0%) as the main reason. Commonly consumed foods for breakfast were from the bread and cereal group (36.7%) and tea/cocoa beverages (35.5%). Both male and female adolescents showed average nutrition knowledge (45.5%). No significant differences were observed in the nutrition knowledge between males and females (P>0.05). Similarly, nutrition knowledge did not differ significantly between breakfast eaters and skippers (p>0.05).

Conclusions: This study showed that nutrition knowledge was generally on the average and breakfast was consumed by about two thirds of the adolescents daily. It is suggested that the nutrient content of breakfast foods consumed be further assessed in order to ascertain the quality.

Keywords: Breakfast, adolescents, knowledge, habits

THE RELATION OF SEDENTARY BEHAVIOR AND BODY COMPOSITION AMONG CHINESE ADULTS WITH DIFFERENT GENETIC PREDISPOSITION TO OBESITY

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Background and objectives: Previous studies on gene-lifestyle interaction and obesity have focused mostly on the FTO gene and physical activity, whereas little attention has been paid to sedentary behavior (SB), particular in China. We aimed to examine whether the association between SB and body composition indices among Chinese adults could be modified by genetic predisposition, physical activity and energy intake etc.

Methods: Data on total time of SB, non-screen based SB, screen-based SB and specific types of screen-based SB (television watching, computer/phone using), moderate-to-vigorous intensity-activity energy expenditure (MVPAEE) and dietary intake of 3976 Chinese adults (54.92% women) aged 25-65 years were obtained by questionnaires. Height, weight and waist circumference (WC) were measured to calculate body mass index (BMI), percent body fat (%BF), fat mass index (FMI) and fat-free mass index (FFMI). Genetic risk score (GRSweighted) were calculated on 9 established obesity associated genetic variants among Chinese.

Results: Among adults with high obesity GRSweighted, time spent on television watching was positively associated with BMI, WC, %BF, and FMI, after adjusting for age, gender, family monthly income, smoking, EI and MVPAEE concurrently. For every 1-hour increment in television watching, BMI, WC, %BF, and FMI increased 0.20 kg/m2, 0.85cm, 0.27, and 0.12 kg/m2, respectively (p<0.02). After further classified by MVPAEE for three groups, however, we only observed the association between television watching and WC among adults with low/moderate MVPAEE: adults in low/moderate MVPAEE with longer time of television watching had 3.18%/3.68% higher WC (p=0.02). Time spent on other sedentary time were not associated with body composition indices.

Conclusions: Television watching is of relevance for body composition, especially for WC among Chinese adults with high genetic predispositions to obesity.

Keywords: sedentary time, television viewing, obesity, body composition, genetic risk score

Further collaborators:

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BAMBARA GROUNDNUT (VIGNA SUBTERRA-NEA (L.) VERDC.) FORMULATED DIET PRO-MOTES GROWTH IN WEANING MALE WISTAR RATS

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Background and objectives: Earlier work done before now on the formulation and nutritional quality of infant formula produced from germinated popcorn, Bambara groundnut and African locust bean flour revealed growth potentials in this blend. Hence, to be able to strike a balance in terms of the limiting amino acids in cereal and legume, the work basically is to estimate the best ratio or blend of these with Bambara groundnut that will be required to support growth, using weaning wistar rat as a model.

Methods: Formulated diets were fed with water ad libitum for 28days to twenty (20) weaning male wistar rats (60 – 70g), comprising of five (5) animals each in four (4) different groups. Group 1 is the commercial rat fillet diet, while Groups 2,3 and 4 were the experimental diets with varied percentages of Yellow maize : Bambara groundnut flour at 100% : 0%; 30% : 70% and 50% : 50% respectively supplemented with the necessary vitamins and minerals

Results: Group 1 had the highest mean dietary consumption of 100.4 ± 3.78g followed by Group 3 with 84.06 ± 3.74g; then Group 4 with 83.08 ± 4.11g and finally Group 2 with 71.6 ± 6.38g. Mean differential weight changes at the end of the 4 weeks was highest for Group 1 with 13.50 ± 2.97g; followed by Groups 3,4 and 2 in that order, with mean differential weight of 10.65 ± 2.70g, 9.34 ± 2.06g and 5.53 ± 2.13g respectively

Conclusions: The best blend of these formulated diets for growth is the group 3, as it shows comparable mean differential weight changes to those of the commercial rat fillet. Hence, possible future development of this diet into a weaning or infant formula is envisaged.

Keywords: Bambara groundnut, Formulated diets, Growth, Wistar rats

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PREVALENCE OF PEDIATRIC METABOLIC SYNDROME AMONGST CHILDREN IN THE AGE GROUP OF 10-16 YEARS BELONGING TO HIGH INCOME GROUP (HIG) IN DISTRICT SHIMLA, HIMACHAL PRADESH, INDIA

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Background and objectives: Obesity is the most common cause of insulin resistance and metabolic syndrome. These are the most important risk factors for coronary heart disease. High levels of body mass index (BMI, kg/m2) among children are associated with abnormal levels of lipids, insulin, blood pressure which are components of the Pediatric Metabolic Syndrome (PMS). No evidence exists regarding the prevalence of PMS amongst children of Himachal Pradesh state, India. We aimed to evaluate the prevalence of pediatric metabolic syndrome amongst children in 10-16 years of age belonging to high income group in district Shimla, Himachal Pradesh, India.

Methods: A school based cross-sectional study was conducted in the year 2015-2016. District Shimla, Himachal Pradesh was selected for the present study. In district Shimla, all the urban schools which are located at the altitude of 1000 meters and above catering to high income group schools with monthly tuition fee of 2000 or more were enlisted along with their population. Thirty clusters/schools were identified using Population Proportionate to Size (PPS) sampling methodology. In the identified schools, all the children in schools were enlisted. Seventy children per school were selected by using random number tables. Thus a total of 2100 children in 10-16 years of age were randomly selected. The children were briefed about the objectives of the study and written consent was taken from their parents. Pre-tested, semi structured questionnaire was administered to each subject. Weight, height, waist circumference (WC), body mass index (BMI), and blood pressure were measured using standard tools. Ten milliliters of blood was taken for measuring lipid profile and fasting blood sugar (FBS) of the school children. We determined PMS according to the International Diabetes Federation (2007) criteria.

Results: Prevalence of PMS was found to be 3.5% (boys: 3.6%, girls: 3.4%) and the prevalence of overweight and obesity was 12.8% and 3.2% amongst the studied children.

Conclusions: PMS is known to be a precursor of adult metabolic syndrome in a population. The findings of the present study indicate that PMS is significant but hidden public health problem, which requires urgent attention of the programme managers and administrators in the health sector.

Keywords: Overweight, Obesity, Pediatric Metabolic Syndrome, School age Children, India

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ASSOCIATION OF DIETARY FLAVONOID INTAKE WITH RISK OF CANCER IN THE CANCER SCREENING EXAMINATION COHORT IN KOREA

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Background and objectives: Dietary flavonoids are thought to play a prominent role in cancer prevention through antioxidant capacity, but their association with cancer incidence has not been thoroughly investigated using epidemiological data in Korea. The purpose of this study was to investigate whether dietary flavonoid intake is associated with reduced risk of cancer based on data from the Cancer Screening Examination Cohort 2004–2008 of the National Cancer Center of Korea.

Methods: This study included 8,024 subjects who completed a written survey on demographics and lifestyles, as well as a 3-day dietary record. Prediagnostic flavonoid intakes were estimated using a flavonoid database of common Korean foods (KFDB). Hazard ratios (HRs) were estimated, comparing the highest quartile of flavonoid intake with the lowest, using Cox proportional hazard model. All statistical analyses were conducted using the STATA program version 14.0 (STATA Corporation).

Results: During the mean follow-up period of 9.0 years, 425 cancer cases were newly diagnosed. The median flavonoid intake was 111.6 mg/d. Mean of the highest quartile (287.6mg/d) was six times greater than that of the lowest quartile (46.6mg/d). After multivariable adjustment, there was a weak association between dietary flavonoid intake and overall cancer risk (HR=0.74; 95% CI 0.54-1.00; highest vs. lowest quartile; p-trend=0.088). Among men, significant association was observed in age-adjusted dietary flavonoid intake and risk of cancer (HR=0.66; 95% CI 0.46-0.94; highest vs. lowest quartile; p-trend=0.044). After multivariable adjustment, dietary flavonoid intake was associated with reduction in HR for total cancer incidence, but this association was only marginally significant (HR=0.66; 95% CI 0.45-0.98; highest vs. lowest quartile; P-trend=0.056). Among Women, there was no such an association.

Conclusions: Our results suggest that greater intake of flavonoid may reduce overall cancer risk, particularly among men. Additional research is necessary to clarify the association between dietary antioxidants including flavonoid and the risk of cancer.

Keywords: dietary flavonoid, antioxidant, cancer

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THE IMPACT OF FOUR SCHOOL FEEDING FOOD PRODUCTS ON THE NUTRITIONAL STATUS OF CHILDREN IN SOUTHERN GAUTENG, SOUTH AFRICA

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Background and objectives: School feeding programmes have been used in many parts of the world for a number of years; with varying success. Four micronutrient dense products were introduced as part of the school feeding programme in Southern Gauteng, South Africa. The purpose of this paper is to provide an overview on the impact on the nutritional status by comparing anthropometric status and biochemical variables of the children. Biochemical variables, specifically iron was measured. Blood samples were drawn for the determination of serum vitamin A, haemoglobin, haematocrit, zinc, iron, ferritin, transferrin and total iron binding capacity.

Methods: The participation of all the children in this study was voluntary and all the children taking part in this study obtained written parental consent. The food consumption patterns of the school children was determined by a food frequency questionnaire as test measurement and a 24-hour recall questionnaire as reference measurement at baseline. The impact on nutritional status was determined by evaluating and comparing the anthropometric indices: weight-for-age, height-for-age and body mass index (BMI). For the anthropometric results, data was categorised according to the percentile system, in accordance with the National Centre for Health Statistics indicators. The duration of the intervention was seven months with a total of 332 participants in the four groups, each group receiving a different product.

Results: All the interventions showed improvement in the mean energy intake of the children. The mean weight, height and BMI increased with all the interventions. Anthropometric results indicated that children in the severely underweight category, as well as the group at risk of being underweight, decreased in two of the groups. The number of children at risk of being stunted (>5 and <25th percentile) declined, with the exception of the group consuming the sorghum based product. The biochemical results indicated that normal values were present for the majority of the parameters before and after the interventions.

Conclusions: Positive changes were observed in each of the groups, indicating that any one of these products can be successfully used as part of a school feeding programme and may have a beneficial effect on hungry, malnourished children.

Keywords: school feeding products; school intervention; nutrition; health promotion, malnutrition.

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FACTORS ASSOCIATED WITH THE CONSUMPTION OF SUGAR-RICH FOODS AMONG BRAZILIAN ADOLESCENTS: NATIONAL SCHOOL HEALTH SURVEY (PENSE 2015)

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Background and objectives: Background: The excessive intake of sweets, deserts and sugar sweetened beverages among adolescents stands out as a major health issue in several countries.
Objective: This study aimed to analyze the consumption of high-sugar foods by Brazilian adolescents and to identify associated factors.
Methods: We used data from the National School Health Survey (PeNSE 2015) conducted by a partnership between the Brazilian Institute of Geography and Statistics (IBGE) and the Brazilian Ministry of Health. This is a cross-sectional study developed from a representative sample of ninth grade students living in all regions of Brazil, including urban and rural areas and attending public and private schools. Consumption of these foods was classified as: do not consume sweets and soft drinks regularly (≥5days/week); consume sweets or soft drinks regularly; and consume sweets and soft drinks regularly. Its association with sociodemographic information, eating habits, and family contexts were investigated by multiple ordinal regressions. All statistical analyses were performed using SAS and commands were performed taking into account the complex sample design of PeNSE. In the final model 101,812 students who presented complete information about the investigated variables were considered.
Results: About 16.0% of participants reported regular consumption of sweets and soft drinks and 35.9% regularly consumed one of these sugar-rich foods. The ordinal multiple regression analysis showed that the odds of regularly consuming sweets or/and soft drinks was higher among females; adolescents aged 15; students with mothers with higher education; those that eat meals in front of the TV; and those with a high amount of daily TV time. The largest magnitudes of association with the outcome variable were found for maternal education ≥ 12 years (OR = 1.39), being female (OR = 1.26), eating while watching TV (OR = 2.07) and time spent watching TV ≥ 5 hours per day (OR = 2.69).
Conclusions: The results highlight the clear association observed between daily time spent watching television and regular consumption of sweets and soft drinks. This scenario shows that changing these factors should be a priority for interventions to prevent negative health effects, particularly overweight and associated morbidities.
Keywords: adolescents, sugar, soft drinks, food consumption

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FEEDING PRACTICES AND MALNUTRITION AMONG UNDER FIVE CHILDREN IN COMMUNITIES OF KUJE AREA COUNCIL, FCT ABUJA, NIGERIA

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Background and objectives: Poor dietary practices and malnutrition, including severe acute malnutrition among under five children in Nigeria has remained a great public health concern. This study assessed infant and young child feeeding practices and nutritional status of under-five children to determine the prevalence of malnutrition of under five children in Kuje area council, Abuja.
Methods: The study was a cross-sectional study. Multi-stage sampling techniques was used in selecting the population that was studied. Probability proportion by size was applied in choosing 30 clusters for the survey using ENA for SMART software 2011 version. Validated questionnaires were used to obtain information from the population, while appropriate equipment was used for measurements of anthropometric parameters. The data was also subjected to statistical analysis using statistical package and service solution version 20.
Results: The result showed that 96.7% of the children were breastfed, 30.6% had early initiation to breastfeeding within first hour of birth and 22.4% were breastfed exclusively up to 6 months, 69.8% fed infants' colostrum, while 30.2% discarded colostrum. About half of the respondents (49.1%) introduced complementary feeding before six months and 23.2% introduced it after six months while 27.7% had age appropriate timely introduction of complementary feeding.The anthropometric result showed that the prevalence of global acute malnutrition (GAM) was 12.8%, severe wasting prevalence was 5.4%, moderate wasting was 7.4%, underweight was 24.4%, stunting was 40.3% and overweight was 7.0%.
Conclusions: The result showed that there is high prevalence of malnutrition among under five children in Kuje which is generally consistent with National Average. Hence, there is need for urgent appropriate interventions to improve their nutrition and health status.
Keywords: Malnutrition, Under Five Children, Breastfeeding, Complementary feeding

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NUTRITIONAL QUALITY, NUTRIENT CLAIMS AND '1 OF YOUR 5 A DAY' LOGOS IN PRE-PACKAGED FOODS MARKETED TO YOUNG CHILDREN IN THE UK

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Background and objectives: High sugar consumption contributes to high energy intake and is linked to unhealthy eating behaviours associated with increased obesity risk in childhood. It is important that parents can understand the nutritional quality of pre-packaged foods targeted at pre-school age children to inform them about healthy choices and nutrients of concern such as sugar. We aimed to assess the nutritional quality, nutrient claims and use of '1 of your 5 a day' logos in pre-packaged foods targeted to young children (1.5-3 years) in the UK market.

Methods: A cross-sectional survey of all pre-packaged foods available from 4 major UK supermarkets. Foods were included in the survey only if they used cartoon imagery and/or child friendly related words on the packaging. Food labels were assessed for nutritional information, added vitamins, nutrient claims, and '1 of your 5 a day' logos. Nutritional quality was assessed using the Ofcom nutrient profiling model.

Results: In total, 485 food items were assessed and divided into 10 categories: fruit juice (20%) cereals (18%), ready meals (16%), yogurt (17%), fruit snacks (13%), various snacks (9%) cereal bars (5%) and smoothies (2%). The highest sugar content [mean (SD)/100g] was found in fruit snacks [44 (10)/100g] followed by cereal bars [30 (7)/100g] and cereals [24 (8)/100g]. For each of the major food categories, cereals, cereal bars and fruit snacks had the highest proportion of products assessed as being 'less healthy'. Nutrient claims were reported in 96% of products, 50% had added vitamins and 32% showed a '1 of your 5 a day' logo. Overall, 95% of foods contained at least 1 or more nutrient claim or '1 of your 5 a day' logo across all food categories but 52% (n=254) of the children's products were assessed as being 'less healthy' in accordance to the UK Ofcom nutrient profiling model.

Conclusions: Over half of children's pre-packaged food products targeted to young children were considered as less healthy food choices despite majority of these foods displaying a nutrient claim. This study suggests further efforts need to be taken to regulate advertisement of nutrient claims on products with unhealthy nutrient profiles.

Keywords: food labelling, food marketing, infants, nutrient claims, 5-a-day

Conflict of Interest Disclosure: There is no conflict of interest. This research was funded by Human Nutrition, University of Glasgow, UK.

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TREND OF OVERWEIGHT AND OBESITY IN PERUVIAN SCHOOLCHILDREN OF THE PRIMARY LEVEL

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Background and objectives: To analyze the tendency of overweight and obesity in Peruvian schoolchildren of the primary level.

Methods: A trend study that analyzed overweight and obesity in 24794 primary school children. The samples were representative and probabilistic of Peruvian households. The measurement of weight and size was made according to Peruvian regulations. Data collection was performed in Peruvian households during 2007-2014. Overweight and obesity were assessed using the body mass index for age (BMIZ); overweight was considered to be an BMIZ> 1 and ≤2 and obesity was an BMIZ> 2. It was analyzed by complex samples, prevalences and chi square of linear trend were calculated.

Results: Between 2007 and 2014, overweight increased from 15.5% to 18.1% and obesity from 6.1% to 14.1%. The trend of overweight (p <0.001) and obesity was increased (p <0.001). The trend of overweight and obesity was increased in children aged 8 to 10 years (p <0.01) and aged 11 to 13 years (p <0.01). In both sexes, the tendency of overweight (p <0.001) and obesity (p <0.001) was increased. In children that the head of the household had primary education level (p <0.001), secondary (p <0.01) and higher (p <0.01), the tendency of overweight and obesity was increasing. In the urban area (p <0.001) and rural (p <0.01), the tendency of overweight and obesity was to increase (p <0.001). In Lima Metropolitan (p <0.01), coast (p <0.001), saw (p <0.001) and jungle (p <0.001) the tendency was to increase. According to poverty condition, the tendency of overweight in the poor was to increase (p = 0.011), while obesity increased in the non-poor.

Conclusions: The trend of overweight and obesity increased in primary school students in Peru, to the predominance of obesity.

Keywords: Overweight, Obesity, School Health, Child, Students

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ACCEPTANCE OF SUGAR REDUCTION IN PROCESSED FOODS AMONG MOROCCAN POPULATION

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Background and objectives: Morocco has recently developed a plan of reducing sugar consumption to reinforce prevention of non-communicable diseases and to contribute to the achievement of global voluntary targets for non-communicable diseases set by ICN2 by 2025. The objective of the present study is to assess acceptance of yogurts with different percentage reduction of sugar by Moroccan population.

Methods: A total of 201 participants (age >15 y.) were recruited to determine the level of sugar reduction in yogurt. Sucrose was added to a plain yoghurt in the following different concentrations 166.5; 149.8; 133.2; 116.5; 99; 83.2 mM/l, corresponding to the reduction of sugar of 0%, -10%, -20%, -30%, -40% and -50%, respectively, compared available yogurt in local market. Overall liking, "Just About Right" (JAR) and purchase scales was used to score the different yoghurts.

Results: Yogurts containing -20% and -30% added sugar were highly accepted by 81% and 74% of respondents. Based on JAR score, yoghurt with 20% (133.2mM/l) and 30% (116.5mM/l) reduction were considered as "just about right' by 42.7% and 44.3% respectively. Best average score of purchase intent is obtained for sucrose concentration of 149.8 mM/l. 35.8% and 40.3% for yoghurt with sucrose concentration of 133.2 mM/l and 116.5 mM/l respectively.

Conclusions: Finding of this study indicate that yogurts containing -20% and -30% added sugar were best accepted by respondents. Advocacy before dairy industry to make them commit toward sugar reduction in yogurt is needed, in order to help achieving the national sugar reduction strategy in Morocco.

Keywords: Sugar reduction. acceptance. yoghurt. Morocco

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ORAL FAT TASTE SENSITIVITY AND THE DEVELOPMENT OF OBESITY IN MOROCCAN ADULT SUBJECTS

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Background and objectives: In recent decades the prevalence of obesity is become an alarming threat for human health. In 2014 about 13% of the world's adult population was obese and 39% was overweight (World Health Organization). In 2011, 10.3 million adult Moroccans were overweight; 3.6 million were obese (National Survey on Anthropometry).

It is known that fats properties including olfactory, visual and textural cues play a significant role in their attractiveness. Nonetheless developing proofs think also of "Fat Taste" as a sixth taste besides the previous five basic taste modalities: sweet, salt, sour, bitter and umami; that could participate in their palatability.

The aim of our project is to investigate whether an alteration of oro-gustatory detection of lipids is associated to high fat intake and then to the development of obesity among adult Moroccan people.

Methods: Till now a total of 80 adult subjects (age $\geq$ 20 years) were recruited and all anthropometric measures were taken to classify them into obese and control groups. Participants were also exposed to oral fat test using emulsions containing food-grade oleic acid (OA), at ascending concentrations (0.018, 0.18, 0.37, 0.75, 1.5, 3, 6 and 12 mmol / L) via three-alternative forced choice (3-AFC) method, in order to compare the detection thresholds and the sensitivity to fatty acids between the two groups.

Results: The average BMI (Body Mass Index) and fat content for obese were respectively 37.84kg/m2 and 40.94% and those of control were 22.26kg/m2 and 25.00%.

Obese participants exhibit high thresholds for OA oral detection (3.87mmol/l) than control (0.17mmol/l).

The subjects were classified into 4categories: Non Tasters (all of them belong to obese group), High Tasters (from control subjects only), Middle Tasters (from the both groups) and Low Tasters (predominated by obese group).

Conclusions: Fatty acid taste sensitivity can lead to high dietary fat intake and consequently to the development of obesity.

Keywords: Obesity. Fat taste. Oro-gustatory Detection thresholds.

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OVERWEIGHT, OBESITY AND METABOLIC SYNDROME IN MOROCCO: RESULTS FROM AN INTEGRATED INTERVENTION STUDY

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Background and objectives: The aim of this intervention study is to estimate the prevalence and determinants of metabolic syndrome (MS) in a urban overweight population and to assess the impact of an integrated approach to care including Mediterranean diet and a program of coached physical activity (DMAC) versus those adopting only the Mediterranean diet (DM) .

Methods: Between September 2012 and September 2016 we have recruited 983 people who consulted for overweight at the University Center for Preventive Medicine in Casablanca.

All the patients were proposed to follow or not an integrated program with specific mediterranean diet and aerobic physical coaching even if they were already treated for hypertension or diabete or hypercholesterolemia. The two groups DMAC and DM were followed during a minimum of six months and were assessed for clinical, biological and metabolic parameters.

Results: Among 983 patients, 830 have completed their program DM or DMAC with a minimum of six months follow-up. In terms of risk factors, 54.3% had a family history of diabetes , hypertension or hypercholesterolemia , 26.1 % were regular smokers , 39.2 % were regular alcohol drinkers . Weight and BMI means were respectively 86.77 kg and 28.66 kg/m2 . In total, the prevalence of metabolic syndrome (IDF 2009 criteria) was 28.1% (37, 3% in men and 21.6% in women). After 6 months of intervention , the prevalence of MS was 11.6% among those who opted for the DMAC and 23.1 % among those who opted for DM (OR = 0.43 (0.19 to 0 , 98) p = 0.04) , indicating a reduction in the prevalence of 57%. In a multiple logistic regression, factors associated with metabolic parameters improvement were the DMAC (ORadj = 9.6 , p = 0.000) , BMI (ORadj = 6.9 , p = 0.000) and sex (0Radj = 0.48 , p = 0.038).

Conclusions: Integrated intervention including specific Mediterranean diet and adapted physical activity improve Metabolic syndrome or prevent it in the Moroccan population. The incidence of some MS parameters could decrease by 25 to 50%.

Keywords: Obesity - Metabolic syndrome - Mediterranean Diet- Intervention

Further collaborators: Adamir Kaltoum. Loukili Najoua. Adamir Fatima Zahra

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STRUCTURAL RELATIONSHIPS BETWEEN DIETARY DIVERSITY AND SUBJECTIVE FACTORS AMONG HEALTHY ELDERLY IN AN OKINAWAN FARM VILLAGE, JAPAN

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Background and objectives: In Japan, dietary diversity (DD) called "Japanese diet" characterized by rice staple, diverse plant origin foods, and fish intake, might be contributed to extend our healthy life expectancy (HLE), however, structural relationships between DD and HLE including subjective factors still remains unclear. Especially, not only direct effects, but also indirect ones between DD and subjective health (SH), which are both independently predictors of HLE, have not fully been elucidated. The purpose of this study was to clarify the structural relationships between DD and SH among healthy elderly in Japan.

Methods: A home visit survey was conducted in 2012 for elderly aged 65 years or over living in A municipality in Okinawa. A total of healthy elderly 1,525 respondents excluding long-term care needs participants were examined. "DD" was characterized by a combination of dishes, i.e. staple, main dishes, sub-dishes, milk and dairy product, and fruits, making it as a latent variable. As the subjective factor's indicators, we used economic satisfaction (ES), subjective well-being (SWB), life satisfaction (LS) and SH. Direct relationships among them were evaluated by using correlation analysis. The fit of hypothetical models was evaluated using covariance structure analysis.

Results: The largest direct relationship was identified between SWB and LS (r=0.718), then we made them for a latent variable named "mental and emotional well-being (MEWB)". We set ES for our hypothetical model's base, SH for its outcome, and DD and MEWB for mediating factors. Four groups' models; from 65 years to 74 years (<75), and 75 years or over (≥75) by men and women separately, were evaluated. The most fitted models showing indirect effects mediated by MEWB and by DD were statistically more acceptable (CFI=0.958, NFI=0.923, RMSEA=0.026), in comparison with the direct effects of ES on SH in models except men of <75. The effect of MEWB on DD was largest in women of ≥75.

Conclusions: The present findings suggest that creating support for the subjective well-being and life satisfaction based on economic satisfaction might enhance the subjective health of healthy elderly over 75 years old through improvement of dietary diversity.

Keywords: Okinawa, dietary diversity, subjective health, covariance structure analysis

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TIME TRENDS IN THE AVAILABILITY AND APPARENT CONSUMPTION OF PROCESSED FOODSTUFFS IN GUATEMALAN HOUSEHOLDS IN 2006 AND 2011

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Background and objectives: Even though consumption of processed foodstuffs is increasing in the world, trends in food consumption has not been analyzed in Guatemala. The objective is to assess time trends in the availability and apparent consumption of processed foodstuffs in Guatemalan households and to identify factors that had influenced food consumption change in the last 10 years.

Methods: Mixed methods approach. Quantitative: We classified foods from the Guatemalan National Living Conditions Survey (NCLS) 2006 and 2011 (12,766 and 12,666 representative household sample respectively), according to the NOVA classification. The availability and consumption in terms of energy, macronutrients, saturated fat, cholesterol, fiber, and sodium were calculated for each processed food group. We run T-Test analyses using Stata. Qualitative: to identify changes in food consumption, 12 focus groups with parents of children who attended public schools in three Guatemalan departments were performed, considering different geographic areas, ethnicity and socioeconomic level. Data was analyzed using QDA Miner-Lite4.

Results: Processed and ultra-processed foodstuffs accounted for almost 25% of the household food availability, without changes over time. The contribution of this group to the total energy consumption in households was 20%, with a decrease trend over time, as well as in macronutrients, saturated fat, cholesterol and fiber. Non-poor, non-indigenous and urban area households showed greater food availability and consumption. Participants perceived that consumption of processed foodstuffs in households was higher at present than 10 years ago.

Conclusions: Trend in the availability and consumption of processed and ultra-processed foodstuffs in Guatemala apparently decreased between 2006 and 2011. This was more pronounced in the non-poor, non-indigenous and urban area households. These results contradicted people's perception. The fact that the NCLS does not capture information from new processed foods in the market might explain part of these inconsistencies.

Keywords: Processed foodstuffs, food availability, apparent consumption.

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CAPACITY BUILDING OF TEACHERS AND SCHOOL GIRLS THROUGH TRAINING AND EDUCATION BALANCED NUTRITION IN SENIOR HIGH SCHOOL IN MAROS DISTRICT SOUTH SULAWESI INDONESIA

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Background and objectives: There are many nutritional problems in adolescent girls such wasting, stunting, obesity, and anemia (10.3%, 23.6%, 6.8%, and 15.5%, respectively). This study aims to build the capacity of teachers and students through training and education to achieve balanced nutrition behavior and improvement of the nutritional status of adolescent girls.

Methods: The study is a multi-year study (3 yrs). A balanced nutrition CIE (communication, information and education) media has been developed in previous year (2015) and tested in the training for teachers and as education for the students (2016). There were four senior-high-schools selected and each school was represented by three teachers.The training for teachers (n=12) has been conducted for 2 days, then trained teachers taught the students for 4 months. For exact students, the balanced nutrition material has been inserted into biology, and physical and health education subjects, while for social science students, the material delivered through extracurricular activities.

Results: This study found that training of balanced nutrition successfully enhances teachers' knowledge in answering correctly (90%). Based on the evaluation of teachers regarding to students knowledge, they answered correctly and showed increasing score from 67 to 82. Based on the assessment of researcher, it was found that nutritional knowledge of students increase significantly before and after intervention (median score 32 to 62; p = 0,000). The eating behaviors become better for breakfast (34%), bringing food to school (46%), two-fold increase in daily fruit consumption (19%), never consume fruit reduced (13%), always consume complete food group (43.2%), BAZ-score increased significantly before and after intervention (p = 0,000), wasting student decreased 2%, microcytic anemia decreased almost half became 46.2% (p = 0,000), and anemia based on hematocrit level decreased three-fold became 4.6% (p = 0,000), .

Conclusions: By giving the training to teachers and balanced nutrition education to students, the capacity could increase in understanding the concept of balanced nutrition. It has implications for improvement of students'eating behavior and nutritional status.

Keywords: girls adolescent, balanced nutrition, education, nutritional status

Further collaborators: We potentially collaborate with the counselors to see the effect of the balanced nutrition CIE media effect in peer-counselling.

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MEASURING BLOOD RETINOL CONCENTRATIONS OF INFANTS FED WITH COMPLEMENTARY FOODS FORTIFIED WITH MORINGA OLEIFERA LEAF POWDER – A PILOT STUDY

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Background and objectives: Vitamin A deficiency (VAD) in the developing world remains a widespread public health problem. Investment in surveillance of VAD in high burden regions, using consistent methods, would provide improved information for intervention priorities. Improvement in the overall nutrition of high VAD burden populations, through dietary diversification and improved access to vitamin A rich foods, may be beneficial in combatting VAD. Leaves of the Moringa Oleifera plant reported to be a rich source of micronutrients particularly vitamin A, could be cheaply dried and stored for use in improving micronutrient content of diets of households in low resource settings. This study aimed at piloting measurement of blood retinol concentrations (using the i-check® fluorometer) among infants aged 8-12 months, whose complementary foods were supplemented with Moringa Oleifera leaf powder (MLP), in a rural district in Ghana.

Methods: Retinol concentration was measured (in 5ml of whole blood), at baseline and after 6 weeks, in a sub-sample of 103 infants participating in a 3-arm randomised controlled trial (RCT), ISRCTN14377902. One arm (n=35) received a cereal-legume blend fortified with (MLP) named MCL-35g, a second arm (n=34) received MLP as a supplement to be sprinkled on infants' usual foods (MS-5g) and a third arm (n=34) which received a cereal–legume blend, without MLP (CF-35g) served as controls. Data were analysed using SPSS for descriptive statistics, paired t-test and analysis of covariance.

Results: Sixty-five infants completed the study. Compared to World Health Oragnization (WHO) cut off for VAD (0.70 μmol/L) , mean retinol concentrations for all groups were low at both baseline and endline. There was a marginal increase at endline for all groups, but this was not statistically significant; 0.466 μmol/L at baseline to 0.548 μmol/L at endline for CF-35g (n=26), 0.509 to 0.631μmol/L for MC-35g (n=20), and 0.639 to 0.652 μmol/L for MS-5g (n=19).

Conclusions: The i-check® fluorometer has potential as a convenient tool for measuring blood retinol concentrations. Further studies on its reliability are however needed. Adequately powered RCTs with bigger sample size, which last for extended periods are needed to test the efficacy of MLP in combatting VAD.

Keywords: Vitamin A deficiency, i-check, Moringa Oleifera leaf powder, infants

Conflict of Interest Disclosure: The i-check® fluorometer was purchased with the main author's PhD grant and training on its use was provided by the manufacturer's (Bioanalyt Inc) training support staff. Aside this, there are no conflicts of interest to declare.

Further collaborators:
There are no further authors. We however wish to acknowledge Prof. Anna Lartey for her guidance and helpful inputs through all the phases of this work.

144/606

EVALUATION OF POLITICAL COMMITMENTS TO NUTRITION PROGRAMMES IN LAGOS STATE, NIGERIA

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Background and objectives: Under-and over-nutrition have public health consequences including disease burden, decreased cognitive development and possible mortality. Political involvement has been proven to be a potent tool in nutrition programmes development. However, there is need to conduct an evaluation on the level of political commitment in nutrition programmes in Lagos State, which is one of the economically buoyant States in Nigeria.

The study was designed to evaluate the level of political commitments to nutrition programmes in Lagos State.

Methods: The study was exploratory and the study location was purposively selected to justify the purpose of the study. Two research tools were developed and pretested, which included: key informant interview guide and record assessment guide. The interview guide was administered to stakeholders involved in implementation of nutrition programmes in Lagos State. Available documents on nutrition programmes from the State were assessed using the developed themes from the study objectives. The interview sessions were transcribed verbatim and were analysed thematically.

Results: Nutrition programmes were developed through various methods such as survey gaps and participatory rural appraisal. This evolved into the formation of strategic plans for nutrition intervention programmes to be implemented. The priority accorded to the nutrition sector has been a major drawback. The Commis-

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sioners for Health and Agriculture, the Governor and significant others were identified as the political class who could influence and make various commitments to nutrition programmes. The commitments to nutrition were verbal with little financial support for the sector. The quality of personnel working in the sector also determined the corresponding influence that political involvement had in the support for the sector. There were well established and planned organograms for the coordination of nutrition programmes. The relevance given to nutrition has made it to be incorporated into State development plan.

Conclusions: Political commitments should include financial support and quality officers are required to coordinate nutrition programmes.

Keywords: Political involvement, Stakeholders in nutrition, Nutrition intervention programmes.

144/616

IMPROVING THE PERFORMANCE OF THE HEALTH STAR RATING FRONT-OF-PACK NUTRITION LABELLING SYSTEM BY INCORPORATING ADDED SUGAR

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Background and objectives: The Health Star Rating (HSR) is an interpretive front-of-pack nutrition labelling system that rates the overall nutritional profile of packaged food and assigns a rating from 0.5 to 5 stars in half star increments. The HSR algorithm uses total sugar content as one of the components. This has been criticised because intrinsic sugars naturally present in dairy, fruits, and vegetables are treated the same as sugars added during food processing. We assessed whether the HSR could better discriminate between core and discretionary foods by including added sugar in the algorithm.

Methods: Nutrition information for 34,135 packaged foods available in Australian supermarkets were used. Products were classified as 'core' or 'discretionary' based on the Australian Dietary Guideline dichotomy between those everyday foods intended to make up the bulk of a healthy diet and those which should only be eaten occasionally. Added sugar values were estimated using a validated method and HSRs were calculated per proscribed standards. The ability of the HSR, with or without added sugar, to discriminate between core and discretionary foods was estimated using the area under the receiver operating characteristic curve (AUC).

Results: 15,965 core and 18,350 discretionary foods were included. Of these 8,230 core (51.6%) and 15,947 discretionary (86.9%) foods contained added sugar. Median (Q1, Q3) HSR and added sugar contents (g/100g) were 4.0 (3.0, 4.5) and 3.3 (1.5, 5.5) for core foods and 2.0 (1.0, 3.0) and 14.6 (1.8, 37.2) for discretionary foods. The AUC (95% confidence interval) for the current HSR algorithm was 0.825 (0.821; 0.829). The AUC for a model with added sugar alone was 0.777 (0.773; 0.782), compared with 0.692 (0.686; 0.697) for a model with total sugar alone. Including both added and total sugar increased the AUC to 0.870 (0.867; 0.874). Replacing total sugar by added sugar resulted in an AUC of 0.843 (0.839; 0.847).

Conclusions: Including added sugars in the HSR algorithm led to better discrimination between core and discretionary foods. These data argue for inclusion of added sugar in the HSR algorithm and reporting of added sugar as part of Australian nutrient declarations.

Keywords: food policy, front-of-pack labelling, Health Star Rating, nutrition labels, public health

Conflict of Interest Disclosure: Cliona Ni Mhurchu is a member of the New Zealand Health Star Rating Advisory Group. The New Zealand Health Star Rating Advisory Group had no role in study design, data analysis, decision to publish, or preparation of the abstract. Alexandra Jones is a member of the HSR Technical Advisory Group. The Technical Advisory Group had no role in study design, data analysis, decision to publish, or preparation of the abstract.

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SIMPLIFICATION OF THE HEALTH STAR RATING FRONT-OF-PACK NUTRITION LABELLING SYSTEM

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Background and objectives: The Health Star Rating (HSR) is an interpretive front-of-pack nutrition labelling system designed for packaged foods. Packaged foods are given a star rating of 0.5 to 5.0 stars in half star increments based on their overall nutrient profile score. The underpinning algorithm includes energy, risk nutrients (saturated fat; sodium; and total sugars), and positive nutrients (fibre; protein; and fruit, vegetable, nut and legume [FVNL] content). We assessed whether the HSR could be simplified, without materially changing its performance, by removing fibre and FVNL content, which are not mandatory on current nutrition labels.

Methods: Nutrition information for 34,135 packaged foods available in Australian supermarkets were used. Products were classified as 'core' or 'discretionary' based on the Australian Dietary Guideline dichotomy between those everyday foods intended to make up the bulk of a healthy diet and those which should only be eaten occasionally. Fibre content (g/100g) and FVNL content (%) were estimated using a validated method for each product. HSRs were calculated using both the standard HSR algorithm and a simplified HSR algorithm excluding fibre and FVNL values. The performance of the simplified HSR was determined by comparing the capacity to discriminate between core and discretionary foods using the area under the receiver operating characteristic curve (AUC).

Results: 15,965 core and 18,350 discretionary foods were included. The AUC (95% confidence interval) for the standard HSR algorithm with all components was 0.820 (0.816; 0.825). Removing FVNL, fibre, and both together changed the AUC by -0.0106 (-0.0134; -0.0079), 0.0001 (-0.0027; 0.0029), and -0.0099 (-0.0127; -0.0071), respectively.

Conclusions: The ability of the HSR to discriminate between core and discretionary foods did not change with the removal of fibre from the equation. Removing FVNL from the algorithm did reduce HSR performance by a small margin. Removal of both fibre content and FVNL content from the current HSR algorithm would have little material impact on performance but would greatly simplify HSR calculation for food manufacturers and researchers.

Keywords: public health; food policy; nutrition labels; front-of-pack labelling; Health Star Rating

Conflict of Interest Disclosure: Cliona Ni Mhurchu is a member of the New Zealand Health Star Rating Advisory Group. The New Zealand Health Star Rating Advisory Group had no role in study design, data analysis, decision to publish, or preparation of the abstract. Alexandra Jones is a member of the HSR Technical Advisory Group. The Technical Advisory Group had no role in study design, data analysis, decision to publish, or preparation of the abstract.

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COMPARISON OF DIETARY DIVERSITY SCORES (DDS) ACCORDING TO THE STATURO-PONDERAL STATUS AND GENDER AMONG RURAL MIDDLE SCHOOL CHILDREN IN THE NORTHWEST OF MOROCCO

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Background and objectives: Internationally, data on the nutritional health of adolescents (10-19 years) in rural areas are much rarer than those for infants (0-4 years), and adults (> 19 years). this study aims to compares the dietary diversity scores according to the staturo-ponderal status and gender among rural middle school children in the northwest of Morocco.

Methods: A sample of 300 middle school children was observed in a rural school in the northwest of Morocco. The dietary diversity scores are calculated by counting the number of the 11 most frequented food groups (grains, sweet tea, fatty substances, dairy products, vegetables, sweets, poultry, fruits, legumes, red meat, fish) consumed during the preceding 7 days by the middle school children. The staturo-ponderal status is determined by height for age and body mass index (BMI) for age.

Results: The sample consists of 102 girls (34%) and 198 boys (66%). The average age is 15.45 ± 1.64 years, ranging from 12.3 to 19.74 years. Stunting and thinness are respectively 9.7% and 10%. The comparison by Mann-Whitney test with a risk α = 5% shows that there was no significant difference in dietary diversity scores between the normal group (N = 271) and the group with stunting (N = 29): (u = 3046, p = 0, 051> 0.05), same thing between normal group (N = 270) and the group with thinness (N = 30) (u=3566; p=0,26>0,05). Also between girls and boys (u = 9588.5, p = 0.46> 0.05).

Conclusions: The study suggested that dietary diversity is not associated with the staturo-ponderal status or gender, A focused analysis is needed to determine the part of socioeconomic status.

Keywords: the dietary diversity scores, staturo-ponderal status, gender, middle school children. Morocco.

144/625

NUTRITION CONTENT OF BREAKFAST CEREALS AFTER THE FRONT OF PACKAGE LABELING REGULATION IN MEXICO

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Background and objectives: Breakfast cereals substantially contribute to daily energy and nutrient intakes in the Mexican population. One of the main dietary patterns of breakfast among Mexican children is cereals with milk. The Mexican National Health and Nutrition Survey of 2012 indicated that 49% of children aged <2 years consumed sweetened cereals. Due to the high prevalence of obesity and non-communicable diseases, the Mexican government implemented a Front of Package Labeling (FOPL) regulation. Such mandatory regulation displayed the nutrition content per package, not per serving. This regulation might have encouraged food industry to reformulate their products, since the total nutrition content of nutrients of concern would be displayed in the front of the package. The aim of this study was to identify the differences in the

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nutrition content of breakfast cereals between 2013 and 2014, after the FOPL regulation was implemented in Mexico.

Methods: This is a cross-sectional study. Data was collected from supermarkets. Trained nutritionist took photographs of breakfast cereals (n=371) in eight food retail chains. For 2013, data of n=155 breakfast cereals were collected; and after the regulation, in 2014, data of n=216 breakfast cereals were collected. Nutrient content was standardized by 100g. Since the data was non-parametric, we used Wilcoxon test to compare the nutrition content of breakfast cereals.

Results: We assessed the nutrition content of saturated fat, sugar, sodium, energy, carbohydrates and proteins. The mean nutrition content (2013 vs 2014) was: saturated fat (1.04 vs. 1.34), sugar (26.6 vs 23.3), and sodium (462 vs. 357), and energy (382 vs. 374 kcal). Significant differences in the nutrition content of breakfast cereals in year 2013 and 2014 were found (p<.05), except for energy. We also found significant differences in the content of carbohydrates and proteins which means that reformulation of products was made by increasing the content of other nutrients in the product.

Conclusions: The nutrition content of breakfast cereals changed after the implementation of the FOPL regulation. Most of the breakfast cereals decreased the content of nutrients of concern, especially sodium content.

Keywords: breakfast cereals, nutrition content, labeling.

Conflict of Interest Disclosure: This research was part of a larger study funded by the International Development Research Centre. The authors state that there is no potential conflict of interest in relation to this investigation.

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THE ASSOCIATION BETWEEN COFFEE, ARSENIC, LEAD, CADMIUM AND POLYMORPHISMS OF PON1 AND PPAR-Γ AND CHRONIC KIDNEY DISEASE

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Background and objectives: Environmental pollutants such as arsenic, lead and cadmium may increase the risk of CKD, by the reason of oxidative damage induced by these metals. Paraoxonase1 (PON1) as an important antioxidant enzyme, and peroxisome proliferator activated receptor-γ (PPAR-γ) as a transcription factor for regulating the gene expression of PON1. The aim of present study is to investigate the relationship among arsenic, lead, and cadmium, genetic polymorphisms of PON1 and PPAR-γ and CKD. In addition, we also explore the joint effects of the polymorphisms of PON1 and PPAR-γ on lifestyle related CKD.

Methods: Two hundred twenty CKD patients were defined using estimated glomerular filtration rate lower than 60 ml/min/1.73 m2, and recruited from the Department of Internal Medicine/Nephrology of Shin Kong Wu Ho-Su Memorial Hospital, Taipei Medical University Hospital and Taipei Municipal Wan Fang Hospital from 2007 to 2011. Age-gender matched 440 controls were recruited from a hospital-based pool, including those receiving senior citizen health examinations and adult health examinations. Concentration of urinary arsenic species, including arsenite (AsIII), arsenate (AsV), monomethylarsonic acid (MMAV) and dimethylarsinic acid (DMAV) were determined by a HPLC-HG-AAS. Polymorphisms of SNPs including PON1 (R192Q), PON1 (M55L), PPAR-γ(C1431T) and PPAR-γ(C[-681]G) were examined by PCR-RFLP.

Results: Study participants who had high educational levels, or alcohol, coffee or tea consumption had a significantly low risk of CKD, while those with diabetes, hypertension and analgesic usage routinely had a higher risk of CKD. Subjects carrying PPAR-γ (C1431T) CT genotype had a descending OR of CKD compared with CC genotype. PPAR-γ (C[-681]G)CG genotype had a lower OR of CKD than CC genotype. We also found a significant dose-response relationship between CKD risk and urinary total arsenic levels, or and erythrocytes lead and cadmium levels. The coffee non-drinkers and had higher urinary total arsenic levels, or and high erythrocytes lead and cadmium levels had a significantly higher OR of CKD than those sometimes or often drink coffee and had lower metal levels, respectively.

Conclusions: The present study is the first study to explore the association and joint effects among personal lifestyle, hypertension, diabetes, urinary total arsenic levels, erythrocytes lead and cadmium levels on CKD.

Keywords: Chronic kidney disease (CKD), Arsenic, Paraoxonase1 (PON1), Peroxisome proliferator activated receptor-γ (PPAR-γ), Polymorphism.

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HEALTH, NUTRITION AND DIETARY HABITS AMONG SCHOOL-AGE CHILDREN LIVING IN SOCIOECONOMIC INEQUALITIES CONTEXTS: PRELIMINARY OUTCOMES OF "SPORT FORGOOD" PROJECT IN ITALY AND ARGENTINA

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Background and objectives: Children living in socioeconomic inequalities contexts are at greater risk of health and nutritional diseases. This preliminary study assesses growth, health

and dietary habits of a sample of school-age children living in Italy and Argentina, enrolled in a promoting healthy lifestyle program.

Methods: Socio-demographic conditions, health, blood pressure (National High Blood Pressure Education Program-Pediatrics 2004) and anthropometry assessment (WHO standards/BMI Cole's cutoff), dietary habits (food frequency/24hours food recall) were analyzed at baseline. All children were living in socioeconomic inequalities context in Italy (Rome, Naples, Milan - (n.184, 76.7%) and Argentina (Buenos Aires - n.56, 23.3%), and were included in "Sport Forgood" program, promoting sport and healthy diet. Odds ratios (OR: 95% CI) were calculated to identify predictors of unhealthy dietary habits and malnutrition, both over and undernutrition.

Results: High rates of malnutrition were observed in 240 multi-ethnic children (72.1% males, mean age 10.2± 2.7 years). The prevalence of overweight (BMI Cole's cutoffs) was 17.5% (Italy 16.8%, Argentina 19.6%), obesity 15.4% (Italy 14.1%, Argentina 19.6%), underweight 6.7% (Italy 6.5%, Argentina 7.1%). Italian immigrant children with lack of access to water (OR:6.4; CI 1.3-30.8) and sanitation (OR:8; CI 1.7-38.4), and illiterate mothers (OR:8.8; 1.6-47.2) were at higher risk of being stunting (WHO height-for-age z-score <-2). Elevated blood pressure (>90th percentile) was detected in 7.6% of the sample, with an higher risk when BMI >25 (OR:3.7; CI: 1.2-11.7). Nearly twenty percent of the children had familiarity for chronic diseases. Dietary habits analysis showed: 41.4% of children not having breakfast or having inadequate breakfast (22.6%): having illiterate mothers increased the risk of not having breakfast (OR:2.4; CI:1.1-5.2); 53.8% of the sample not consuming adequate fruit or vegetable portions (<1 serving/day); 65.8% exceeding in sweet food consumption (>2 serving/daily) and 55.5% in sugar-sweetened beverages, especially when fathers were illiterate (OR:3.2; CI 1.1-9.2).

Conclusions: This finding adds to the growing literature that suggests living in socioeconomic inequalities contexts increases risk of childhood malnutrition, both overnutrition and undernutrition. The current study will continue to investigate changing in dietary habits after "Sport Forgood" healthy lifestyle intervention.

Keywords: dietary habits, school-age children, social inequalities context, sport.

that in LMIC mothers are more concerned about their babies not eating enough rather of being overweight. Understanding the factors that are associated to stunting, underweight and overweight could contribute to identify the population at risk and to better guide mothers on how to monitor growth and weight gain during infancy and early childhood. The aim of this study is to relationship between maternal and household characteristics and feeding practices to infant's height and weight status from 6-59m.

Methods: We combined 47 nationally representative and standardized Demographic and Health Surveys (DHS) spanning the period 2006-2015 which include over 250,000 children. We split the children population into two age groups: 6 to 23 months old; 24 to 59 months. For children aged 6 to 23 months, in some surveys there is 24 hours food intake information, which is also included in the association analysis. We ran multilevel regression models with country and year fixed-effects: a binary logistic regression on overweight, underweight and stunting and a quintile regression of z-score weight for height.

Results: For children 6-23m, we found that household wealth and maternal education was significantly negatively associated with stunting and underweight but positively with overweight. Breastfeeding status, consumption of fortified baby foods and fruits and vegetables were associated with lower rates of overweight. Infant formula, fortified baby food and fruits-and-vegetable were associated with lower rates of stunting and anemia. For children 24-59m, maternal education was no longer associated to overweight but household wealth was. Maternal overweight was associated with higher rates of child overweight in both age groups.

Conclusions: There is a strong association between maternal characteristics and children's health outcomes including weight status. The association between maternal education, household wealth and overweight should be further study. There could be cultural belief on child's healthy weight that is bias towards overweight in infancy.

Keywords: Child overweight, maternal education, infant feeding and stunting.

Conflict of Interest Disclosure: Authors are employees of Nestec. S.A. Industry Food Company

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144/635

MATERNAL CHARACTERISTICS AND FEEDING PRACTICES ARE ASSOCIATED WITH INFANT'S HEIGHT AND WEIGHT STATUS

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Background and objectives: While stunting and underweight have been gradually declining, childhood obesity has become an increasing public health problem in low and middle-income countries (LMIC). However, some studies have reported

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MONITORING OF BREASTMILK SUBSTITUTE ACT 2013 IN BANGLADESH

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Background and objectives: Deaths of 823,000 children in each year could be averted through universal breastfeeding, along with economic savings of US$300 billion. Bangladesh Breastfeeding Foundation (BBF), supported by Institute of Public Health Nutrition (IPHN) & Ministry of Health and Family Welfare (MoHFW) aimed to establish Breast milk Substitute (BMS) code monitoring system in Bangladesh.

Methods: In eight divisions, two trained BBF divisional officers monitored BMS Act 2013 by visiting health care facilities, doctor's chambers, markets in divisional town and media monitoring. Health care facilities included District hospitals, Upazilla Health Complex (UHC), Maternal and Child Welfare Center (MCWC), Private hospitals and Clinics etc while doctor's chambers and markets. Media monitoring was also done.

Results: From September 2016 to February 2017, a total of 120 divisional markets from eight divisions were monitored to detect the violation of BMS ACT 2013 for print, exhibit, circulate or publish any advertisement of any BMS among departmental stores and pharmacy. On the other hand, a total of 693 government and private hospitals were visited under the same project. In Mymensingh division, among 25 health facilities, BMS products were existed among 30% of government and private hospitals while 36% hospitals have breastfeeding corner established by BMS company. Among 76 visited health facilities of Sylhet division, 18% hospitals had breastfeeding corner established by BMS company whereas 28% showed to have BMS product and 34% found to have poster/leaflet/booklet of BMS Companies in the HF. However, there were no representatives from BMS companies. Social sites (Facebook, Twitter etc) were found to be used for promoting BMS products.

Conclusions: Violation of BMS Act 2013 in government and private hospitals and shops was quite high in Bangladesh which needs to be addressed to protect IYCF practice in Bangladesh.

Keywords: Breastmilk sustitute, Breastmilk sustitute Law, Bangladesh

144/648

UNDERSTANDING THE FACTORS THAT INFLUENCE THE DIET AND FEEDING PRACTICES OF POOR URBAN HOUSEHOLDS AND CHILDREN IN NAIROBI, KENYA

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Background and objectives: Research was undertaken in the informal settlement of Kibera, Nairobi, to assess the dietary habits and monetary cost of meeting the energy and nutrient specifications of households and children aged 2-5 years and their anthropometric status.

Methods: The study was undertaken in three stages. First a Household Economy Analysis (HEA) was done involving 36 focus group discussions to assess typical income and expenditure on essentials such as food and fuel. Second a Cost of the Diet (CotD) assessment was undertaken, which involved a market survey to calculate the cost per 100 g of all fresh foods followed by focus group discussions with local women to understand their typical food habits. These data were applied to CotD software to calculate the cost of meeting the energy and nutrient specifications of households, including children aged 2-5 years. Third, a cross-sectional survey was done of children aged 2-5 years in 409 households to assess their anthropometric status and feeding habits and to obtain a 24-hour dietary recall on a sub-sample of 26 households.

Results: The HEA indicated that approximately 60% of the population were classified as poor or very poor, earning less than USD 200 monthly. Households purchased cooked food to save on fuel and commonly on credit; school meals were an important source of food for school children. The CotD assessment indicated that a nutritious diet for a family of 6 costs about USD 380 per month, so was unaffordable to most people. The survey showed that 44% of children aged 2-5 years were stunted while 10% were wasted. Their median meal frequency was 4 meals a day, including snacks. The 24-hour dietary recall found that only 31% of children had consumed any animal protein, and 88%, 65% and 54% had consumed inadequate amounts of calcium, iron and zinc respectively, compared with the recommended daily nutrient intake.

Conclusions: The studies revealed poor diets among children aged 2-5 years with poverty playing a major role in the affordability of nutritious foods and the purchasing preferences of households.

Keywords: dietary habits, urban poor, household economy, cost of the diet.

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DEVELOPING AND TESTING REPORTING GUIDELINES FOR OBSERVATIONAL STUDIES IN NUTRITIONAL EPIDEMIOLOGY: A CONSENSUS BASED METHOD AND A RCT

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Background and objectives: The need to strengthen the evidence base, replicate studies and systematic reviews in health research led to the development of reporting guidelines. A reporting guideline is a checklist, a flow diagram or a combination that specifies the items to be reported concerning what was done and found during the study. For use within nutritional epidemiology, Strengthening the reporting of observational studies in epidemiology – nutritional epidemiology (STROBE-nut) an extension of the STROBE reporting guideline, was developed in 2016.

The mere existence of a reporting guidelines, does not guarantee adherence or correct use. Better understanding of how to implement reporting guidelines is required. We investigate whether the implementation of a checklist as an embedded tool in Microsoft Word increases the understanding and adherence to reporting guidelines (i.e., STROBE-nut, STROBE, CONSORT, and PRISMA) compared to traditional checklists.

Methods: In the first phase of this study, STROBE-nut guidelines were developed following a recommended procedure using the Delphi method. A steering group of 21 members with varied expertise coordinated the development of the reporting guidelines while external international experts were consulted to reach consensus on the proposed items .In the second phase of the study, the reporting guidelines were developed as a Word Add-in in VisualBA. Through a Randomized Controlled Trial, we compare the traditional way of administering reporting guidelines through paper checklists (control) with administering them through an embedded writing tool during manuscript drafting (intervention). Perceived usefulness, ease of use and completeness of reporting are the main outcome measures of the study. Participants are authors of nutritional epidemiology studies, randomly recruited from protocol repository websites (i.e. clinicaltrials.gov and PROSPERO).

Results: In total, 24 recommendations for nutritional epidemiology were added to the STROBE checklist to compose STROBE-nut. STROBE-nut is translated and disseminated widely through the website http://www.strobe-nut.org . The comparison of the Word add-in to traditional implementation of reporting guidelines is ongoing and pilot results will be presented at the congress.

Conclusions: It is hypothesized that using the guidelines improves the readability of the published literature. If reporting guidelines are appropriately translated in a user-friendly tool, they might be used more consistently and rigorously.

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TRENDS IN THE PREVALENCE OF OVERWEIGHT AND OBESITY AMONG BRAZILIAN SCHOOLCHILDREN, 2002, 2007, AND 2012/13

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Background and objectives: The negative health consequences of childhood overweight/obesity (OW/OB) are well known. Therefore, an accurate monitoring of the OW/OB prevalence is essential. Anthropometry is the most practical and cost-effective method for nutritional status evaluation. The purpose this study was to describe trends in the nutritional status among 7–10-year-old children by investigating changes in the prevalence of overweight (including obese) and obesity.

Methods: A school-based sample of 7–10-year-old children participated in three cross-sectional studies in 2002 (n=2,936), 2007 (n=1,232) and 2012/13 (n=1,531) in Florianopolis, southern Brazil. The WHO Child Growth Standards were used to define the prevalence of overweight and obesity.

Results: In 2012/13, 40.2% of the boys and 33.9% of the girls were overweight (including obese), which is a substantial increase since 2002 (boys 32.9%, girls 27.6%) and 2007 (boys 36.2%, girls 32.5%). Similarly, 15.9% of the boys and 11.2% of the girls were obese, which is higher than in 2002 (boys 11.9%, girls 8.3%) and which is much higher than in 2007, mainly among girls (boys 13.9%, girls 6.9%).

Conclusions: Over the period 2002 to 2007, there were a potential leveling off in the prevalence of obesity, and an increase in the prevalence of overweight. Over the period 2007 to 2012/13, the prevalence of overweight and obesity was still rising, and at an even faster rate than the preceding period. Evidence-based interventions are needed to counter the obesity epidemic, and there is an urgent need for school intervention programs.

DIET QUALITY INDICES IN RELATION TO MET-ABOLIC SYNDROME IN AN INDIGENOUS CREE (EEYOUCH) POPULATION IN NORTHERN QUÉBEC, CANADA

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Background and objectives: To assess associations between three diet quality indices and metabolic syndrome (MetS) in the Cree (Eeyouch) of northern Québec Canada.

Methods: 811 Eeyouch (≥18 years old) from seven James Bay communities participated in the 2005-09 cross-sectional "Nituuchis-chaayihititaau Aschii" Environment-and-Health study. The alternative-Healthy Eating Index (aHEI-2010), the Food Quality Score (FQS) and the contribution of ultra-processed products (UPP) to the total dietary energy intake using the NOVA classification were calculated from 24-hour food recalls. MetS was determined with the harmonized International Diabetes Federation (IDF) definition. Logistic regressions assessed the relationship between quintiles of dietary quality scores with MetS and its components.

Results: MetS prevalence was 56.6% with 95.4% abdominal adiposity, 50.1% elevated fasting plasma glucose, 43.4 % high blood pressure, 38.6% elevated triglycerides and 44.5% reduced high-density lipoprotein-cholesterol. Comparing highest to lowest quintiles of scores, adjusted odds ratios (ORs) of MetS was 0.70 [95% CI: 0.39-1.08; p-trend=0.05] for aHEI-2010, 1.06 [95% CI: 0.63-1.76; p-trend=0.87] for FQS and 1.90 [95% CI: 1.14-3.17; p-trend=0.04] for the contribution of UPP to the total dietary energy intake.

Conclusions: Although diet quality indices have been associated with cardiometabolic risk, only the dietary intake of UPP was significantly associated with MetS in the Eeyouch. Indices tailored to the food environment of northern communities are essential to further understand the impact of diet quality in this context.

Keywords: Ultra-processed products, diet quality, metabolic syndrome, aboriginal health, NOVA classification

IS MEDITERRANEAN DIET ADHERENT IN A YOUNG ADULT ALBANIANS TO PREVENTION OF CARDIOVASCULAR DISEASES?

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Background and objectives: Mediterranean diet (MD) is associated with lower risk of major chronic diseases. Despite the overall documented health benefits, adherence to this MD pattern has been rapidly declining over the last decades due to youth tendency toward unhealthy foods. Albania is a Country that is living a transitional economical realty from the rural life to a more developed and westernized state. This transition is seen also in the change of lifestyles. The aim of the study to assess the adherence to MD through the Mediterranean Adequacy Index (MAI) in young adult Albanians and verify the risk for the development of cardiovascular diseases.

Methods: In 78 males and 165 females, belonging to Albanian young adults aged 18-27 years. Weight, height werw mwasured and body mass index (BMI) was calculated. Body composition ((fat mass (FM), fat free mass (FFM), body cell mass (BCM)) by bioelectrical impedance analyses (BIA), blood pressure (BP), waist hip circumferences were assessed. Food intake by food frequency questionnaire (FFQ) and physical activity questionnaires were measured. Mediterranean Adequacy Index (MAI) was computed by dividing the sum of the percentage of total energy from typical Mediterranean food Groups by the sum of the percentage of total energy from non-typical Mediterranean food groups

Results: BMI were 23.5 ± 5.0 and 22 ± 4 kg/m2 men and women respectively. FM 14.6 ± 8.0 kg, 14.0 ± 6.0 kg; %FM 18.7 ± 8.1 and 24.0±6.2; BCM 33.6±3.9 kg and 22.3 ± 2.9 kg males and females respectively There was a significant correlation between diastolic BP and waist/hips ratio in females (p< 0.05) as well as diastolic BP and MAI (p< 0.05); fat mass and MAI (p< 0.03) women; in men waist/hips and MAI (p<0.03). Overweight subjects had an higher blood pressure, practiced less physical activity and their food habits were less adherent to MD.

Conclusions: Young Albanian population is moving from a traditional rural life-style to more westernized way-to-live that can also be understood in the nutritional habits of our population

with an increasing risk for overweight/obesity and cardiovascular diseases.

Keywords: Mediterranean diet, cardiovascular diseases, fat mass

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DIETARY LEUCINE, ISOLEUCINE AND VALINE INTAKE AND THEIR ASSOCIATION WITH METABOLIC SYNDROME: A POPULATION-BASED STUDY

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Background and objectives: Metabolic syndrome (MetS) is considered a cluster of factors that raises risk for cardiovascular disease and other health problems. Evidences from epidemiological studies suggest that BCAA intake may be related to chronic diseases, especially MetS, but this association is not yet clear. The aim of this study was to investigate the relationship between BCAA intake with MetS

Methods: Data of 591 adults and older adults, of both sexes, were obtained from the 2008 Health Survey of São Paulo, a cross-sectional population-based survey. Baseline characteristics were collected from a structured questionnaire and the data of consumption of BCAA was obtained from two 24-hour recalls, analyzed in the Nutrition Data System for Research (NDSR). The leucine, isoleucine and valine intake were adjusted for total energy intake and the usual intake were estimated using the Multiple Source Method. MetS was defined as the presence of at least three of the following: hypertension, hyperglycemia, dyslipidemia and central obesity. Multiple logistic regression was used to investigate the association between BCAA intake and the presence of MetS. The models were adjusted by sex, age, alcohol consumption, per capita income, smoking status, race, BMI (Body Mass Index), physical activity level, total energy intake, high-sensitivity C-reactive protein, monounsaturated fat, polyunsaturated fat and saturated fat intakes. All analyzes considered the complexity of the sample design and the significance level of 0.05 was considered.

Results: Individuals with higher leucine intake (fifth quintile) was positively associated with MetS when compared to those of the first quintile (OR=3.85, 95%CI=1.67-8.87). The same occurs with valine (OR=4.33 95%CI=1.75-10.69) and isoleucine intake comparing fifth with first quintile (OR=3.58 95%CI=1.46-8.77)

Conclusions: The highest dietary leucine, isoleucine, and valine intake were positively associated with MetS.

Keywords: food consumption; branched chain amino acids; Metabolic Syndrome; health survey.

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INFLUENCE OF EXERCISE ON OBESE CHILDREN 6-12 YEARS IN ENUGU SOUTH LOCAL GOVERNMENT AREA OF ENUGU STATE, NIGERIA

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Background and objectives: Social environment or life style of an individual is created through the different social activities around him and it could affect his nutritional status. Exercise is a life style that could have positive influence on obesity. Overweight and obesity in children are increasingly becoming public health concern in the world. Obesity is a risk factor for many chronic non-communicable diseases like type 2 diabetes, high blood pressure, heart diseases and some cancers. The study assessed the effect of physical exercise on weight of obese children 6-12 years in Enugu south Local Government Area (LGA) of Enugu State, Nigeria.

Methods: A preliminary study was conducted on school children 6-12 years in Enugu south LGA of Enugu State, Nigeria, to determine those who are obese. A total of 60 children representing 49.6% of the 121 obese children identified were randomly selected for the study. The children were divided into test and control groups (n = 30) based on body weight. Test group was subjected to physical exercise (jogging, dance aerobics, rope skipping, handball and football) 2 hours a day for 8 weeks. The control group had no physical exercise. Weight measurements of the children were taken at baseline and endline of the exercise.

Results: The test group had a weight decrease of 9.88% while the control group had 7.2% weight gain. The females in the test group had a weight decrease of 9.68% while the males had 11.84% decrease. There was 8.09% and 6.37% weight increase in the female and male children, respectively in the control group.

Conclusions: Physical exercise reduced obesity in the school children and should be encouraged in children as a way of fighting obesity.

Keywords: Obesity, Physical exercise, School children.
Further collaborators:
Ministry of Education. Enugu state. Nigeria.

THE ASSOCIATION BETWEEN SOCIOECONOMIC STATUS, PLACE OF RESIDENCE, OVERWEIGHT AND CENTRAL OBESITY IN POLISH FEMALES. THE GEBAHEALTH STUDY

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Background and objectives: Socioeconomic (SES) and demographic factors can influenced weight status. It was found that people with low SES are more likely to be overweight and obese [1]. The aim of this study was to assess the effect of SES, its single factors and place of residence on the prevalence of overweight and central obesity in Polish females.

Methods: A cross-sectional study was carried out in representative sample 1107 of Polish females aged 13-21 years. The SES index was calculated based on categorial variables: mother's education, father's education, self-declared economic status, description of household. Six regions of the country (ordered from the poorest to the richest) and rural/urban place of residence were analyzed. The prevalence of overweight was assessed using IOTF 2012 standards. The criterion of central obesity was WHtR≥0.5 [2]. Odds ratios (ORs) adjusted for age were calculated.

Results: Overweight (including obesity) was observed in 12.1% and central obesity in 7.9% of females. Females with high SES were less likely to be overweight (OR=0.52) and to have central obesity (OR=0.51). Overweight was less likely in females having father with higher education (OR=0.33) and good economic situation of the household (OR=0.49). Central obesity was less likely in females having mother with upper secondary education (OR=0.50). Compared to eastern region of the country (the poorest one), females living in northern (OR=2.61), north-western (OR=2.52) or south-western (OR=3.25) region were more likely to be overweight and females living in south-western region (OR=2.56) to have central obesity. The ORs for rural/urban place of residence were not significant.

Conclusions: SES, its single factors and region of residence were linked with overweight and central obesity in Polish females. High SES was associated with lower prevalence of overweight and central obesity. The relation with place of residence was inconsistent.

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PHYSICAL ACTIVITY LEVEL MEASURED BY PAQ-C IN 8-11 YEARS OLD SCHOOL-AGED CHILDREN: A MULTICENTRIC STUDY IN THREE WEST AFRICAN COUNTRIES

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Background and objectives: Physical inactivity is an important risk factor of childhood obesity and highlight the need for more physical activity (PA) data surveillance. The aim of this study was to use a common tool: Physical Activity Questionnaire for Older Children (PAQ-C) to compare the prevalence of PA levels among school children from three West African countries.

Methods: The study is a cross-sectional one conducted in Senegal, Mali, and Mauritania. Overall 471 school-aged children, 8-11 years old (235 boys, 236 girls) were randomly selected from elementary public schools in urban area of Dakar (n=156), Bamako (n=155) and Nouakchott (n=161). BMI-for-age and Height-for-age (z-scores) were calculated according to WHO growth standard reference. PA level was assessed by PAQ-C using a harmonized protocol, and was categorized as low (score=1), moderate (score=2-4) and high (score=5).

Results: The prevalence of overweight/obesity (BMI> +1 z-score) and stunting (HAZ< -2 z-score) were comparable among the children: 4.5% and 1.92% in Senegal, 3.9% and 4.5% in Mali, and 2.5% and 5.7% in Mauritania, respectively. Thinness affected significantly more children in Senegal (30.1%) than in Mali

(13.5%) and Mauritania (15.7%, p<0.01). Mean PAQ-C score was significantly lower in the Senegalese (2.34±0.74), compared to the Malian (2.60±0.59) or the Mauritanian children (2.62±0.67, p<0.01). In the three countries, the lowest score value was recorded in girls with significant difference between boys and girls (p<0.001). Overall, 79% of the children in the 3 countries were engaged in moderate PA level (score=2-4), but the proportion was significantly lower in Senegal (65%) than in Mali (83%) and Mauritania (84 %; p=0.002). Across all countries, boys more frequently reported moderate PA than girls (p<0.05). Whatever the country or sex any intense PA level was observed among the children.

Conclusions: Similar physical activity patterns were found in the three West African countries indicating moderately active school-aged children. PAQ-C could be a suitable tool for the assessment and surveillance of PA as well as data comparisons across countries. Although PAQ-C is an uncomplicated routine method, various activities were not adapted for genuine activities and therefore need further validation.

Keywords: PAQ-C, School-aged children, Senegal, Mali, Mauritania.

Further collaborators: Supported by International Atomic Energy Agency (IAEA) through the RAF/6/042 project, the Ministry of Higher Education and Scientific Research of Senegal (PA-PES : Projet d'Appui aux Enseignantes-Chercheures du Sénégal) and the Islamic Development Bank (IDB).

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SOCIO-DEMOGRAPHIC AND BIRTH CHARACTERISTICS INFLUENCE THE DURATION OF BREASTFEEDING IN COLOMBIA: RESULTS FROM THE 2010 DEMOGRAPHIC AND HEALTH SURVEY

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Background and objectives: Breastfeeding is associated with positive maternal and infant health benefits. In high-income countries, socially disadvantaged women breastfed less often. However, there is limited research in low- and middle-income countries. This study assessed the duration of total breastfeeding by region and estimated the role of socio-demographic, life-style related and birth characteristics on the duration of breastfeeding in Colombia.

Methods: We used cross-sectional data from the 2010 Colombian Demographic Health Survey. Six regions were defined according to particular physical and climatic characteristics. 16,594 mothers aged 13-49 years were included in the study. Univariate

and bivariate analyses were conducted. Time-to-event analyses were employed for the analysis of breastfeeding-related data.

Results: The association between breastfeeding duration and region varies substantially. Overall, women who reported higher age at first birth (Sub hazard ratio (SHR= 1.05, 95% CI 1.04, 1.06), higher parity (SHR= 1.13, 95% CI 1.10, 1.16) and delivery by cesarean (SHR= 1.07, 95% CI 1.02, 1.12) discontinued breastfeeding sooner than their counterparts. In contrast, breastfeeding duration was longer among lower educated (SHR= 0.77, 95% CI 0.73, 0.82) and poorest (SHR= 0.83, 95% CI 0.78, 0.89) women. Life-style related characteristics such as alcohol consumption and smoking had no significant associations on breastfeeding duration.

Conclusions: Socio-demographic and birth characteristics play a role in explaining regional differences in duration of breastfeeding. Therefore interventions looking for increasing the duration of breastfeeding should be more focused on women who are most at risk of early cessation of breastfeeding, also integrating the different regional needs to reduce the socioeconomic inequalities in breastfeeding.

Keywords: Breastfeeding, Infant health, Colombia, Cesarean delivery, Maternal education,

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SUGAR-SWEETENED BEVERAGE CONSUMPTION AND OBESITY IN CHILDREN'S META-ANALYSES: REACHING WRONG ANSWERS FOR RIGHT QUESTIONS

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Background and objectives: Recent studies assert that sugar-containing drinks may play a key role in the etiology of overweight at all ages. However, scientific literature shows contradictory findings. Whether this association is a leading cause or not is a matter of debate. It is also subject to discussion whether the quality/adequacy of studies may influence the outcome. Our aim was to explore the most recent scientific evidence focused on sugar-sweetened beverages (SSB) and child obesity and to further analyze the adequacy of the meta-analyses in terms of their results, with special emphasis in the methodology, clarity and transparence of their procedures.

Methods: We selected only meta-analyses of randomized control trial studies on PubMed database and Cochrane Website until January, 2016. Adherence to PRISMA was assessed.

Results: Six meta-analyses were included. All of them showed some degree of evidence of heterogeneity in theirs pool estimates. Two of them showed a positive association between SSB and obesity but the other four found no association. The adherence to the PRISMA criteria was higher in two of the meta-analyses that showed opposite conclusions regarding the association or non-association of SSB and obesity in children. Thus, there is no relation between the adherence of the meta-analyses to the PRISMA criteria and the results obtained.

Conclusions: The use of meta-analysis as a scientific tool requires further promotion, better refinement and widespread agreement. Available quality-assessment tools have limitations, and many contextual factors beyond the intrinsic characteristics of the reviews may influence their results. Sugary drinks are often blamed as a potential cause of the obesity pandemia, but this possible association requires a broader approach that includes a detailed analysis of the whole diet and lifestyle.

Keywords: Sugar-sweetened beverage, obesity, children, meta-analyses

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MATERNAL SYMPTOMS OF MENTAL HEALTH ARE ASSOCIATED WITH MATERNAL AND CHILD DIET DIVERSITY AND MATERNAL BMI IN UPPER MANYA KROBO DISTRICT OF GHANA

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Background and objectives: Poor maternal mental health may affect productivity and livelihood opportunities as well as diminish mothers' ability to provide adequate care for their young children and themselves. The objective of this analysis was to examine the association between symptoms of maternal mental health and maternal and child nutritional indicators.

Methods: Nutrition Links is a 5-y project to improve rural health and economic well-being in the Upper Manya Krobo district, Ghana. In 2013-2014, an exhaustive survey of 1096 households with infants < 12 months was completed; a one-year follow-up survey was carried out with 943 households (86%). The Self-Reporting Questionnaire with 20 symptoms of depression and anxiety (SRQ20) estimated probable mental disorder among mothers. The survey also included a socio-demographic questionnaire and a 24-hour and 7-day food frequency questionnaire for children and mothers, respectively. Child dietary diversity score (DDS) was the number of food groups (7 maximum) consumed and maternal DDS was based on 15 food groups. Weight and height were taken and WHO standardized indicators [child] and BMI [mother]) were calculated. The analysis excluded communities randomly selected to participate in an agricultural and nutrition education intervention, leaving 687 households for the linear regression models.

Results: The median SRQ20 score was 7 at baseline and 8 one year later; the two scores were strongly correlated ($r = 0.56$; $p<0.0001$). The SRQ20 score at baseline was negatively associated with both maternal ($b=-0.08$; $p<0.001$) and child ($b=-0.27$; $p=0.01$) DDS one year later. Having the highest increase in symptoms between baseline and one year (i.e., $\geq$ 75th percentile: 4+ symptoms) was associated with a further lower DDS for mothers only ($b=-0.72$; $p<0.01$). A higher SRQ20 score tended to be associated with a lower maternal BMI ($b=-0.059$; $p=0.07$) but was not directly associated with any anthropometric indicators among the children.

Conclusions: The limited association between maternal mental health symptoms and child outcomes may reflect support from alternative caregivers. Integrated nutrition programs must consider mechanisms to address mental health. The Nutrition Links project is registered as Clinical Trials # NCT01985243.

Keywords: Mental health, diet, nutrition, maternal, child

144/695

HERBS AND SPICES: NUTRIENTS, CONTAMINANTS AND RESIDUES

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Background and objectives: Herbs and spices as a food category have a significant role in culinary traditions around the world, and are highly traded food commodities. However, as usual consumption is low, e.g., in amounts of a few grams per person per day, dietary surveys often fail to capture their contribution, and food composition databases often omit their inclusion. Nevertheless, they are generally acknowledged as contributing to intakes of micronutrients and beneficial bioactive non-nutrients for households and communities, particularly where there is significant adherence to food traditions. Of equal interest are the exposures to contaminants and chemical residues. This paper examines the risks and benefits of herbs and spices specific to the nutrients, beneficial bioactive non-nutrients, chemical residues and contaminants.

Methods: Nutrient data from national and regional food composition databases, and data from pesticide residue and heavy metal analyses in the USA and New Zealand, and from import refusals for EU and USA, were examined for ginger, turmeric, pepper, paprika, cinnamon, nutmeg, garam masala and curry powder from various countries of origin. Original analyses for heavy metals are carried out using Graphite Furnace Atomic Absorption Spectrometry.

Results: Compositional data from popularly traded spices show levels of nutrients and beneficial phytochemicals that justify their inclusion in diets. Noteworthy are the provitamin A carotenoid contents of highly pigmented spices. The data also reveal chemical contaminants that exceed the maximum levels stipulated by global (Codex Alimentarius) and national (Food Standards Australia New Zealand) food safety bodies. In these analyses, all of the spices tested were found to contain detectable levels of heavy metals. The case study of turmeric is highlighted in the context of its recent popularity because of the therapeutic effects of curcumin, one of three major curcuminoids; the recent food safety recall in the US due to lead contamination; the surveillance measures to ensure consumer safety; and the relevance of country of origin in world spice trade.

Conclusions: As interest in the beneficial nutrients and bioactive non-nutrients in spices increases, the requirement for safety testing becomes critical. Dietary intake assessments, and exposure assessments, should always include both benefits and risks.

Keywords: spices, contaminants, food safety, exposure assessment, turmeric

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144/698

CRUCIFEROUS VEGETABLE INTAKE AND LUNG CANCER RISK: A PROSPECTIVE STUDY AND A META-ANALYSIS

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Background and objectives: Cruciferous vegetables, a rich source of isothiocyanates, have been reported to lower the risk of lung cancer. However, evidence from prospective observations of populations with relatively high intake of cruciferous vegetables is sparse. We examined the association between cruciferous vegetable intake and lung cancer risk in a large-scale, population-based, prospective study in Japan.

Methods: We studied 82,330 participants aged 45–74 years. Participants responded to a questionnaire that included 138 food items. The association between cruciferous vegetable intake and lung cancer incidence was assessed using the Cox proportional hazard regression model. Furthermore, we carried out a meta-analysis of all prospective studies.

Results: After 14.9 years of follow-up, a total of 1499 subjects were diagnosed with lung cancer. After the deletion of early-diagnosed cancer, we observed a significant inverse association between cruciferous vegetable intake and lung cancer risk among male current nonsmokers: multivariate HR (95% CI): 0.49 (0.27, 0.87), P for trend=0.04 for never smokers, and 0.59 (0.35, 0.99), P for trend=0.10 for past smokers. No association was noted in male current smokers and female never smokers.

Conclusions: The study suggests that cruciferous vegetable intake may be associated with reduction in lung cancer risk among male current nonsmokers.

Keywords: cruciferous vegetables, isothiocyanate, lung cancer, prospective study, Japan

Conflict of Interest Disclosure: M Inoue is the beneficiary of a financial contribution from the AXA Research Fund as chair holder of the AXA Department of Health and Human Security, Graduate School of Medicine, The University of Tokyo. The AXA Research Fund had no role in the design, data, collection, analysis, or interpretation. Other authors declare no other conflict of interest.

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144/700

QUALITY OF FOOD CARRIED OUT OF HOME BY ADULTS IN THE SANTOS CITY - SÃO PAULO (SP)

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Background and objectives: Out-of-home meals are a trend in today´s society and may be associated with unhealthy eating habits. In this study, the objective was to evaluate the consumption and quality of food carried out outside the home by adults, as well as to verify the association between sociodemographic aspects, health, nutritional status and characteristics of meals outside the home.

Methods: Cross-sectional study in a convenience sample with 100 adults (20-59 years old) attending a Shopping Center in Santos/SP (Ethics Committee protocol number 1.028.804 in April 2015). Sociodemographic information and health conditions (ed-

ucation, marital status, family income, weight and height referred to the calculation of body mass index to assess the nutritional status) were been collected. Regarding food outside the home, information was collected on food assistance, daily expenditure, type of meal and preparation, place and food consumed. Chi-square or Fischer's exact tests were performed using STATA® 12.0 to evaluate the proportions of the studied variables with the characteristics of meals performed outside the home.

Results: Of the 100 individuals surveyed, 60% were women and 40% men. Most men were overweight (56,41%), but most women were eutrophic (49,12%). Most participants had higher education (73,19%), were single (65,00 %) and had a family income between US$ 1.166 and US$ 2.915 (66,65%). Most participants consumed only one meal (62,00%); preferred grilled preparation (58,00 %), lunch was the most accomplished meal (83,00%) and the place of meals was the restaurant per kilo (64,00%). The daily consumption of unhealthy foods (cold and sausage, fried salted, pizza, jam and cake) occurred in a higher proportion among people with lower schooling (53,84%; p<0,01) and lower purchasing power (50,00%; p<0,01). However, daily intakes of healthy foods (fruit, vegetables, legumes and beans) were also higher among those with low schooling (40,35%; p<0,01). Among those who ate mores meals home outside, the consumption of healthy foods was not daily (10,81%; p=0,02).

Conclusions: Lunch was the main meal performed outside the household in a restaurant per kilo and although the grills were preferred, there was consumption of "healthy" and "unhealthy" foods.

Keywords: Adult, food outside of home, eating habits.

144/701

NUTRITIONAL PROFILE AND NUTRITIONAL EDUCATION IN SCHOOLCHILDREN OF PUBLIC AND PRIVATE SCHOOLS IN SANTOS CITY/SÃO PAULO (SP)

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Background and objectives: The school period, between 6 and 10 years of age, the child develops motor skills, has higher nutritional needs and increases food intake. Therefore, education activities in this age group are extremely important. In this context, the objective was to compare nutritional status, food consumption and performance in nutritional education among schoolchildren from a public school and a private school in Santos/SP.

Methods: Cross-sectional study of 6 to 10 year-old schoolchildren from a public school and a private school in Santos/SP (Ethics Committee protocol number 1.237.133 September 2015).

The body mass index/age and stature/age indicators were been calculated from the weight and height measured and evaluated from the WHO growth charts. Information on food consumption and nutritional education activities were also collected. To verify the proportion between food consumption and type of school type and food consumption and nutritional status, the Chi square or Fisher exact test was been used. The Mann Whitney test was used to evaluate the difference in means of correctness of nutritional education activities by type of school. A significance level of 5% and STATA® 12.0 software were been adopted.

Results: 172 students schoolchildren participated in this study: 50 from the private school and 122 from the public school. For the IMC / age indicator, 40% of them were overweight. There was a higher proportion of private schoolchildren who consumed in natura foods (28,00%, p=0,04) and higher proportion of public schoolchildren who consumed ultraprocessed foods in the morning snack (62,79%, p=0,00). At lunch and dinner, the intake of ultra-processed foods was higher among schoolchildren at the private college (44,00%, p<0,01; 58%, p<0,01, respectively). In relation to nutritional education activities, the students of the private school obtained a greater average of correct answers in activities 3 ($\overline{x}$=81,24; p <0,01) and 4 ($\overline{x}$=87,40; p<0,01).

Conclusions: Most schoolchildren were overweight. Processed and ultra-processed foods were overconsumed among public schoolchildren in morning snack and among private schoolchildren in lunch and dinner. The performance in nutritional education activities was better in activities 3 and 4 among the private schoolchildren.

Keywords: Nutritional status, food intake, nutritional education, schoolchildren.

144/703

AN ASSESSMENT OF THE ASSOCIATIONS BETWEEN COMMUNITY-LEVEL ENVIRONMENTAL FACTORS AND DIETARY INTAKE QUALITY IN GEOGRAPHICALLY ISOLATED COMMUNITIES

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Background and objectives: Remote Indigenous Australians experience disproportionately poor cardio-metabolic health,

largely underpinned by adverse dietary intake. Little is known about the environmental-level factors that shape diet quality in this geographically isolated population group. Therefore, this study aimed to identify modifiable environmental level factors associated with features of dietary intake that underpin cardio-metabolic disease risk in this population group.

Methods: Community-level store food and beverage purchasing data collected over 49 weeks throughout 2012 were linked with social, built and physical environmental dimension data for up to 20 remote Indigenous Australian communities in the Northern Territory. Descriptive analyses were performed to investigate associations between modifiable environmental factors and diet quality.

Results: At the community level, percent of dwellings needing extra bedroom/s was negatively associated with protein intake (Pearson correlation; r=-0.64, p=0.02) and sugar-sweetened beverage intake (r=-0.55, p<0.05). Mean Indigenous household income was negatively associated with protein intake (r=-0.57, p=0.04). Indigenous unemployment was negatively associated with sugar-sweetened beverage intake (r=-0.62, p=0.02). Distance to a neighbouring store was negatively associated with discretionary food intake (r=-0.45, p<0.05) and sugar-sweetened beverage intake (r=-0.61, p<0.01).

Conclusions: In the first study of its kind, several modifiable environmental factors appear to be associated with adverse diet quality in geographically isolated communities.

Keywords: Indigenous health, spatial epidemiology, nutrition, cardio-metabolic disease

and physical activity were collected by validated questionnaires. Investigated indices for describing glucose homeostasis included fasting plasma glucose (FPG), fasting plasma insulin, glycated hemoglobin (HbA1c), the homeostatic model assessment-insulin resistance (HOMA2-IR) and odds of pre-diabetes (impaired glucose tolerance and (or) impaired fasting glucose). Waist circumference (WC), height and weight were measured, and the last two were used to calculate body mass index (BMI). Data were analyzed by multivariable regression models.

Results: The average serum 25(OH)D was 22.66 ng/ml, and percentages of vitamin D deficiency (25(OH)D < 20 ng/ml) and insufficiency (20 ≤25(OH)D ≤30 ng/ml) were 47.61% and 32.17%, respectively. Serum 25(OH)D was inversely associated with fasting insulin (p=0.0007), HbA1c (p=0.0001) and HOMA2-IR (p=0.0007), but not with FPG, after adjusting for age, gender, personal monthly income, smoking status, energy intake, physical activity and WC. Furthermore, higher serum 25(OH)D level was a protective factor of pre-diabetes, the estimates of odds ratio (OR) comparing the highest vs. the lowest tertile of serum 25(OH)D were 0.68 (95% CI: 0.47-0.99) after adjusting for the confounders mentioned above.

Conclusions: Our results support that a higher serum 25(OH)D level is associated with decreased risk of pre-diabetes by mechanism likely tied to effects on insulin sensitivity in Chinese population.

Keywords: Vitamin D, 25(OH)D, Glucose homeostasis

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SERUM 25(OH)D CONCENTRATIONS ARE ASSOCIATED WITH GLUCOSE HOMEOSTASIS AMONG ADULTS IN SOUTHWEST CHINA

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Background and objectives: Recent epidemiological studies have suggested inverse associations between vitamin D status and metabolic diseases including type 2 diabetes. However, the role of vitamin D in glucose metabolism remains inconclusive. We aimed to examine whether a higher serum 25-hydroxy vitamin D (25(OH)D) was associated with a more favorable glucose homeostasis among adults in Southwest China.

Methods: Serum 25(OH)D was detected in a cross-sectional sample of 920 non-diabetic adults (62.61% women) aged 25-65 years recruited from Southwest China. Data on dietary intake

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144/714

OBESITY PARADOX IN THE OLDEST OLD: EVIDENCE FROM A CHINESE COMMUNITY-BASED PERSPECTIVE COHORT STUDY

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Background and objectives: Current international and national guidelines for body mass index (BMI)and waist circum-

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ference (WC)were recommended to all adults aged 18 or older. However, the optimal BMI and WC in the oldest old (aged 80 or older) were poorly known. The present study was to investigate the relationship of BMI and WC with all-cause mortality in a large prospective community-based cohort study in the oldest old.

Methods: A total of 4361 Chinese oldest old (mean age 91.8) participated in this study. BMI and WC were measured at baseline and all-cause mortality was calculated over a 3-year period from 2011 to 2014. The BMI and WC were used as continuous variables and as categorized variables by recommendations or by tertiles. In both genders, additive Cox proportional hazards models and Cox proportional hazards models were used to explore and assess the association with adjustment for covariates.

Results: During 3 years of follow-up, 1795 participants died, and the overall all-cause mortality was 41.2%. Compared to underweight participants (BMI<18.5 kg/m2), the hazard ratios (HRs) for all-cause mortality were lower in normal weight participants (BMI:18.5-24.0 kg/m2) and overweight or obese participants (BMI≥24.0 kg/m2), were 0.71(0.60-0.83) and 0.60(0.47-0.76) for men, and 0.80(0.70-0.91) and 0.79(0.64-0.96) for women. Similarly, the HRs were lower in participants with abdominal obesity, were 0.76(0.65-0.89) for men and 0.78(0.69-0.88) for women. Compared to the upper BMI tertile, the middle and lower tertile of BMI and WC increased the risk of mortality. For men, the HRs were 1.23(1.02-1.48) and 1.53(1.28-1.82) for middle and lower BMI, 1.21(1.01-1.46) and 1.41(1.18-1.69) for middle and lower WC. For women, the HRs were 1.21(1.03-1.41) and 1.35(1.15-1.58) for middle and lower BMI, 1.35(1.15-1.58) and 1.55(1.32-1.81) for middle and lower WC. These findings were robust or more significant in further sensitive analyses.

Conclusions: In Chinese oldest old, both higher BMI and higher WC predict better survival in both genders. This study lends further support for the opinion that current international and national recommendations for the oldest old should be revised, and reminds the importance in providing Asian-specific and gender-specific guidelines for optimal BMI and WC in this age group.

Keywords: body mass index; waist circumference; mortality; obesity paradox; oldest old.

144/716

THE SOUTH AFRICAN SALT STORY: WHERE ARE WE AND WHERE ARE WE HEADING?

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Background and objectives: The mortality and morbidity burden caused by hypertension are preventable and therefore, efforts need to be taken to address this burden. Excess dietary sodium intake is associated with increased blood pressure and the reduction thereof is considered as one of the best investments for public health. As a first step the South African (SA) government has implemented a mandatory regulation (R.214) pertaining to the reduction of sodium in foodstuffs as part of a wider sodium reduction strategy. Monitoring of different aspects of such a strategy is crucial to establish effectiveness and was the main aim. Objectives included (i) establishing baseline sodium and potassium excretion; (ii) investigating appropriate monitoring methods in terms of sodium intake and (iii) to evaluate sodium content in foodstuffs set out in R.214.

Methods: We collected 24-hour urine samples and spot urine samples from three population groups i.e. White, Black and Indians in SA. Sodium and potassium were analysed. Three formulas were used to estimate sodium excretion i.e. Kawasaki, Tanaka and INTERSALT. To evaluate the sodium content of foodstuffs we randomly selected ten food products from each of the categories and measured the sodium through atomic absorption spectrometer.

Results: In total, 692 and 681 24-hour and spot urine collections were collected. Median sodium and potassium excretion was 122.9 and 33.5mmol/day, and median salt intake was 7.2g/d. The majority (92.8%) of the population did not meet the recommended potassium intake per day and 65.6% consumed more than 6g/d of salt. The Kawasaki and Tanaka formula showed significantly higher (p≤0.001) estimated sodium values than the measured 24 hour excretion in the whole population (5677.79mg/d and 4235.05mg/d vs. 3279.19mg/d). The majority of the food products tested complied with the 2016 targets (72%) and 42% with the 2019 targets.

Conclusions: These findings support the SA government's sodium reduction legislation. Estimated sodium excretion from the three formulas should be used with caution. The sodium content in foodstuffs provides valuable information with regard to monitoring and evaluation. SA is doing well in terms of the strategy but a lot still needs to be done.

Keywords: Sodium, Potassium, Hypertension, Regulation, South Africa

144/720

WHAT FOODS WERE INSUFFICIENT AFTER THE GREAT EAST JAPAN EARTHQUAKE?

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Background and objectives: To aid in preparation for future disaster and disaster response programs, we looked at what was needed in successive phases after the Great East Japan Earthquake Disaster by exploring what shortages there were in food supplies.

Methods: Which included a question requesting detail on the "shortages of food and supplies needed in the affected areas," was mailed to 1,991 members of dietetic associations in Iwate, Miyagi, and Fukushima Prefectures. Of the 435 responses received (response rate: 21.8%), the 303 that contained responses to that question were used for the analysis. Supply shortages were tallied for four successive phases after the earthquake (within 3 days, 4 days to 1 month, 1 month to 2 months and 3 months to 6 months after the Great East Japan Earthquake).

Results: During the first month after the disaster struck, the shortages of supplies in the disaster areas were the greatest, with shortages of ordinary foods and foods for special dietary uses being especially severe. Regarding ordinary foods, there were many instances of shortages of water, food sources of protein, and sources of vitamins and minerals. Regarding foods for special dietary uses, there were conspicuous shortages of foods for vulnerable disaster victims.

Conclusions: We suggest that in order to fill the gaps between the foods needed in a particular phase and the supplies provided, in addition to a national-level disaster response plan to supply food that meets the needs of disaster victims, a system is needed to ensure the delivery of foods needed by vulnerable populations.

Keywords: food shortage, disaster nutrition, Great East Japan Earthquake, vulnerable

Conflict of Interest Disclosure: This study was suported by the Japan Dietetic Association and founded by the Japanese Society of Nutrition and Dietetic.

144/723

IS THERE A PREFERENCE FOR HEAVIER BODY SIZES FOR WOMEN LIVING IN AFRICA? EVIDENCE FROM A SYSTEMATIC REVIEW OF EVIDENCE SPANNING OVER 30 YEARS

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Background and objectives: Overweight and obesity are increasing in Africa, particularly amongst women. The widespread belief that there is a cultural preference for heavier body sizes for African women may be a contributing factor to this growing problem. Hence, we assessed body size preferences for African women and the factors influencing these.

Methods: A mixed-methods systematic review spanning over the past 30 years was conducted. Comprehensive searches were undertaken on Medline, CINHAL, ASSIA, Web of Science and PsycINFO. Reference list searching and contact with experts in the field were also used to identify relevant studies. Studies conducted in Africa composed of Black or Arab females and/or males aged ten and above were included, providing they assessed participants preferred body size for females and/or factors influencing preferences. A sequential-explanatory approach was used to integrate quantitative and qualitative data.

Results: Fifty-one studies from 15 countries were included in the final synthesis: 37 quantitative, four qualitative and four mixed-methods. Most studies reported a preference for body sizes within the normal or overweight body mass index category. Appearance, health, wellbeing, fear of negative treatment within the community, social standing, acculturative stress and fatalistic attitudes towards body size were found to influence African women's body size ideals.

Conclusions: Obesity remains an important public health issue with a high prevalence amongst African women. It is generally assumed that larger body sizes are preferred for African women, however the evidence synthesised in this review found that overall a body size that is normal or overweight (to a lesser extent) in medical terms is preferred for African women. Numerous factors were found to influence body size preferences for African women. For example, women were aware of obesity's associated health risks,

and were willing to lose weight to improve their health. These perceived health risks were overshadowed by the community's negative perceptions towards weight loss and thinness, which are associated with HIV in some contexts and subsequently negative treatment by the community. A preference for normal or overweight body sizes among African women means that cultural norms are not an obstacle for preventing obesity in African women.

Keywords: body size, women, Africa, review, mixed-methods

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PROMOTING SUSTAINABLE FOOD SYSTEMS FOR GOOD NUTRITION AND HEALTH IN THE MEDITERRANEAN REGION: A CONCEPTUAL FRAMEWORK FROM THE MEDINA STUDY GROUP

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Background and objectives: Countries of the Mediterranean region are undergoing different stages of nutritional transition affecting the health of inhabitants, while facing massive alteration of the environment (climate change, water scarcity, soil erosion, biodiversity loss and urbanization). The increasing demand of water in agriculture, the capacities to maintain local food production and the growing dependence on food imports are interconnected challenges to ensure food security and good nutrition in the Mediterranean region. The objective is to present the conceptual framework and methodologies developed by the MEDINA-Study Group for rethinking food systems to sustain consumption and production.

Methods: Based on its multidisciplinary expertise in nutrition, food science, agronomy and economy, the MEDINA-Study Group identified the relevant parameters for including in a conceptual framework that was developed for research activities in South of France and Tunisia, two contrasted areas in regards to the Diet-Agriculture-Environment Nexus.

Results: The conceptual framework consists of an array of elements of the food systems (from consumption to production) and scales (individual, household and national levels). We prioritized the following parameters: adherence to the Mediterranean diet pyramid and nutrient recommendations, nutritional value of foods and local recipes, nutritional potential of local agroecosystems, women's empowerment in agriculture, multiple environmental indicators of the food systems, and food trade and dependence on food imports. The proposed methodologies consist in: (1) modeling at different scales the dietary changes to optimize food consumption-production without increasing environmental impact, (2) translating the identified changes into action proposals,

(3) testing the acceptability and feasibility by multi-stakeholders, and (4) co-building guidelines to orientate sustainable food choices and production.

Conclusions: To ensure sustainable food systems in the Mediterranean region, the MEDINA-Study Group identified other perspectives to implement the initially-build framework, such as the nutrient bioavailability, the exposure to contaminants and active substances used in agriculture, and social indicators to contribute designing ambitious agricultural, food and health policies and prioritizing actions. Acknowledgement: Medina-Study is funded by the French Research Agency (ANR-12-TMED-0004).

Keywords: Food systems; Sustainability; Mediterranean region; Conceptual framework.

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ANAEMIA AND NUTRITIONAL STATUS IN POPULATION OF SALTA CITY. CROSS-SECTIONAL STUDY.ARGENTINA 2017

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Background and objectives: Iron deficiency anemia is a nutritional disease of high prevalence especially in developing countries. In the city of Salta, malnutrition coexists with an increase in overweight and obesity. The objective of this study was to determine the prevalence of anaemia and its relationship with nutritional status in children, adolescents and adults in the city of Salta.

Methods: Cross-sectional study, secondary database (Salta Nutritional Survey 2014). Stratified two-stage sample. Variables: sex, age, anaemia (Hemoglobin level measurements were adjusted for altitudes and the cut-off points for anaemia based on WHO 2011); Nutritional status BMI (WHO z score tables in children and adolescents): normal >-2 <+1, malnutrition ≤-2, overweight ≥+1, obesity ≥+2. Adults: malnutrition <18.5; normal ≥18.5 <25; overweight ≥25 and <30; obesity ≥30. Short stature (≤-2 z score height WHO) .Analysis: Frequency distribution (chi2, Fisher), mean comparison (ANOVA), level of significance $p < 0.05$. EXCEL, SPSS V18, WHO softwares Anthro V.1.0.4 Plus, programs were used.

Results: A total of 147 children aged 6-59 months, 170 aged 5-11 years, 70 children aged 12-14 years and 533 ≥ 15 years old, of both sexes were evaluated. The overall prevalence of anaemia was 7%, the groups most affected were children 6-59 months (12.9%) and ≥ 15 years (8.3%, significant difference by sex). Mild anaemia was found in 78.1%, moderate in 20.3% and severe in 1.6% of the anaemic population. The 47.5% of children aged 6-59 months with anaemia and 56.8% of ≥ 15 years with anaemia were overweight/obese.There was no association between nutritional status and short stature with the prevalence of anaemia. Mean values of hemoglobin were: 12,18mg/dl ±1.09 (6-59m) ;13,39mg/dl ±0.74 (5-5-11 ys); 13.93±0.85(12-14 ys) and 13.91mg/dl±1,44 (≥15 ys) Mean values of weight and height were significantly lower in anemic children aged 6-59 months.

Conclusions: Although low prevalence of anemia was observed in all age groups, it remains a relevant public health problem, which also affects those with overweight and obesity.

Keywords: anaemia, nutritional status, children, adolescents, adults.

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TWO-YEAR SUSTAINED IMPACTS OF LARGE-SCALE SOCIAL AND BEHAVIOR CHANGE COMMUNICATION INTERVENTIONS TO IMPROVE INFANT AND YOUNG CHILD FEEDING IN BANGLADESH

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Background and objectives: Achieving sustained improvements in infant and young child feeding (IYCF) likely requires continued implementation of effective interventions and sustained enabling social norms. From 2010-2104, Alive & Thrive (A&T) provided intensified interpersonal counseling (IPC), mass media (MM), and community mobilization (CM) at large-scale in Bangladesh, with demonstrated impact on IYCF practices. Since 2014, geographically expanded implementation was continued by national partners, with support from other donors. In 2016, we assessed sustained impacts of the IPC + MM + CM interventions in intensive compared with non-intensive areas (standard nutrition counseling + less-intensive MM + CM) on intervention exposure and IYCF knowledge and practices.

Methods: We used a cluster-randomized design with repeated cross-sectional surveys at baseline (2010, n=2,188), endline (2014, n=2,001), and follow-up (2016, n=2,400) in the same communities, among households with children 0-23.9 months of age. Within-group differences over time were tested using regression models, and differences between groups in changes between baseline and follow-up were tested using difference-in-difference estimates (DDE), adjusting for geographic clustering, child age, and gender.

Results: In intensive areas, exposure to IPC decreased between endline and follow-up but remained high (77.2% for home visits by community health workers); exposure to CM activities decreased significantly (29.3% to 3.6% for video shows). Exposure to MM at follow-up was moderate (22.9-54.4% across 7 TV spots). There was no expanded exposure to interventions in non-intensive areas. Most IYCF indicators in intensive areas declined from endline to follow-up, but remained higher than at baseline. Larger improvements in intensive areas between baseline and follow-up remained for early initiation of breastfeeding (BF), exclusive BF, timely introduction of foods, and consumption of iron-rich food (DDE: 16.6, 17.0, 16.6, and 11.8 percentage points, respectively). Differential impact in BF knowledge remained between baseline and follow-up (DDE: 0.4 points); complementary feeding knowledge increased similarly in both groups.

Conclusions: Continued IPC exposure and sustained impacts on IYCF practices in intensive areas in 2016 indicate lasting benefits from A&T's interventions through existing delivery systems. Remaining gaps indicate that sustained delivery of behavior change interventions will be needed to support appropriate IYCF practices.

Keywords: Bangladesh, breastfeeding, complementary feeding, infant and young child feeding, sustainability

Conflict of Interest Disclosure: All authors declare no conflicts of interest. TS, ZM, MRH and KA were members of the program implementation team that designed and implemented the interventions studied and reported on in this abstract. They reviewed the abstract and provided interpretation of the results, but final decisions for content lay with the primary authors from the evaluation team (SSK, PHN, EAF, MTR and PM).

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ASSOCIATION BETWEEN LEVELS OF IRON IN GROUNDWATER AND IRON STORES IN WOMEN IN KAMPONG CHHNANG PROVINCE, CAMBODIA

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Background and objectives: Groundwater has been shown to be high in iron in some areas in Cambodia. However, little is known about the bioavailability of the iron and the potential contribution to iron stores. Further, household biosand and ceramic filters have been shown to remove 95-99% of the iron in groundwater. Our objective was to determine if levels of groundwater iron from household wells were associated with serum ferritin concentrations among women in rural Cambodia.

Methods: Water samples were collected from 80 households in Kampong Chhnang Province, Cambodia. Information on the type of household well and use of a water filtration system was collected, as iron concentrations may differ by well type and whether or not the water was filtered before consumption. Fasting venous blood samples were collected for analysis of serum ferritin, serum transferrin receptor (sTfR), C-reactive protein (CRP), and α-1 acid glycoprotein (AGP) using a sandwich ELISA. Serum ferritin was adjusted for CRP>5mg/L and AGP>1g/L. Median serum ferritin concentrations are presented for women who used ground well water with and without a filtration system, and for women who used ring well water with and without a filtration system.

Results: Overall, 50% of households had a ground well and 50% had a ring well. Mean ± SD groundwater iron was higher (1265 ± 2632 µg/L) than ring well water iron (423 ± 375 µg/L). More than half of the water samples (n=48) were above the 2011 WHO drinking water standards for iron (300 µg/L). More women with a ground well (n=17) used a water filter as compared to those who had a ring well (n=4). Median (IQR) serum ferritin concentrations were highest among women who used ground well and ring well water without filtration 53 (20,95) µg/L and 57 (23,91) µg/L, respectively. Those who used a filtration system had lower median (IQR) serum ferritin concentrations for both the ground well and ring well source 29 (17,57) µg/L and 23 (8,58) µg/L, respectively.

Conclusions: Women who used a filter had lower median ferritin concentration. Despite this, little is known about the bioavailability of iron.

Keywords: iron deficiency, serum ferritin, groundwater, ring well water, anemia

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TEENEGERS' PERCEIVED QUALITY OF LIFE AND LIFESTYLE: A CROSS-SECTIONAL STUDY IN POLISH STUDENTS FROM LESS-URBANIZED REGIONS. THE POLYSES PROJECT

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Background and objectives: Teenagers' health is positively linked to many factors of lifestyle [1]. Less-urbanized regions create specific conditions for living, including lifestyle. The association between quality of life and lifestyle of Polish teenagers living in less-urbanized regions is not well understood.

Objective: To assess association between teenagers' perceived quality of life and lifestyle.

Methods: The study involved 576 students 13-18 years old who lived in small towns and villages in less-urbanized regions of Poland. Students were chosen in a two-step random selection. Closed questions were applied to characterize lifestyle. High-active lifestyle (everyday performance with high activity outside school) and sedentary lifestyle (TV watching or computer games at least 4 hours/day) were determined. Quality of life perception was assessed by the SF-36 questionnaire (The Short Form Health Survey) with 36 items [2]. Using the alfa-Cronbacha 20 items were selected to describe teenegers' quality of life. The Cluster Analysis (k-means method) was used to identify quality of life clusters. The association between clusters and lifestyle was verified by logistic regression, with adjustment for gender, age and socioeconomic status.

Results: Two clusters differentiating with respect to quality of life in mental context, but not in physical context, were found. They were labelled: better mental quality of life (MQoL; 41% of the sample), worse MQoL (59%). Teenagers with better MQoL compared to worse MQoL were significantly less often nervous, depressed, sad, exhausted and tired. Teenagers with better MQoL compared to worse MQoL (odds ratio OR=1.00) were less likely to have high-active lifestyle (crude OR=0.83; 95% confidence interval 95%CI:0.72,0.96; adjusted OR=0.84; 95%CI:0.72,0.97). No significant association was found between sedentary lifestyle and quality of life clusters.

Conclusions: Conclusion: Worse mental quality of life was widespread among Polish teenagers from less-urbanized region. We revealed negative association between high-active lifestyle and mental quality of life. Next study are necessary to explain our findings and not compliance with previous ones.

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Keywords: activity, adolescent, lifestyle, quality of life, sedentary lifestyle

SOCIAL INEQUALITY AND NUTRITIONAL TRANSITION IN ARGENTINA: AN ANALYSIS FROM A SOCIO-ECOLOGICAL STUDY, PERIOD 2005-2013

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Background and objectives: Argentine society is in transition with significant sociodemographic and economic gaps. Such heterogeneous living conditions could generate inequality in the population's access to health services, education and food, all of which affects its health and nutrition. The aim of this work was to identify social inequalities according to unmet basic needs (UBN) in the distribution of nutritional transition (NT) indicators in Argentina, in the period of 2005-2013

Methods: Multi-group, ecological study (24 geographical units: 23 provinces and the Autonomous City of Buenos Aires). NT indicators were selected (in three analysis dimensions: nutritional state, physical activity, and food intake) obtained from secondary sources of information (official surveys and census data). The mean of each NT indicator was calculated according to the distribution of provinces by quartile of the indicator "proportion of households with UBN" (2010). A mean differences test was conducted between the provinces belonging to the upper and lower quartiles. In addition, the concentration index was calculated for each NT indicator according to the proportion of households with UBN using the EPIDAT version 3.1 software package.

Results: The prevalence of low height in children (p=0.003) and anemia (p=0.054) were greater in the provinces belonging to the upper quartile of UBN (over 15.27% of households with UBN), while the prevalence of childhood obesity, the frequent consumption of salt, and the use of computers was greater (p<0.05) in the provinces of the first quartile (that is, those in a better relative situation according to UBN, with fewer than 7.95% poor households). Meanwhile, the concentration index evidenced that the indicators showing greater social inequality were the consumption of salt, the prevalence of anemia, and the use of computers.

Conclusions: There are social inequalities in the distribution of NT indicators in Argentina. The results of this work could contribute to define equitable nutritional policies.

DIETARY TOTAL ANTIOXIDANT CAPACITY AND INCIDENCE OF CHRONIC KIDNEY DISEASE IN SUBJECTS WITH DYSGLYCEMIA: TEHRAN LIPID AND GLUCOSE STUDY

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Background and objectives: We aimed to investigate the association of dietary total antioxidant capacity (TAC) with incidence of CKD in subjects with dysglycemia.

Methods: We followed-up 1179 subjects with dysglycemia from the Tehran Lipid and Glucose Study (TLGS) for 3 years, who were initially free of CKD. Dietary intakes of TAC, vitamin C, vitamin E, and ß-carotene were assessed by a food-frequency questionnaire at the baseline. Dietary TAC was estimated using the oxygen radical absorbance capacity method. Estimated glomerular filtration rate (eGFR) was calculated, using the Modification of Diet in Renal Disease Study equation and CKD was defined as eGFR <60mL/min/1.73m2. Odds ratios (ORs) using multivariable logistic regression were reported for the association of incident CKD with dietary TAC.

Results: A total of 197 (16.7%) cases of incident CKD were recorded after 3 years of follow-up. After adjustment for age, sex, smoking, physical activity, body mass index, hypertension, and total energy intake, the top tertile of dietary TAC, compared to the bottom was associated with 39% (95% confidence interval (CI) = 0.61 0.40-0.93) lower risk of incident CKD (P for trend=0.025). Furthermore, the highest tertile of vitamin C intake, compared to the lowest, the risk of incident CKD was decreased (OR: 0.60; 95% CI: 0.38-0.93, P trend: 0.023). Intakes of vitamin E and ß-carotene were not significantly associated with incident CKD risk.

Conclusions: Our findings suggest diets high in TAC are associated with a lower risk of incident CKD among subjects with hyperglycemia after 3 years of follow-up.

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EVIDENCE BASED RECOMMENDATIONS TO IMPROVE THE LAW IN MEXICO TO RESTRICT UNHEALTHY FOOD ADVERTISING TO CHILDREN ON TELEVISION

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Background and objectives: In Mexico, government regulations to restrict food and beverages(F&B) advertising to children on screens during selected hours were implemented in mid-2014. The aim of the study is to compare the Mexican F&B regulation guidelines on TV with international and evidence based criteria.

Methods: Total of 1,140 hours were recorded over three years (2013,2014&2015) from four-free-to-air television channels with the highest national audience ratings over six randomly selected days from 6:25am-10:15pm. Each advertisement was analyzed following the International Network for Food and Obesity/non-communicable diseases Research Monitoring and Action Support (INFORMAS)type of program category, Nielsen definition of children peak times,and three nutrient profile models criteria (WHO Europe 2015;OPS 2016,Mexican regulation(MR).

Results: From the 6,785 F&B identified ads, 76.7% were aimed at children, and at least 50.2% of the F&B display ads contain a persuasive technique. After the MR came on channels 5 and 7(children's channels) decrease of 7% and 2.8% of F&B ads (p <0.001) were found. The soap opera shows an increase between 2014-2015 of 3% in F&B advertising and series and a 1.7% was shown(p <0.001). Contrary, children's programs showed a decrease 6.2%(p <0.001).

During the peak viewing time(PV) on 2013, 23.5 F&B per hour were advertised compared to 22.2 F&B ads in 2015.Chocolate and confectionery ads rates decreased from 2.1 to 1 ads per hour, while an increase of breakfast cereals from 1.4 to 2.1 ads/hr were observed.The nutritional quality of products aimed at children in PV.Specifically, during 2015 the MR allowed advertising during of 55.2% of total products, however WHO of 23.2%, and PAHO only allowed 5.6% of the products advertised in the Mexican TV.

Week-days at regulated times, F&B highest advertising(3.5 F&B ads unhealthy/hr) comes in unregulated hours.

Conclusions: Most of the F&B ads are targeted to children and includes a persuasive technique of attraction, which needs to be considering into the MR. Increase/migration to other types of programs that children do watch. MR need to consider more extensive time schedules and all program types, particularly those aimed at general audiences.Encourage Mexican government to take into account evidence based criteria to improve the current regulation to protect children.

Keywords: television-advertising, policy, children, food and beverages

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THE ADVERTISING OF FOOD AND BEVERAGES ON MEXICAN TELEVISION: THE TECHNIQUES OF ATTRACTION SHAPPING CONSUMPTION HABITS IN SCHOOL CHILDREN

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Background and objectives: The National Health and Nutrition Surveys in Mexico show that between 1999 and 2012, the combined prevalence of overweight and obesity in children between 5-11 years of age, increased from 26.9% to 34.4%. México implemented guidelines governing advertising of F&B to children on screens were implemented in mid-2014.

Methods: A total of 780 hours of television programming were recorded from the four major television channels in Mexico from 6:25am-10:15pm, the December 2014 To April 2015. Each advertisement was analyzed following the International Network for Food and Obesity/non-communicable diseases Research Monitoring and Action Support (INFORMAS) type of program category, F&B advertisements were identified into three major groups: Core and Healthy Food Categories, Non-Core and Unhealthy Food Categories (NUFC) and Miscellaneous. For the analysis, programming was divided as peak viewing periods (PV) and non-peak viewing periods for children (NPV). The presence of visual, promotional, associative and audio techniques was analyzed. During the same time period, a survey among 10-12 year old children was conducted to understand the relationship between television viewing habits and brand recognition of advertised F&B products.

Results: Of the recorded hours, 390 belong to PV, and the rest to NPV. From the total number of advertisements, 3766 were F&B advertisements, comprising 12.4%. An average of 23.5 ads per hour, were of F&B. The most dominant group of F&B advertisements observed during PV was NUFC (67.3%). Most of NUFC advertisements were observed during soap operas (41.7%), followed by comedies (14.5%), movies (14.1%), and cartoons (10%). A total of 64% of F&B advertisements screened during PV utilized persuasion techniques. Survey results demonstrated that the majority of children could identify characteristics of products advertised; 97% could identify products with its television character and 73.8% could identify a product with its slogan.

Conclusions: The children are still largely exposed to NUFC advertisements during PV, even with the new Guidelines. It should also be noted that children are still exposed during unregulated programming. An overwhelming majority of F&B advertisements used persuasive techniques during PV.

Keywords: television-advertising, children, eating habits

FOOD PROCESSING CATEGORIES RELATING TO DIET QUALITY IN THE NURSES HEALTH STUDY

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Background and objectives: High intake of ultra-processed foods has been related to an unhealthy nutrient profile; however, the relationship between food-processing categories (FPC) with diet-quality has yet to be assessed. To assess the relationship between intake of foods classified into four FPC and diet-quality.

Methods: This was a cross-sectional analysis of 52,976 women from the Nurses' Health Study. Diet was assessed with FFQ in 2006, and food intake was classified into four FPC: unprocessed, moderately, processed, and ultra-processed FPC calculated in grams and percentage of energy. We computed the following diet-quality scores for each woman: Dietary Approach to Stop Hypertension (DASH-score) and the Alternative Health Eating Index-2010 (AHEI-2010). The associations between FPCs with diet-quality was evaluated using Spearman correlation coefficients and generalized linear models adjusted for energy, age, smoking, BMI, and physical activity.

Results: In the adjusted analysis adjusted, DASH-score was 21 and the AHEI-2010 was 45 for women in the first quintile of unprocessed FPC. In comparison to the first quintile, DASH-score and AHEI-2010 were 4.7 and 7.5 higher in women in the fifth of unprocessed FPC in grams. DASH-score and AHEI-2010 were lower in women in the fifth quintile of % of energy from ultra-processed FPC (22 and 47) than in the first (25 and 50). We found modest correlations between the unprocessed PFC and the DASH-score and the AHEI-2010 for both, grams (r=0.39 and r=0.21) and percentage of energy (r=0.43 and r=0.30). Negative correlations were seen between ultra-processed FPC and the DASH and AHEI-2010 as percentage of energy (r=-0.38 and r=-0.26) and as grams (r=-0.15 and r=-0.13). Intake of unprocessed FPC in percentage of energy was negatively correlated with ultra-processed FPC (r=- 0.78).

Conclusions: Eating unprocessed foods had a positive impact on diet quality scores, which was more significant than the negative impact of consuming ultra-processed foods.

Keywords: food processing categories, ultra-processed foods, food processing, diet quality.

RELATIONSHIP AMONG BONE MINERAL DENSITY, ADIPOSITY, AND PHYSICAL ACTIVITY IN MEXICAN WOMEN

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Background and objectives: It has considered that in females low intake of calcium and physical inactivity could influence on reduction of the bone mineral density (BMD) and developing osteoporosis later. The aim of this study was to determinate the relationship between BMD and nutritional status, body fat, nutrient intake, physical activity, alcohol consumption, and smoking in women from an urban area of Mexico.

Methods: The volunteers were 201 women aged 27 to 55 years old from Mexico City and Mexico State. BMD was assessed with dual energy X-ray absorptiometry (Hologic densitometer, model DiscoveryWi) in lumbar spine and femur neck. Nutritional status was evaluated with body mass index (BMI) and waist circumference. The percentage of body fat was obtained with bioelectrical impedance (Inbody 720). The intake of calcium, phosphorous, vitamin D and sodium was assessed with a food frequency questionnaire. The time spent in moderate and vigorous physical activities daily, alcohol consumption, and smoking were also assessed by questionnaire.

Results: Menopause was present in 14.7% of females. Low BMD was found in 24% of participants. It was showed a high prevalence of total adiposity (76.9%) and in abdomen (88.8%). Calcium and vitamin D intakes were deficient in most of them. The 64% did not spend enough time to moderate and vigorous physical activities. The alcohol consumption in the last 3 months was of 35.7% and 65.1% reported to smoke. Linear models of regression showed that BMI, body fat percentage, waist circumference, physical activity, and menopause were related to BMD. A high body fat percentage and frequent physical activity were associated with less probability to present low BMD.

Conclusions: In a sample of Mexican urban women the adiposity and physical activity were factors related to BDM.

Keywords: Bone mineral density, women, adiposity, physical activity.

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PHYSICAL FITNESS PERCEPTION IS ASSOCIATED WITH NUTRITIONAL STATUS AND ACTUAL PHYSICAL FITNESS IN ADOLESCENTS

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Background and objectives: Although physical fitness (PF) is associated with better health outcomes, its direct assessment sometimes in not feasible; therefore surrogates of actual PF are necessary. The aim of this study was to analyze the association between the perception of PF with nutritional status and actual PF in adolescents.

Methods: The participants were 319 boys and girls aged 10 to 15 years from Mexico City. Nutritional status with evaluated with body mass index (BMI)-for-age and waist circumference-for-age. Body fat was estimated with Slaughter equation. Each component of PF (aerobic capacity, muscular strength and endurance, and flexibility) was assessed with FITNESSGRAM tests. International Fitness Scale (IFIS) was applied to evaluate the perception of PF.

Results: It was observed a high frequency in inadequate aerobic capacity (48.8%), in low strength of trunk, arms and abdomen (60.7%, 63.9% and 42.5% respectively) and flexibility of trunk and legs (68.7%). Most of adolescents did perceive themselves with a good PF (aerobic capacity: 85.2%%, muscular strength: 90.5, flexibility: 74.1%, velocity/agility: 89.6% and general PF: 92.7%). Adolescents with a high adiposity had a low aerobic capacity, muscular strength and flexibility and perceived themselves with inadequate PF. Adolescents that perceived themselves with a good general PF had an adequate aerobic capacity and strength of abdomen and arm. A good perception of aerobic capacity and muscular strength was related with an adequate aerobic capacity and strength of abdomen and arms. The level agreement between FITNESSGRAM battery and IFIS was fair (K= 0.37, p<0.05) between perception of aerobic capacity and actual aerobic capacity and there was a poor agreement in the others components of PF perception and the tests of PF.

Conclusions: Adolescents perceived themselves with better PF compared than actual PF. Nutritional status influence on the perception and actual PF. It was showed a poor agreement between both methods of assessment PF.

Keywords: Perception of physical fitness, physical fitness, adolescents,

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THE POTENTIAL OF A HUMAN RIGHTS APPROACH FOR ACCELERATING THE IMPLEMENTATION OF COMPREHENSIVE RESTRICTIONS ON THE MARKETING OF UNHEALTHY FOODS AND NON-ALCOHOLIC BEVERAGES TO CHILDREN

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Background and objectives: Overweight and obesity in children is increasing at the global level, particularly in low- and middle-income countries. Among the causes for this increase is the marketing of unhealthy food and beverage products, which affects children's food preferences, purchasing requests and consumption patterns. The need to address harmful marketing to children has been recognized by the World Health Organization, with Member States having agreed in 2010 to implement a set of recommendations to restrict such practices. Concurrently, there is an increasing understanding of unhealthy food and malnutrition as human rights concerns. This study explores the potential of existing human rights instruments for accelerating the implementation of comprehensive restrictions to reduce harmful marketing of unhealthy foods and beverages to children.

Methods: A review of legally and non-legally binding human rights instruments was conducted, including the Universal Declaration of Human Rights, the International Covenant on Economic, Social and Cultural Rights, the Convention on the Rights of the Child, the Guiding Principles for Business and Human Rights and a series of General Comments as components of existing human rights frameworks.

Results: Legally and non-legally binding human rights instruments offer important opportunities to strengthen and accelerate state implementation of restrictions on marketing of unhealthy food and beverage products to children. Four relevant themes were identified in existing human rights instruments: 1) the best interest of the child should be considered above all other interests; 2) the rights to health and adequate food cannot be realized without supportive healthy environments; 3) children should be protected from economic exploitation; and 4) the persuasive marketing of unhealthy food and beverage products is explicitly recognized as a threat to the rights to food and health.

Conclusions: In conclusion, existing human rights instruments could be harnessed to advance public health measures to restrict the marketing of unhealthy foods and beverage products to children. Policy-makers and advocates should draw from these instruments and refer to State's obligations within international and domestic human rights law to strengthen their efforts to restrict harmful marketing practices to children.

Keywords: right to food, right to health, nutrition, marketing, unhealthy foods, public health

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MALNUTRITION IN ALL ITS FORMS AND SOCIO-ECONOMIC DISPARITIES IN GUATEMALA

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Background and objectives: The complex interplay of social, economic, and political determinants of malnutrition results in substantial disparities. Identification of population groups at higher risk of malnutrition will inform public health policy and aid in the design of appropriately targeted interventions. Therefore, our objective was to reveal disparities of malnutrition in all its forms by socioeconomic status (SES) in children, adolescents and women of reproductive age (WRA) in Guatemala.

Methods: We used the 2008 National Maternal and Child Health Survey conducted in Guatemala. We estimated the prevalence (95%CI) for underweight/thinness, stunting/short stature, overweight/obesity in children <5 y (n=10,645), adolescents (15-19 y) (n=2,894), and WRA (20-49 y) (n=13,925). Then we evaluated whether the prevalence of malnutrition differed according to tertiles of SES. Disparities are shown as the ratio of low to high-SES tertile.

Results: Wasting/thinness prevalence among children, adolescents, and WRA was low (<1%) and was no significantly different among SES. Stunting/short stature prevalence was 48.0% (45.8,50.2) among children, 51.1% (48.4,53.8) among adolescents, and 29.0% (27.5,30.1) among WRA. The prevalence of stunting in these age groups was 3.1, 1.9, and 3.0 times significantly higher in the poorest SES tertile than in the richest tertile, respectively. Anemia prevalence was 49.2% (47.1,51.3) among children, 25.1% (22.7,27.7) among adolescents, and 29% (27.5,30.1) among WRA. The prevalence of anemia was 1.3, 1.8 and 1.7 times significantly higher in the poorest SES tertile than in the richest tertile, respectively. Overweight/obesity prevalence was 6.0% (5.3,6.6) among children, 21.3% (19.3,23.4) among adolescents and 57.8% (56.5,59.2) among WRA. Overweight/obesity prevalence in WRA was 1.4 significantly higher in the richest SES tertile than in the poorest tertile.

Conclusions: Stunting and anemia affected the poorest two to three times more than the richest SES tertile. In contrast, only in WRA overweight/obesity was higher among the richest SES tertile. These results highlight the disparities in Guatemala and the need for targeted interventions.

Keywords: malnutrition, socioeconomic status, disparities, nutrition policy

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METHODOLOGICAL ASPECTS OF NEW WEB-BASED TECHNOLOGIES FOR ASSESSING DIETARY INTAKE IN CHILDREN AND ADOLESCENTS

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Background and objectives: New web-based technologies have been developed in order to contribute for the improvement of dietary intake evaluation of children and adolescents. To review the characteristics of studies that developed web-based questionnaires for assessing dietary intake in children and adolescents.

Methods: questionnaires for assessing dietary intake in children and adolescents. Methods: **Results:** Twelve web-based questionnaires were found. Eight of them were developed for children and adolescents from European countries, two in Brazil, and two in the United States (n=2). Regarding the population age, 58.3% of the questionnaires were developed for children aged 7 to 10. Only one questionnaire developed in Brazil evaluated the qualitative dietary intake. All questionnaires were based on 24-hour recall from the previous day and were self-administered. Four instruments provided an Avatar to assist the respondent with completing the questionnaire, and five presented six eating events. Most of the questionnaires (90.9%) had images or photographs of portions size in order to assist the quantity of food reported. Of the 12 studies, 11 published results of validity and 2 of reproducibility. Regarding the reference methods for validity, half of the studies used direct observation. The percentage of agreement between the test questionnaire and the reference method ranged from 37% to 90%. Intrusion rates (false positives) ranged from 5% to 35%, and omission rates (false negatives) from 3% to 35%.

Conclusions: There are still few published studies that have developed web-based questionnaires for assessing dietary in children and adolescents. There is a wide variation in the results of agreement when compared the web-based questionnaires with the reference method, and few studies presented results of reproducibility.

Keywords: dietary intake, children, adolescents, online, questionnaires.

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THE ASSOCIATION OF DIETARY APPROACHES TO STOP HYPERTENSION WITH VISCERAL ADIPOSITY INDEX IN ADULTS: TEHRAN LIPID AND GLUCOSE STUDY

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Background and objectives: Abdominal obesity is independently related to increased risk of metabolic and cardiovascular diseases and mortality rates. The effect of abdominal obesity on metabolic factors seems to be mainly mediated by the visceral adipose tissue (VAT) that might modify by dietary intakes. This study was conducted to examine the association of adherence to the Dietary Approaches to Stop Hypertension (DASH)-style diet and its components with prospective visceral adiposity index (VAI)-changes after 6.1 years of follow-up among an Iranian population.

Methods: We followed-up 1863 participants (50.5%women, mean age: 42.8years) of the Tehran Lipid and Glucose Study (TLGS) for 6.1years. Baseline diet was assessed using a valid and reliable 168-item food-frequency questionnaire. A DASH-style diet was calculated based on Folsom et al score. Linear regression was used to report for the association of VAI-change and logistic regression was used for calculating the odds of incident visceral adiposity dysfunction (VAD) with DASH-style diet score.

Results: The mean age of participants was 40.25y, and mean VAI was 1.85. After adjusted for age, sex, physical activity, smoking, and total energy intake, a unit increase in adherence to the DASH-style diet score was positively associated with changes in VAI (β: -0.098;P=0.009). Each increased in scores of vegetable and saturated fatty acid were associated with a 0.349, 0.287 decreased in VAI (p<0.05), respectively. Furthermore, subjects in the highest quartile of the DASH-style diet score had the lower risk of incident VAD in comparison to those in the lowest quartile (OR:0.72;95%-CI:0.55-0.94).

Conclusions: Higher adherence to the DASH-style diet was associated with a lower change of VAI and risk of incident VAD among adults during 6.1 years of follow-up.

Keywords: DASH-style diet; Visceral Adiposity Index; Obesity; Dietary pattern

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BULLYING IN ADOLESCENCE: A MAJOR REASON TO PREVENT OBESITY

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Background and objectives: Interpersonal violence in teenagers is a public health problem that requires studies that delve into possible determinants. Physical appearance can predispose to intimidation experiences. Research indicates that obesity promotes discriminatory behaviours that affect the psychosocial development of young people.

To investigate the connection between obesity and bullying related to physical appearance in adolescents from Uruguay, Argentina and Chile.

Methods: It has been made a cross-sectional and descriptive study with an analytical component of the Global School Health Survey of Uruguay (2012), Argentina (2012) and Chile (2013); (30.845 adolescents).

The variables were: sex, age, bullying related to physical appearance, overweight or obesity, family support, number of close friends, feeling alone and problems for sleeping.

To study the contribution of each risk factor, a multivariate analysis was performed through binary logistic regression. The chance was expressed as Odds Ratios with a 95% confidence interval. All tests were considered statistically significant with a level α p<0,05.

Results: About 23.8% (95% CI: 23.3-24.3%) of teenagers admitted to having been bullied at least once in the last month. Argentina occupied the first place in this problematic, followed by Uruguay and finally Chile. About 27.9% (CI 95%, 27.3-28.5%) of teenagers were overweight (overweight 21.6% and obesity was 6.3%). In Chile, this figure ascended to 41.8% (95% CI, 31.4-44.4%), being the country with the highest prevalence (p<0.001). Obesity predominated in the males of the three countries (p<0.001). Bullying was more prevalent among adolescents under 15 years (p<0.001); among teenagers with poor parental support (p<0.001), among young people with little or no close friends (p<0.001), and among those who presented overweight (p=0.005) or obesity (p=0.01). The most frequent form of aggression was the jokes and within them the ones related to the physical aspect. It was observed that adolescents with obesity are more prone to bullying, they are more than twice as likely to be bullied (OR: 2.44, 95% CI 1.94-3.08).

Conclusions: Approximately 20% of adolescents in the region are victims of bullying.

The main form of aggression between peers is the physical appearance teasing.

Obesity turns out to be the greatest risk for this type of bullying.

Keywords: Adolescence. Bullying. Intimidation. Obesity

Further collaborators: Calvo, Soledad; Bove, Isabel

THE RELATION OF NEIGHBORHOOD ENVIRONMENT CHARACTERISTICS WITH ANTHROPOMETRIC INDICES AND ACTIVITY IN TWO IRANIAN ETHNIC GROUPS LIVING IN NORTH-WEST OF IRAN

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Background and objectives: Features of living environments may contribute to weight and activity status. This study aimed to assess the relation of neighborhood environment with anthropometric indices and activity in Azeris (as major ethnic group) and Kurds (as minor ethnic group) living in Urmia city, North West of Iran.

Methods: In this cross-sectional study, 723 participants (427 women and 296 men) aged 20–64 year old, from two ethnic groups (445 Azeri Turk and 278 Kurd) were selected through a combination of cluster, random and systematic sampling methods from 38 neighborhoods. Neighborhood characteristics was obtained by using a validated 22-items neighborhood and health observational checklist. Weight and height and waist circumference (WC) were measured using standard methods and Body Mass Index(BMI) was calculated. Activity level was measured by a validated long form International physical activity questionnaire(IPAQ). Principal component analysis was used to define dominant neighborhood environment. The relation between anthropometric indices and activity with neighborhood characteristics was analyzed by multiple linear regression. P<0.05 was considered as significant level.

Results: Three common neighborhood environments were defined: "newly built and affluent", "Centrally located neighborhood with high access to social services" and "marginally located neighborhoods". Higher percent of Azeri group were settled in higher tertiles of "Modern-high quality" and "Central-high access "neighborhoods. In Azeri vs. Kurd ethnic group, the mean ± SD of BMI, WC and physical activity was 27.9±5.7 vs.26.9±5.8 kg.m2, 93.5±13.8vs. 91.7±13.0 cm and 5619±7723vs.8052±9637 MET/hour/week, respectively. In total participants, after adjustment for age, gender, marital status, SES and energy intake those living in higher tertile of "Central-high access" neighborhoods had higher WC and lower physical activity level. In Azeri Turk ethnic group, living at the highest tertile of Modern-high quality neighborhoods was significantly related with higher BMI. In Kurd ethnic group, those living in "marginally located neighborhoods" had higher physical activity.

Conclusions: Findings suggest that living in high quality neighborhoods and belonging to the major and affluent ethnic group was related with higher BMI however, living in low quality neighborhoods located in marginal part of city was related with higher activity level in minor ethnic group.

Keywords: neighborhood characteristics, anthropometric indices, activity, ethnicity, Iran.

EXAMINING FOOD ENVIRONMENT POLICY IMPLEMENTATION IN CANADA: ADAPTING THE FOOD-EPI TOOL AND PROCESS TO THE CANADIAN CONTEXT

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Background and objectives: Globally, food environment policies play a critical role in improving diet and related non-communicable diseases (NCDs). This study aimed to identify food environment policies in different policy domains in Canada to improve the food environment and address high rates of obesity and NCDs.

Methods: This study employed the Healthy Food Environment Policy Index (Food-EPI), developed by International Network for Food and Obesity / non-communicable Diseases Research, Monitoring and Action Support (INFORMAS) to measure the extent of implementation of food environment policies by governments globally. The index examines 7 policy domains (composition, labelling, promotion, prices, provision, trade, and retail) and 6 infrastructure support domains (leadership, governance, monitoring and intelligence, funding and resources, platforms for interaction, and health-in-all-policies). An inventory of current policy implementation was collated and verified by government stakeholders for accuracy. Policies were examined at national and provincial/territorial level (13 jurisdictions). Ratings were conducted by more than 70 non-governmental experts to assess the level of implementation compared to international benchmarks for 47 indicators on a scale from 1 (less than 20% implementation) to 5 (80–100% implementation). Federal policies were rated in 3 workshops in Vancouver and Toronto in May/June 2017, while provincial/territorial policies were rated using an on-line process. Concrete areas for action at the federal and provincial/territorial level were discussed and prioritized at the in-person workshops.

Results: Overall, there was no evidence of national or provincial implementation in 6 of 23 policy indicators. National and provincial policies were identified for food composition and labelling domains, while pricing policies were only implemented nationally. Policy regarding unhealthy food marketing and nutrition standards in school settings, public settings such as recreation centres and private sector settings were primarily provincial in nature. No actions relating to food retail or zoning policy or taxing unhealthy foods were identified. Ratings by experts and priority areas for action will be discussed.

Conclusions: There are gaps in food environment policy in Canada at the federal and provincial level. Prioritizing actions to improve the food environment has significant potential to influ-

ence the diet of Canadians, with downstream influences on rates of obesity and NCDs.

Keywords: Food environment, food policy, obesity prevention

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STUDY OF ADULT-TYPE PRIMARY HYPOLAC-TASIA IN TERMS OF THE GEOGRAPHICAL AND ETHNIC FACTORS: CASE OF MOROCCAN AND SUB-SAHARAN POPULATIONS

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Background and objectives: Background: Less known in Africa, yet very widespread in the world, Lactose intolerance is a digestive problem that testifies a deficit of lactose digesting enzyme, lactase, which leads to uncomfortable digestive symptoms.

Context: The prevalence of lactose intolerance varied from one region to another with an undeniable north-south gradient ranging from 5% in North Europe to 100% in some Asian countries.

Objective: The purpose of this article is to highlight the difference in the prevalence of adult type hypolactasia according to geographical space and ethnicity.

Methods: The survey was conducted in the city of Kenitra representing the North of Morocco and the city of Agadir representing the south of Morocco on the adult population and also among the sub-Saharan adults residing in Morocco. Lactose intolerance was assessed by the rate of glucose in blood before and 30 minutes after administration of an overload taking of lactose and also taking account of the subsequent digestive symptoms. Subjects were also asked to answer some questions about their milk consumption and their knowledge about lactose intolerance.

Results: The prevalence of adult-type primary hypolactasia was higher in the sub-Saharan population than in the Moroccan population, it varies significantly with age and may be influenced by milk consumption in adulthood but less by its consumption after weaning.

Conclusions: Lactose intolerance increases as we go towards the south, several genetic and environmental factors influence this divergence. The prevalence of lactose intolerance is very high among the studied population which requires the participation of the health authorities to raise awareness of the existence of lactose intolerance in order to improve their quality of life.

Keywords: Lactose, Intolerance, Lactase, Milk, Morocco.

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USING HEALTH EXAMINATION DATABASE TO STUDY PUBLIC HEALTH NUTRITION -- A DATA PROCESSING APPROACH

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Background and objectives: With the rapid development of information technology, medical and health related personal data was generated very fast and diversely.

Since data collection became more and more easily, using data directly by screening, integration, processing and analyzing is a suitable approach for studying public health nutrition. A data processing procedure used to support research purpose is essential.

Methods: In this study, a health examination database was integrated with several other databases including personal behavior questionnaire, personal health records and clinical laboratory dataset to form a research data warehouse by using SQL server. All the subjects signed the consent form to agree the data without personally identifiable information used for the purpose of academic research. A standard procedure was built to connect data from different data sets and retrieved automatically according to the research problems.

Results: An integrated health related database was built which contains health examination data, behavior data, personal health records and clinical laboratory data. The researchers can set inclusion and exclusion criteria and query the data across from different datasets. This provides a very easy and efficient way for the researchers to obtain correct and clean data. Further data analysis can be done by using variety of statistical tools.

Conclusions: Data driving approach has been applied in many different research areas to obtain statistical inferences. The data warehouse built in this study is useful to do value-added applications such as finding the association between dietary patterns and metabolic and cardiovascular diseases, identifying the risk factors for building disease prediction/prevention models in public health nutrition, and applying to personalized health care.

Keywords: Personal Health Records, Public Health Nutrition, Data Warehouse, Data Analyzing, Data processing, Meaningful Use of PHR

Further collaborators:

Health Examination Companies, Health Insurance companies, public health researchers.

THE FIRST INFORMAS NATIONAL FOOD ENVIRONMENTS SURVEY IN NEW ZEALAND: A BLUEPRINT COUNTRY SCORECARD FOR MEASURING PROGRESS ON CREATING HEALTHIER FOOD ENVIRONMENTS

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Background and objectives: INFORMAS aims to benchmark food environments globally. We present results of the first-ever, comprehensive New Zealand (NZ) food environments study, the policies influencing those and a scorecard to measure progress over time and compared to other countries.

Methods: Implementation of priority national food environment policies, and strength and comprehensiveness of District Health Board (DHB) and school nutrition policies were assessed. Food environments were measured in 819 schools, 204 supermarkets, 1500 takeaway outlets, 28 hospitals, 70 sport centres and all school zones. Food swamps, areas with high relative density of unhealthy outlets, were identified, and food marketing to children on television, websites, magazines, packages and social media and in and around schools was measured. The proportion of packaged foods in supermarkets carrying health-related claims and promotions, and the cost differential between healthy and current diets were calculated.

Results: Implementation gaps exist for 75% of recommended national policies. Comprehensiveness and strength of policies are higher for DHBs than schools. About 75% of hospitals, 60% of schools and 44% of sport centres are sugary drink free. The average ratio of cumulative linear shelf length for healthy versus unhealthy foods is 0.42 and the average proportion of junk food free endcaps and check-outs is 47.0 and 14.7 in supermarkets. Nation-wide, one-third of census areas are food swamps with the highest number in most deprived areas. Median road distance to the closest convenience store from urban schools is higher for the least (617 m) versus the most deprived (521 m) schools. Food marketing to children through all media is predominantly for unhealthy foods. About 83% of less healthy packaged foods carry at least one nutrition claim. It is possible to consume a healthy diet at the same cost as current NZ diets, but the majority of healthy household menus are significantly more expensive than current household menus.

Conclusions: NZ food environments, especially children's environments, are largely unhealthy, and policy implementation is low. Effective policies, particularly on food marketing, healthy food in schools and food prices need to be implemented. NZ's healthy food environment scorecard will be updated regularly and benchmarked against other countries globally.

Keywords: food environments, benchmarking, monitoring, nutrition policies

INTRODUCTION OF GUAVA IN SUPPLEMENTARY NUTRITION MEAL PROVISIONED FOR 24-60MO CHILDREN BY INTEGRATED CHILD DEVELOPMENT SCHEME (ICDS) IMPROVES IRON STATUS OF BENEFICIARIES

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Background and objectives: Simultaneous intake of guava with rice-based meal enhanced iron bioavailability by more than 100% among Indian adolescents. Hence, a RCT was done to establish the impact of regular inclusion of guava in a nutrition sensitive platform for strategy adoption.

Methods: In India, Supplementary Nutrition Programme (SNP) provides hot cooked meal to 24-60mo children under ICDS through its operational unit, 'Anganwadi Centers' (AWCs). A three-arm cluster-RCT (CTRI/2014/09/004983) integrated with SNP was designed with passive control cucumber group (minimal vitamin C), active control banana group (minimal vitamin C, high soluble fiber) and experimental guava group (high vitamin C and soluble fiber) to receive 25g of each fruit based on 1RDA of vitamin C (40mg) present in the guava portion. Written consent from parents and permission from government departments were obtained. Participants (n=261) having Hb>8g/dL with no chronic diseases/severe malnutrition were recruited from 28 AWC-clusters in rural area of Nalgonda district, Telangana State. Participants were dewormed with albendazole. Randomization was followed at village level. Fruits were supplied by a local vendor throughout study period for 6 days/week for 21 weeks. Compliance was supervised at AWC. 2mL blood samples were collected at baseline and endline to assess haemoglobin (Hb), plasma ferritin (PF), soluble-transferrin receptor (sTfR), c-reactive protein (CRP), hepcidin, IL-6, plasma vitamin B12 and folate. Ferritin was corrected for CRP values>5mg/L by multiplying with 0.67. Linear Mixed Model was used for group comparison adjusting the cluster effect. Endpoint group comparison was analyzed by adjusting the baseline as covariate if found significant (p<0.05).

Results: There were no group differences at baseline in growth, socio-economic status, age, gender and mother's education. Biochemical parameters were also comparable except for PF, B12 and IL-6. At endpoint, experimental group showed improved status compared to both passive and active control groups for Hb (p=0.001, 0.000), ferritin (p=0.000, 001) and sTfR (p=0.000,

0.000). There was no endpoint group difference for hepcidin, IL-6 and B12 except folate which was higher in experimental group only compared to active control group (p=0.032).

Conclusions: Inclusion of Guava in regular SNP meal can be an effective strategy to improve iron status of ICDS preschool beneficiaries.

Keywords: Guava, Iron Status, Supplementary Nutrition Meal, ICDS, Preschoolers

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DEVELOPMENT OF A MULTI-SECTORAL SYSTEM TO ENFORCE A NATIONAL CODE ON MARKETING BREAST MILK SUBSTITUTES IN CAMBODIA

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Background and objectives: In 2005, Cambodia endorsed Sub-Decree 133 (SD133), a national code that regulates the marketing of breast milk substitutes (BMS). In 2014, research revealed that code violations were widespread and that there were no multi-sectoral mechanisms in place to enforce SD133. To monitor national code law, WHO recommends that the Ministries of Health set up an inter-ministerial monitoring team, composed of different ministries, agencies and departments that have a direct responsibility over the marketing, availability and promotion of relevant products.

Methods: Data on code violations and gaps in enforcement were used to advocate for an evidence-based plan to strengthen enforcement of SD133. Prior to August 2014, there was confusion over the roles of the four implementing ministries and no formal monitoring system, resulting in low reporting of code violations. Meetings and consultations were conducted with key stakeholders to discuss these issues. Policymakers including Officials from the Ministries of Health, Commerce, Information, and Industry and Handicraft, along with representatives from relevant UN Agencies and NGOs, collaborated to create a multi-sectoral supervisory mechanism to enforce the National Code regulating BMS in Cambodia.

Results: In August 2014, an Oversight Board (OB) was created to monitor and enforce SD133. This is co-led by the Ministry of Health and the Council for Agriculture and Rural Development; however, the four line Ministries are also represented by their Secretaries. The OB has two executive arms: (i) the Control Committee reviews marketing content regarding breast milk substitutes, and (ii) the Executive Working Group monitors and enforces compliance. In 2015 the OB developed terms of reference and guidelines for the implementation of SD 133; which were adopted in December 2015. In 2016, the OB developed different monitoring checklists for the four line Ministries. Four provinces were selected to pilot test the system, develop implementation guidelines, and propose recommendations. Training included orientation on the national code and monitoring guidelines.

Conclusions: Cambodia's experience & lessons learned in establishing a multi-sectoral enforcement mechanism provide a valuable model for other countries wanting to establish similar systems to enforce code regulations.

Keywords: Breastfeeding, Policy, Multi-sectoral, Enforcement, Cambodia

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144/864

SIGNIFICANT IMPROVEMENT IN SUPPLEMENTATION OF MEGA DOSE OF VITAMIN A TO UNDER FIVE CHILDREN IN INDIA

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Background and objectives: Vitamin A deficiency (VAD) is associated with increased risk of mortality and morbidity amongst under five children (U5). VAD continues to be an important public health problem in India. A survey conducted in 2011-2012 indicated that 2.5% of U5 had VAD. A recent cochrane review revealed that the Vitamin A supplementation (VAS) should be continued for reduction in morbidity in U5.

The Vitamin A Supplementation Programme was given low priority by the Government of India during 1990-2005 which was reflected in the National Family Health Survey (NFHS)-III data which found that only 16.5% of the children received VAS during 2005.

Methods: The NFHS is a large-scale, multi-round survey which undertakes systematic and stratified sampling techniques to ensure inclusion of villages with different socioeconomic characteristics. The NFHS sample covers 99 percent of India's population living in each state. The survey provides state and national level data for India on IYCF practices, maternal and child health, reproductive health, nutrition, anaemia and food supplementation practices using the standard indicators.

An analysis of secondary data available from National Family Health Survey (NFHS)-III (2005-2006) and NFHS-IV (2015-2016) was conducted on the coverage of VAS amongst U5 in different states of the country.

Results: The coverage of VAS was found to increase from 16.5% to 60.2% amongst U5 over a decade (2005-2016). The increase in the VAS coverage was observed in the range of 20-66% in different states of the country. The states with the highest increase in the coverage of VAS were Sikkim (18% to 84%), Karnataka (14% to 79%), Chhattisgarh (9% to70%), Goa (31% to 90%) and Gujarat (13% to 71%). The improvement in coverage of VAS amongst U5

could be attributed to the close monitoring and supervision by the government and development partners.

Conclusions: The present study revealed that the Government of India and development partners have strengthened the VAS Programme in the country. There is a need of continued and sustained efforts for achieving full coverage of VAS to prevent the mortality and morbidity amongst U5.

Keywords: Vitamin A supplementation, vitamin A deficiency, Mega dose of Vitamin A

144/873

ASSOCIATION BETWEEN DIETARY CAROTENOIDS AND FLUOROSIS IN CHINESE COAL-BURNING FLUOROSIS AREA: A CROSS SECTIONAL STUDY

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Background and objectives: Carotenoids are a group of diet-derived phytochemicals with antioxidant and anti-inflammatory properties that have attracted substantial interest because of their capacity to reduce the risks of relevant diseases. Epidemiology and experiments have demonstrated that excessive fluoride could lead to oxidative damage and oxidative stress was an important mechanism of fluorosis. However, there has no epidemiology studies reported the association between carotenoids and the coal burning fluorosis. Thus, we investigated the relation of carotenoid intake, to the prevalence of coal-burning fluorosis.

Methods: Subjects were required to be country resident for at least 5 years, aged between 20-75 years in Zhijin county, which is the most severe coal-burning fluorosis area in Guizhou. Face-to-face interviews were conducted to assess habitual dietary intakes using a 75-item food frequency questionnaire and various covariates by structured questionnaires. Dietary consumption of carotenoids, energy and other nutrients will be caculated according to the database of the China Food Composition and United States Department Of Agriculture.

Results: A total of 899 participants were involved and the prevalence of coal burning fluorosis was estimated to be 72.9% in this cross-sectional study. In the univariate logistic regression analysis showed significantly dose-dependent inverse correlations between the prevalence of coal burning fluorosis and the intake of α-carotene, β-carotene, lutein/zeaxanthin, lycopene and total carotenids in all of the subjects (all P-trend:<0.001). But there was no associcatoin of the prevalence of fluorosis with β-cryptoxanthin. After adjustment for sociodemographic characteristics, dietary factors and other potential confounders, the associations were slightly attenuated but remained significant for all (P-trend: <0.001–0.008) except for β-cryptoxanthin (p=0.553). The adjusted odd ratios

(ORs) and 95% confidence intervals (CIs) for coal-burning fluorosis in the top quartiles (vs. the lowest quartiles) were 0.52 (0.33, 0.83) for α-carotene, 0.48 (0.31, 0.76) for β-carotene, 0.33 (0.20, 0.53) for lutein/zeaxanthin, 0.40 (0.25, 0.67) for lycopene, 1.40 (0.88, 2.24) for β-cryptoxanthin, 0.42 (0.26, 0.67) for total carotenoids, respectively.

Conclusions: Higher intake of carotenoids is independently associated with lower prevalence of coal burning fluorosis. Increasing consumption of carotenoids food may benefit the prevention of coal burning fluorosisi in Guizhou.

Keywords: Carotenoids, Coal-burning fluorosis, Cross-sectional study

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144/874

A CLUSTER RANDOMISED CONTROL TRIAL OF AN INTEGRATED AGRICULTURE-NUTRITION PACKAGE TO IMPROVE CHILDREN'S DIETS THROUGH COMMUNITY BASED CHILDCARE CENTRES IN MALAWI

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Background and objectives: The Nutrition Embedded Evaluation Program Impact Evaluation (NEEP-IE) study is a cluster randomised controlled trial designed to evaluate the impact of a childcare centre-based integrated nutrition and agriculture intervention on the diets, nutrition and development of young children in Malawi. The intervention includes activities to improve nutritious food production and training/behaviour change communication to improve food intake, care and hygiene practices.

Methods: Sixty community-based childcare centres (CBCCs) in rural communities around Zomba district, Malawi, were randomised to either 1) a control group with communities with Save the Children supported CBCCs and parenting education; or 2) an intervention group where additional nutrition and agricultural support activities were provided to help communities provide nutritious meals in the preschools all year round. Primary outcomes at child level include dietary intake of children aged 3-6y (measured through 24-hour recall) and infant and young child feeding (IYCF) practices for children aged 0-24m. At household level, primary outcomes include smallholder farmer production output and crop-mix (recall of last production season). Intermediate outcomes along theorised agriculture and nutrition pathways were measured. During this trial, we followed a mixed methods approach combining child-, household-, CBCC- and market-level surveys and assessments with in-depth interviews and focus group discussions with project stakeholders.

Results: The integrated agriculture and nutrition intervention improved dietary intake and dietary diversity for pre-school children and their younger siblings. Positive effects were also observed

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for household production and production diversity. These effects were driven by increased consumption and production of nutritious foods.

Conclusions: Assessing the simultaneous impact of pre-school meals on diets, nutrition, child development and agriculture is a complex undertaking. This study is the first to explicitly examine from a food systems perspective, the impact of a pre-school meals programme on dietary choices, alongside outcomes in nutrition, child development and agriculture domains. The findings of this evaluation will provide evidence to support policymakers in the scale-up of national programmes.

Keywords: Pre-school feeding, impact evaluation, nutrition, agriculture, diets.

Further collaborators: Amy Margolies, Johns Hopkins University, USA. Marco Santacroce, International Food Policy Research Institute (IFPRI). USA. Aisha Twalibu, Save the Children Malawi. Helen Moestue, Save the Children USA. Mangani Katundu, Chancellor College, University of Malawi, Malawi.

144/879

AFLATOXIN EXPOSURE IN CHILDREN IN MIRPUR, DHAKA: DATA FROM A BIRTH COHORT

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Background and objectives: Dietary exposure to aflatoxin has been implicated in growth faltering in young children. Bangladesh has a hot and humid climate that is conducive to fungal growth and subsequent contamination of dietary staples. Given the high burden of childhood stunting, there has been no data on long-term exposure to aflatoxin measured by aflatoxin B1-lysine (AFB1-lys) adduct in plasma samples from children of urban Bangladesh. This study tried to explore the levels of aflatoxin exposure and its association with growth in a group of children followed longitudinally.

Methods: This study used data and biospecimens collected during 2010-2014 in MAL-ED birth cohort study in an urban slum of Mirpur, Dhaka where children were followed from birth to 36 months. AFB1-lys adduct concentrations were assessed by isotope dilution mass spectrometry from the plasma samples collected at 7, 15, 24 and 36 months. The limit of detection was 0.4 pg AFB1-lys/mg albumin. Aflatoxin exposures were compared to anthropometry, breastfeeding, dietary intake, and seasonal variation of sample collection.

Results: Number of Cohort children with available plasma samples tested at 7 months, 15 months, 24 months and 36 months were 208, 196, 173 and 167 respectively. For 744 tested plasma samples, geometric mean was 1.07 pg AFB1-lysine/mg albumin (range 0.04 - 123.5 pg/mg albumin). Percent of children demonstrated chronic aflatoxin exposure were 10.1%, 20.9%, 17.9%, and 61.7% for 7, 15, 24 and 36 months, respectively. Reduction in breastfeeding prevalence (80% at 24 months vs. 38% in 36 months) corresponds with high level detection of AFB1-lysine at 36 months. Consumption of grain significantly associated with aflatoxin exposure (OR 2.5, 95% CI 1.6-3.8, p= 0.0001). Seasonal variations detected as AFB1-lysine concentrations were highest at the end of rainy seasons. No association was detected between anthropometric indices and aflatoxin exposure.

Conclusions: Sixty two percent of children are chronically exposed to aflatoxin at the end of third year. This is the first reporting in children from Urban Bangladesh. Low mean concentration of detection could be responsible for lack of association with growth parameters. Nonetheless, more work is required to explore further the sources of aflatoxin from the dietary staples.

Keywords: Aflatoxin. MAL-ED. Bangladesh. AFB1-lys. children.

144/882

ISOFLAVONES, LIGNANS AND PROSTATE CANCER RISK: AN ANALYSIS OF INDIVIDUAL PARTICIPANT DATA FROM 5 PROSPECTIVE STUDIES

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Background and objectives: The role of phytoestrogens in prostate cancer development is unclear. Previous studies have shown different results for isoflavones among Asian and non-Asian populations, and there are too few published prospective data to evaluate whether the associations differ by stage and grade of disease. The aim of this study was to determine the association between prediagnostic blood concentrations of isoflavones [genistein, daidzein, equol] and lignans [enterolactone and enterodiol]) and the risk of prostate cancer and to evaluate these associations by tumour stage and grade. Because of the large difference in circulating isoflavone concentrations between Asian and non-Asian populations, the isoflavone analyses were conducted separately for Asian and non-Asian studies.

Methods: A pooled analysis of individual participant data including up to 241 and 503 Asian cases and controls, and 1846 and 3929 non-Asian cases and controls from 5 prospective studies. Multivariable-adjusted conditional logistic regression was used to estimate the odds ratios (ORs) for prostate cancer based on the study-specific fourths of circulating concentrations of each phytoestrogen.

Results: Blood isoflavones were not associated with the risk of total prostate cancer in either Asian or non-Asian populations,

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although in Asian populations there was a suggestion of an inverse association between blood equol and prostate cancer risk (multivariable-adjusted OR for the highest versus lowest fourth = 0.61 [95% confidence interval [CI] =0.39-0.97] and OR per 75 percentile increase = 0.69, 95 CI = 0.46-1.05). No associations between lignans and prostate cancer risk were observed (OR per 75 percentile increase = 1.06, 95 CI = 0.90-1.25 for enterolactone and OR per 75 percentile increase = 0.99, 95 CI = 0.79-1.25 for enterodiol). These associations did not differ significantly by time-to-diagnosis or by tumour stage or grade.

Conclusions: There was no strong evidence that prediagnostic blood concentrations of isoflavones or lignans are associated with prostate cancer risk, although there are still relatively few published prospective data.

Keywords: Pooled analysis, nested case-control study, prostate cancer, isoflavones, lignans

Further collaborators:

The Endogenous Hormones, Nutritional Biomarkers and Prostate Cancer Collaborative Group (EHNBPCCG)

144/885

PERCEPTION OF BRAZILIAN CONSUMERS IN RELATION TO THE TERMS HOMEMADE, TRADITIONAL AND ORIGINAL IN LABELS OF PACKAGED FOODS

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Background and objectives: Terms such as homemade or traditional are present in labels of food products commercialized in Brazil. According to the Brazilian legislation, food labeling should not have terms that cannot be demonstrated, since they may induce the consumer to error in relation to its nature or composition. The study aimed at investigating the perception of Brazilian consumers from Florianópolis/Brazil, in relation to industrialized food products with the terms homemade, traditional and original.

Methods: Nine focal groups, with three to eight participants each, were conducted (October/December 2015). The group meetings were guided by a semistructured interview script with questions related to terms found in the frontal panels of industrialized products that were identified in a survey carried out in one of the ten biggest supermarket chains in Brazil. In addition, food packages were used to instigate the discussion about the meanings of each term. As criteria for inclusion: participants had to be adult; to buy food products; and, they could not have a degree in Nutrition.

Results: Forty-four subjects aged 20-58 participated in the focal groups (24 female). According to the participants, food products that present the term homemade generally refer to more natu-

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ral products, with less processing and less food additives. This term may refer to a food product with flavors that remind consumers of the homemade product; with an artisanal appearance; and is normally considered healthier and tastier. Food products with the term traditional were similar to the term homemade. Nonetheless, they can also refer to food products with variations, or old brands, or to food products whose flavors or ingredients have been kept since the first formulation. Food products that present the term original also refer to more natural products, to products whose production mode is traditional. Participants reported feeling confused or deceived by the use of non-standardized terms.

Conclusions: Therefore, it is necessary to improve the inspection on the use of these terms in food products. The study reinforces the need for assuring consumers' rights to adequate and concise information. Thereby, with the information available in food labels, consumers may choose their food products in a conscious way.

Keywords: Food labeling; Consumer behavior; Industrialized food product; Nutrition.

144/892

SOCIAL DIFFERENTIALS AND NUTRITIONAL STATUS OF CHILDREN POPULATION IN THE NORTHWEST AND PAMPEANA REGIONS IN ARGENTINA

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Background and objectives: Childhood nutritional status is influenced by biological, environmental and psychosocial determinants. Until the first National Survey of Nutrition and Health (ENNyS) performed in 2005, Argentina possessed few epidemiological studies about child nutrition and health. To study social "inequities" in health (avoidable and unfair social differences) in two regions with heterogeneous socio-economic realities, allows to know some characteristics that may explain, in part, differences in health and nutrition during childhood.

Objectives: a) To describe the socio-economic context in which children (2-5 years) reside in Pampeana and Northwest regions of Argentina, according to ENNyS (2005). b) To analyze the association between potential social determinants and children's nutritional condition in both regions.

Methods: observational cross-sectional study. Social determinants were defined according to available indicators correspond-

ing to the study sample of ENNYS (n=981 children in NOA and n=898 in and Pampeana region. We examined difference in ratios of social indicators between regions. The association of the previously defined factors was analyzed with the nutritional status (reference WHO 2006) in each region using a Chi-squared and Fisher test

Results: The ratio of families with female head of household was higher (p<0.0001) in NOA (64.91% vs 35.09% in Pampeana region). Significant differences were observed in the ratio of families with unsatisfied basic needs and poverty (according to poverty line and indigence line) between both regions, as well as access to potable water, electricity and in-house bathrooms. The NOA was determined as being the most disadvantaged region (p<0.0001). The children's low height was significantly associated with poverty (yes/no) in NOA (p=0.0003) and in Pampeana region (p=0.0147), and was associated with anemia in NOA (p≤0.0001). In NOA region, both underweight (p=0.028) and overweight/obesity (p=0.016), were associated with unsatisfied basic needs.

Conclusions: the two regions studied present differential socio-economic contexts. Nutritional status in children aged 2 to 5 years old is linked to conditions of poverty of their environment, especially in the NOA region. The identification of social determinants in childhood health and nutrition contributes to the definition of policies aimed at reducing the social inequities in health, and the design of future editions of the ENNyS.

Keywords: social differentials , nutritional status, childhood, Argentina.

144/899

RETHINKING FOOD SYSTEMS AND FOOD CHOICES THROUGH COMMUNITY GARDEN PARTICIPATION: LESSONS FROM A UNIVERSITY SETTING IN BRAZIL

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Background and objectives: Community gardens promote health and wellbeing by influencing nutritional and social environments, as well as health-related behaviors. Our objective is to describe the experience of developing a community garden in a university as a context to promote healthy eating.

Methods: Participatory community-based methodologies were adopted to develop collectively an urban garden at the Federal University of Sao Paulo, Santos City, Brazil. An iterative planning was conducted over a ten-month period, beginning with an initial assessment of local resources and community engagement

efforts, succeeded by interdisciplinary activities – besides gardening activities – focusing primarily on food systems and other environmental influences on food choices (i.e., workshops, cooking sessions, educational movies, debates, and social media). Direct observation was used to evaluate each activity in terms of individual responses and participation.

Results: Activities sizes ranged from 9-45 participants, and provided an opportunity for dialogue and sharing of knowledge and perceptions about current food, physical and social environmental changes, lifestyle modifications, and impacts on healthy eating. The meetings appeared to enhance engagement and critical consciousness, intentions to change behavior, and empowerment to modify the environments towards health (e.g. skills acquired were applied creating home gardens and cooking for the family using unprocessed foods). Also, the community garden showed social benefits, such as social interaction, cultural diversity, community cohesion and revitalization of the spaces.

Conclusions: This experience demonstrates the potential of community gardens as a facility to enhance local environmental changes and health-conscious food choices. It provides a basis for interventions to improve community capacity and to support social development.

Keywords: Community garden, community development, community-based participatory research, healthy food system, nutritional environment

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144/917

ASSOCIATION BETWEEN USUAL FREE SUGAR INTAKE AND BMI Z-SCORE OF AUSTRALIAN CHILDREN AND ADOLESCENTS

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Background and objectives: Previous studies suggested dietary sugar consumption to be the main contributing factor in obesity, yet the findings were inconsistent. Moreover, evidence regarding the consumption of free sugar, which was defined as sugar added during manufacturing processes as well as some specific sweet foods, causing obesity was limited. In particular, free sugar from liquid and solid food was found to have different effects on obesity measures. The current analysis aimed to assess the effects

of consuming free sugar from solid and liquid food on the BMI z-score of Australian children and adolescents.

Methods: In this cross-sectional analysis, the data from the 2007 Australian National Children's Nutrition and Physical Activity Survey were used. Participants' dietary intake was collected using two separate multiple-pass 24-hour recalls, and free sugar intake was estimated using a previously established methodology. Usual intake of free sugar was estimated using Multiple Source Method. Structural equation modeling was used to determine the association between usual free sugar intake and age-and-sex-specific BMI z-score, and its indirect effect on BMI z-score moderated via energy over-consumption. Confounding variables such as physical activity level, saturated fat and fiber intake, and socioeconomic statuses were also included in the model.

Results: The association between total free sugar consumption and BMI z-score was weak and statistically non-significant (standardized β = 0.009, P = 0.672). Similar results were obtained when the predictor variable was changed to free sugar from solid food (standardized β = 0.26, P = 0.236) and liquid food (standardized β <0.001, P = 0.991). The effect of usual free sugar intake on BMI z-score mediated via energy over-consumption was minimal (standardized indirect effects = -0.035-0.16).

Conclusions: Usual free sugar intake was not associated, either directly or via energy over-consumption, with BMI z-score in this dataset. This possibly reflected the complex relationship between free sugar intake and obesity. However, limitations of this study, such as underreporting and bias in the sampling period, may also have contributed to the findings. Further research effort is needed to further elucidate the roles played by free sugar consumption in causing obesity in children and adolescents.

Keywords: free sugar, structural equation modeling, children, obesity, Australia

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EFFECTS OF MACRONUTRIENT DISTRIBUTION ON WEIGHT CHANGE AND RELATED CARDIO-METABOLIC PROFILES IN HEALTHY NON-OBESE CHINESE: A RANDOMIZED, CLINICAL TRIAL

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Background and objectives: In the past 30 years, obesity rates in China have increased rapidly in parallel with a transition from the traditional lower fat, higher carbohydrate diet to a diet relatively higher in fat and reduced in carbohydrate.

To determine whether the traditional lower fat, higher carbohydrate diet is more effective than the higher fat, lower carbohydrate diet at preventing obesity among a non-obese healthy population in China.

Methods: Six-month randomized controlled-feeding trial conducted at Zhejiang University in Southern China, and Chinese PLA General Hospital in Northern China. Healthy young adults (aged 18-35 years, body mass index < 28) who lived on the university campus or in the hospital dormitory. (1) A lower fat, higher carbohydrate diet (fat 20% , carbohydrate 66% energy)); (2) a moderate fat, moderate carbohydrate diet (fat 30%, carbohydrate 56% energy); (3) a higher fat, lower carbohydrate diet (fat 40%, carbohydrate 46% energy). Protein provided 14% energy in all diets. Spectrum of fat intake was achieved by replacing a proportion of energy derived from carbohydrates (white rice and wheat flour) with fats (soybean oil).

Results: Reduction in body weight was significantly greater in the lower fat, higher carbohydrate group throughout the intervention (P < .001 for the interaction between diet group and time). Weight change at 6 months was -1.6 kg (95% CI: -1.8, -1.4) for the lower fat, higher carbohydrate group, -1.0 kg (95% CI: -1.2, -0.8) for the moderate fat, moderate carbohydrate group, and -0.8 kg (95% CI: -1.1, -0.5) for the higher fat, lower carbohydrate group. Reductions in waist circumference, total cholesterol, lower-density lipoprotein cholesterol, non-higher-density lipoprotein cholesterol and apolipoprotein B on the lower fat, higher carbohydrate group were greater than those observed on the other two diets groups.

Conclusions: Among healthy non-obese Chinese, a lower fat, higher carbohydrate diet is more effective than higher fat, lower carbohydrate diet at preventing obesity and improving cardiometabolic risk profile. (ClinicalTrials.gov NCT02355795.)

Keywords: Fat, carbohydrate, intervention, cardiometabolic risk, body weigh

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144/924

PARENT`S KNOWLEDGE, ATTITUDES, AND PRACTICES ABOUT SALT/SODIUM INTAKE IN CHILDREN

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Background and objectives: PAHO promotes implementation of a knowledge, attitudes and practices (KAP) questionnaire as an element to support strategies to reduce blood pressure (BP) and cardiovascular diseases risk throughout reducing sodium in-

take. PAHO´s KAP is targeted to adult population, however, a reduction of sodium intake also reduces BP in children. Considering that a family environment and parent`s decisions may influence children salt/sodium intakes, our propose was to identify parent's KAP related to salt/sodium intake of children.

Methods: PAHO´s KAP questionnaire was adapted to evaluated salt/sodium variables focusing in Children. The adapted questionnaire was applying to parents and caregivers of children beneficiaries of a food complementary program in Antioquia – Colombia.

Results: Questionnaires were obtained from 2997 parents and caregivers; 37.5 (SD±10.9) years old, 94.3% female, and 65% from rural areas. Related with knowledge, 15.6% of respondents declare that know difference between salt and sodium, 11.4% always know the amount of sodium ingested by children, 15.4% declare that always labeling of children´s food has information about sodium content, 63.5% agree that sodium affects children's health and 62.1% consider that the amount of sodium ingested by their children is adequate. About attitudes, 57.4% and 29.2% of respondent try their children reduce salt and sodium intake, respectively. About practices, 81.7% of respondent declared some action to reduce children's salt/sodium, among them: 22% read food labeling related with sodium, 19.6% choose to buy low sodium content foods, and 68.9% avoid children's addition of salt on the table.

Conclusions: Parents and caregivers recognize that sodium intake has a negative effect on children's health. However, they lack knowledge about what is sodium, furthermore, they think that sodium intake is adequate in children. Parents try to reduce children sodium intake, nevertheless, their actions generally aimed to decrease salt addition, rather than avoid foods source of sodium. It is important to implement educational strategies to sensitize parents and caregivers about a possible excessive intake of sodium in children and identification of food sources of the mineral.

Keywords: Sodium, knowledge, attitudes, practices, parents, children

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144/931

DIET AND EATING PRACTICES AMONG ADOLESCENT GIRLS IN LOW AND MIDDLE INCOME COUNTRIES: A SYSTEMATIC REVIEW

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Background and objectives: Adolescent girls in LMICs have worse nutrition profiles when compared to their counterparts in high-income settings, including greater risks for undernutrition, overweight/obesity, and micronutrient deficiencies. Considering the dramatic shift from communicable to non-communicable diseases (NCDs) in LMICs, the recognition of poor diet as a key risk factor for NCD is also becoming increasingly important. Additionally, adolescent pregnancy is three times higher in LMICs, highlighting the dual burden of poor nutrition and increased pregnancy rates for adolescents in these contexts. It is well established that malnutrition in pregnancy, particularly for adolescents, can lead to poor maternal and infant birth outcomes and sustained intergenerational effects.

Adolescence represents a key entry point for nutrition interventions that will underlie good health and practices in adulthood, especially considering the psychosocial growth and increasing autonomy that occurs during this period. However, before establishing appropriate interventions, we must first understand current trends in intake. As such, the objectives of this review are to describe the dietary intake and practices of adolescent girls in LMICs.

Methods: Using an adapted version of the UNICEF framework for child undernutrition as a logic model, we will systematically evaluate existing literature on the dietary intake and practices of adolescent girls in LMICs. Types of studies and documents to be reviewed will include observational studies, surveys, qualitative research studies, program evaluations, and other descriptive program documents. Participants must include adolescent girls (10-19 years). Primary outcomes assessed will include: types of food consumed, food composition, place consumed, and frequency of consumption. Secondary outcomes will be data dependent and will include height, weight, BMI, and micronutrient deficiencies. Studies conducted in high-income settings and those published prior to 2000 will be excluded.

Results: Pending.

Conclusions: Understanding adolescent girls' dietary intake and practices is critical for identifying causes of malnutrition in order to offer strategic recommendations for improvement through programming, advocacy, and future research. This study will not only synthesize existing evidence across several contexts, but it will translate knowledge into useable action points for country officials.

Keywords: Adolescent, LMIC, diet, eating practices, nutrition transition

POLYCYCLIC AROMATIC HYDROCARBONS BIOMARKER AMONG NON-OCCUPATIONALLY EXPOSED INDIVIDUALS IN SILESIA

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Background and objectives: Polycyclic aromatic hydrocarbons (PAH) constitute a composition of different molecules, ubiquitously present in the environment. Typically are connected with cigarette smoke and heavy industry, while those compounds can be present in food as a result of heat processing, such as: grilling, smoking or frying. The aim of presented study was measurement of PAHs' biomarker: 1-hydroxypyrene, among non-occupationally exposed individuals.

Methods: 206 individuals from region of Silesia in Poland were analyzed with respect to 1-hydroxypyrene urine concentration. High performance liquid chromatography with solid phase extraction and fluorescent detection was used for measurement. Biomarker concentration was normalized for creatinine. Questionnaires for all participants focusing on smoking status and knowledge about PAH sources were obtained.

Results: Mean concentration of biomarker was 0,74 µg/g (SD: 0,39; max: 1,94 µg/g; min:0,06 µg/g). 15% of participants were no-smokers. Smokers obtained higher values comparing to non-smokers (0,82 µg/g; CI: 0,76 to 0,87 vs. 0,73 µg/g; CI: 0,67 to 0,78). Participants were not aware about food sources of PAHs.

Conclusions: Results measured for non-smoking individuals are higher than guidelines described as guidance value for non-smokers, not exposed at work (0,46 µg/g). The basic knowledge about presence of PAHs in food and practical ways how such exposition can be lowered is especially important as for general population diet remains substantial PAHs' source.

Keywords: biomarker, 1-hydroxypyrene, polycyclic aromatic hydrocarbons

FOOD ENVIRONMENTS OF SCHOOL-AGED CHILDREN AND ADOLESCENTS IN LOW- AND MIDDLE- INCOME COUNTRIES: INVESTIGATING A PROPOSED CONCEPTUAL FRAMEWORK

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Background and objectives: Adequate nutrition during school-age and adolescence is important for both current and future health, and these periods are key windows of opportunity for the catch-up growth needed to prevent persistent intergenerational effects of malnourishment (Black et al., 2013; PAHO, 2011). While there have been efforts to determine the burden of malnutrition (undernutrition, overweight/obesity and micronutrient deficiencies) among school-aged children (SAC) and adolescents in LMICs, little is known about the influence of the food environment, particularly in low- and middle-income country (LMIC) settings. Food environments are defined as the collective physical, economic, policy and socio-cultural surroundings, opportunities and conditions that influence people's food and beverage choices and nutritional status (Swinburn et al., 2014). The objective of this study is to synthesize available evidence on the characteristics of the food environment of SAC and adolescents in LMICs in order to substantiate a proposed conceptual framework.

Methods: We comprehensively searched for and evaluated studies and reports published since 2000 in the peer-reviewed and grey literature that describe or assess characteristics of the food environment including product (food availability, assistance and supply), proximity (accessibility), promotion (advertising), prominence (shelf-space), purchasing (sales analysis), price (affordability), preference (choice, desirability and acceptability) and policy (legislation and regulation) among school-aged children (5-9 years) and adolescents (10-19 years) across LMICs. We included observational and experimental study designs, national and subnational policy, program and strategy documents, while excluding animal studies and systematic reviews. Electronic databases (Medline, Embase, CAB abstracts, PsycINFO, Web of Science, The Cochrane Library, CINAHL) were searched using a combination of appropriate keywords, MeSH, and free text terms.

Results: Pending – synthesis is ongoing.

Conclusions: From this synthesis, we will substantiate a proposed conceptual framework of the food environment of SAC and adolescents. Understanding characteristics of the food environment is critical for identifying associations to diet-related health

outcomes and possible indicators of the food environment of SAC and adolescents.

Keywords: Food Environment, Nutrition, Diet, School-age Children, Adolescents

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NUTRITIONAL CONDITION OF CHILDREN AND SOCIAL REPRESENTATIONS OF THE RIGHT OF HEALTH OF CAREGIVERS

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Background and objectives: Introduction: Human rights approach allows you to define the obligations of States against major human rights; the concept of health has evolved, is now recognized as a fundamental right determined by a set of personal, social, economic, political and environmental conditions; proper nutrition is necessary but not enough to be healthy.

Objective. Investigate the nutritional condition of children in a kindergarten and social representations of the right to health of caregivers.

Methods: This research was carried out from two perspectives. In a first stage it was approached from the quantitative perspective, determining the nutritional condition of 89 children attending the kindergarten. In a second stage, from the qualitative perspective, a study on the representations of the right to health of caregivers was done through purposive sampling. They were conducted seven interviews, also participant observation. The analysis of qualitative data was performed using the constant comparative method and inter-method triangulation.

Results: 9% of children were stunted, and 35% overweight or obese. No sex or age differences were found. As for the performances all mothers considered health as absence of disease and parents as primarily responsible for the health of children, malnutrition was not visualized as a health problem; while teachers and health professionals, had a more comprehensive view, they recognize the health situation of children and incorporate the state as guarantor. Violence, drug and alcohol, and pollution were the main problems represented by the interviewees.

Conclusions: It requires a paradigm shift in terms of concepts of health, rights, citizenship, and empower citizens to recognize and exercise their rights, highlighting the State's obligation to adopt measures to guarantee and fulfill the right to health in this community.

Keywords: social representations, rights, health, childhood, nutritional condition.

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HEALTHY DIETS ARE NOT MORE EXPENSIVE THAN THE CURRENT DIET IN NEW ZEALAND

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Background and objectives: Price and affordability of diets are important determinants of food choice and therefore health. A standardized method to determine the relative price and affordability of healthy diets compared to current diets was developed and tested in New Zealand.

Methods: A healthy diet meeting food and nutrition guidelines, nutrient reference values, and energy requirements for a healthy BMI, and a current (unhealthy) diet based on eating patterns identified from national nutrition surveys and energy requirements for the current population BMI were developed. Food prices were collected from three supermarkets, fresh produce stores and takeaway outlets. Affordability of the diets was assessed using three income scenarios for a household of four. Only the current diet contained alcohol, takeaways or discretionary foods (energy dense, high in saturated fat, sugar, sodium). A range of scenarios assessed the cost of diets after changing different metrics such as the type of price (e.g. usual, discounted), diet composition or energy adjustments.

Results: The healthy and current diets were similar in cost at NZ$566 per fortnight. If households were receiving welfare assistance, the healthy and current diets would require 45% of household income and, if receiving the median household income, 18% of household income. If GST were removed from healthy foods, the healthy diet would become 6% cheaper than the current diet. The relative differences between diets changed when scenarios were modeled for inclusion of foods in the healthy diet (healthier takeaways, discretionary foods at 6% of energy, moderate amount of alcohol), which price to use (discounts, brand choice), and whether the diets were isocaloric.

Conclusions: The relative price and affordability of a healthy and current New Zealand diet was similar, however changing some aspects of price or diet changed the price differential. It is essential when comparing diet costs over time or between locations to use the same principles and methodology.

Keywords: Food affordability, Diet cost

THE PATIENTS WITH GESTATIONAL DIABETES AND OBESITY MOSTLY REQUIRE INSULIN AS A TREATMENT AUTHORS

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Background and objectives: Determining nutritional status, diagnostic method and treatment in patients with gestational diabetes.

Methods: Descriptive, retrospective, observational study of the pregnant population attending the Diabetes and Pregnancy clinic of the Maternity Municipality of Malvinas Argentinas, Buenos Aires, between January and December 2014. Information was gathered from clinical records.

The diagnosis method of fasting plasma glucose and Oral glucose tolerance test according to the latin american association of diabetes (ALAD) criteria, insulin treatment or dietary plan only, the mean of BMI and age. The data was processed with the EPI INFO7 statistical program.

Results: 227 cases of GDM were confirmed in relation to the 3975 registered births. The nutritional status based on the BMI: obesity 35%, overweight 27% , normal 36%, underweight 2%.

The average age was 29 years, the mean BMI was 28. It was detected with OGTT: 81%, and with FPG: 19% .

From the group of patients diagnosed with gestational diabetes through OGTT: 34% required only food plan, his average age was 28 years and the BMI 25; 37% required insulin with an average age of 30 years and BMI of 30; 29 % failed to evaluate treatment for concurrent treatment with full term.

From the group of patients diagnosed with gestational diabetes through FPG: 22% required only food plan, his average age was 25 years and BMI 27.5; 64% required insulin with an average age of 28 and a mean BMI of 31.5; 14% failed to evaluate treatment for concurrent treatment with full term.

Conclusions: In our population with GDM, 35% presented obesity and 27% were overweight; The patients who required an insulin treatment the average presented obesity, regardless of the diagnostic method, which shows the need to act on modifiable risk factors.

Keywords: Diabetes, pregnant, obesity, overweight, nutritional

DETERMINING THE PREVALENCE OF EATING DISORDERS AMONG DIETETIC STUDENTS IN SOUTH AFRICA

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Background and objectives: It is expected that eating disorders (EDs) are more prevalent among first year dietetic students, but results contra-indicate that it is higher in first year non-dietetic students. Eating behaviour and eating attitude of students also vary among study majors, as well as subsequent years of dietetic study. To determine and compare the i)BMI (body mass index), ii)eating behaviour and iii)eating attitude of a sample of 62 first- ,third- and fourth year dietetic- versus 83 first year non-dietetic students.

Methods: A cross-sectional descriptive survey was conducted by using the 'Sick, Control, One stone, Fat, Food' (SCOFF)- and Eating Attitude Test-26 (EAT-26) questionnaire (eating behaviour) and Three Factor Eating Questionnaire (TFEQ) (eating attitude) to compare a convenience sample of female undergraduate students (N = 145). It was compared for first- (n = 24), third and fourth year (n = 38) dietetic students and first year non-dietetic students (n = 83).

Results: First year non-dietetic students had a higher prevalence for Bulimia Nervosa (SCOFF1 - 11%), binge eating (SCOFF2 - 53.7% and EAT A – 22.9%), weight loss (SCOFF3 – 20.7%) and believing themselves to be fat (SCOFF4 – 50%). While first year dietetic students had a higher indication for food dominating their lives (SCOFF5 - 41.7%), Bulimia Nervosa (EAT B – 4.2%), using diet pills for weight loss (EAT C – 16.7%) and being previously treated for an ED (EAT D –8.3%). But the mean BMI of first year dietetic students (23.2±4.3 kg/m2) was lower than first year non-dietetic students (24.2±5.3 kg/m2).

Conclusions: A standardized screening tool could be used to select prospective dietetic students at Universities, in order to determine if they suffer from an existing or undiagnosed ED, as it should be emphasised that the core business of the dietititian is to help others with their eating habits. Thus firstly be in a position to address their own eating habits and behaviours. During selection the proposed screening tool 'ED questionnaire' (shortened version of the SCOFF questionnaire and behavioural questions of the EAT-26 questionnaire) was developed. They can then receive timeous intervention regarding existing eating habits and food-related behaviours.

Keywords: Eating behaviour. Eating attitude. Dietetic students. Eating Disorder Questionnaire.

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ASSOCIATION BETWEEN DIETARY PATTERNS AND SLEEP APNEA SYNDROME SEVERITY

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Background and objectives: Studies have shown a strong positive association between obstructive sleep apnea syndrome (OSAS), body mass index (BMI) and obesity. Some studies have shown that an increased intake of some nutrients intake - such as fat - can aggravate OSAS; however, studies evaluating the dietary pattern of individuals with OSAS are still scarce. Therefore, the objective of this study was to evaluate the association of dietary intake and OSAS severity.

Methods: A total of 305 OSAS patients were evaluated in a private clinic in Uberlândia city, Minas Gerais State, Brazil. Dietary intake was evaluated using a food frequency questionnaire (FFQ), and Dietary Inflammatory Index (DII) scores were computed. Higher DII scores indicate a more pro-inflammatory diet and lower scores indicate a more anti-inflammatory. Association between macronutrients, alcohol intake and DII data and apnea severity (mild, moderate and severe) was evaluated in different multinomial logistic regressions, using the mild degree of apnea severity as a reference. Analyses were adjusted for age, BMI and sex.

Results: It was observed that saturated fat intake (Beta=0.072, p=0.012,CI95% 1.016-1.136) showed a positive association with moderate degree of OSAS; alcohol showed a positive association with moderate (Beta=0.058,p=0.004, CI95% 1.019-1.102) and severe degree of OSAS (Beta=0.057, p=0.004, CI95% 1.019-1.099). Carbohydrate (Beta=-0.112, p=0.040, CI95% 0.986-1) and fiber (Beta=-0.064, p=0.014,CI95% 0.891-0.987) intake presented an inverse association with OSAS. There was no significant association between DII, energy, fat, protein and cholesterol intake and OSAS severity.

Conclusions: In conclusion, dietary patterns had an association with degrees of apnea severity, with more impact on moderate than severe apnea.

Keywords: Diet, sleep apnea, inflammatory, dietary surveys

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HIGHER SERUM CAROTENOIDS ASSOCIATED WITH IMPROVED CARDIOMETABOLIC PROFILES IN MIDDLE-AGED AND ELDERLY ADULTS: A 6-YEAR PROSPECTIVE STUDY

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Background and objectives: Previous studies suggested greater levels of carotenoids in diet or blood might be associated with cardiovascular risk factors, but scare data are available from prospective studies. This prospective study examined the associations of serum concentrations of carotenoids with cardiometabolic profiles (body fat, metabolic syndrome [MS], carotid intima-media thickness [cIMT], and non-alcoholic fatty liver disease [NAFLD]) in a community-based Chinese population.

Methods: A total of 4066 participants (40-75 years, 68% women) were recruited in urban Guangzhou (South China) at baseline, 79.3% and 73.0% of them were followed-up at the 3rd and 6th years. We collected general information, lifestyle factors and other covariates using Face-to-face interviews at each visit. Serum levels of carotenoids (α-, β-carotene, β-cryptoxanthin, lycopene and lutein/zeaxanthin) were examined by HPLC at baseline. MS-related indices and cIMT (by ultrasonography) were determined at each visits. Body fat (by dual-energy X-ray absorptiometry) and NAFLD (by abdominal ultrasonography and serum triglycerides and transaminases) were measured at the first and second follow-ups. Serum inflammatory biomarkers (CRP and RBP4) were also tested.

Results: After adjustment for multiple covariates, HRs (95% CIs) of incident MS for the highest (vs. lowest) quartile (Q) were 0.39 (0.31-0.51) for lycopene, 0.42 (0.32-0.54) for α-carotene, 0.45 (0.34-0.56) for β-carotene, 0.72(0.57-0.90) for lutein/zeaxanthin, and 0.47(0.37-0.61) for total carotenoids (all P-trends <0.05). Greater total carotenoids in serum were associated significantly lower %fat mass (4.0%-7.8%, Q4 vs. Q1, p-trends<0.001) and lower changes in trunk fat and waist circumference (p-trends <0.05). cIMTs of common artery tended to be less increased in the higher group of some serum carotenoids (p-trends<0.05). The percentage mean difference in serum carotenoids in the improved (vs. progressed) NAFLD group were 9.1% for alpha-carotene, 22.0% for beta-carotene, 14.6% for beta-cryptoxanthin, 4.3% for lutein/zeaxanthin and 12.1% for total carotenoids in total subjects (all p<0.05) after adjusting for potential covariates. Path analyses showed that CRP and RBP4 played a significant intermediation role between carotenoids and MS and NAFLD.

Conclusions: Higher blood concentrations of carotenoids are associated with low risk of MS, favorable progress in body fat, cIMT and NAFLD mediated by inflammatory biomarkers in middle-aged and elderly Chinese adults.

Keywords: blood carotenoids; metabolic syndrome; carotid intima-media thickness; non-alcoholic fatty liver disease; body fat

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EFFECT OF POLICY REFORMS ON FOOD AND NUTRITION TRENDS IN VIETNAM AND MYANMAR FROM 1960 TO 2015

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Background and objectives: Global and national policy changes and events can affect food and nutrition trends. We conducted this study to examine the ecological association between policy changes and events and trends in food- and nutrition-related measures in Vietnam and Myanmar from 1960 to 2015.

Methods: We used an interrupted time-series design at the country level for this study. We identified relevant policies and events from 1960 to 2015 in Vietnam and Myanmar from WHO's Nutrition Landscape Information System and other available sources. We examined national trends in economy, agriculture, nutrition, and health measures gathered from World Bank, FAO, WHO, and UNICEF databases in relationship to policy changes and events in the two countries.

Results: In the last 50 years, both Vietnam and Myanmar had increased urban populations, increased life expectancy at birth, and decreased mortality rates for neonates, infants, young children, and mothers. Both countries had overall growth in gross domestic product, contributed to initially by increased agriculture production and then by trade, manufacturing, industry, and services. The two countries changed toward market economies, joining and getting support from Association of Southeast Asian Nations (ASEAN), lifting of economic sanctions, and implementing trade agreements. There were periods when the economies were negatively impacted by wars and conflicts (e.g., Sino-Vietnamese war and prolonged civil war and political unrest in Myanmar) or failed policies (e.g., "price, salary, and money" reform in Vietnam). In Vietnam, the implementation of policies, including National Nutrition Strategies, was associated consistently with economic, agricultural, and nutritional measures. In contrast, during Myanmar's 2011–2015 political, economic, and administrative changes, growth in gross domestic product slowed. Reduction in prevalence of stunting and underweight was negligible after the Myanmar's National Plan of Action for Food and Nutrition in 1994, but greater after the National Plan of Action in 2011.

Conclusions: Policy changes toward becoming a market economy and National Nutrition Strategies contributed to economic growth, agricultural production, and improved nutritional status in Vietnam and Myanmar. In addition, political stability was critical for these improvements.

Keywords: Food and nutrition dynamics, market economy, Myanmar, policy reforms, Vietnam

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SYSTEMATIC ASSESSMENT OF POLICY SPACE IN NEW ZEALAND FOR PRIORITY FOOD ENVIRONMENT POLICIES FOR OBESITY/NCD PREVENTION IN RELATION TO INTERNATIONAL TRADE AND INVESTMENT AGREEMENTS

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Background and objectives: Confronting the growing global burden of non-communicable diseases requires policy actions to improve food environments. There are, however, real and perceived barriers to policy development and implementation due to binding commitments under existing international trade and investment agreements (TIAs), which may contribute to regulatory chill. The monitoring of policy space for food environment interventions is thus an important public health priority. This study aims to systematically identify the areas of conflict and coherence between existing trade commitments and priority food environment policies at a national level in New Zealand, to determine where such policies may or may not face real or perceived legal challenges.

Methods: Using the trade and investment law implications of tobacco control policy as a framework, a realist review was carried out to determine the relevance of trade and investment agreement

provisions for public health nutrition. A set of 10 priority policy actions previously identified by public health experts in New Zealand were then cross-referenced with the terms and provisions of 9 international, regional and bilateral TIAs that New Zealand has signed and/or ratified in the last 10 years. These policies were then ranked by order of probability of legal risk.

Results: The results to be presented demonstrate the potential legal implications of national food environment policy priorities for New Zealand, including labeling measures, food composition standards, public procurement, marketing restrictions, and fiscal policy. Their estimated legal risk ranges from high certainty of no conflict (as is the case for introduction of a non-discriminatory excise tax on sugar-sweetened beverages) to high certainty of conflict under certain circumstances (as is the case for some mandatory labeling measures). Primary areas of concern for the selected policies include lack of scientific proof and/or measures not being the least trade restrictive to achieve objectives, interference with usage of trademarks, inconsistent product specifications, and indirect expropriation of investment.

Conclusions: Some priority food environment policy interventions may be pursued with minimal concern of legal challenges under international trade and investment regulations. Others require further analysis to determine under what conditions they could be challenged.

Keywords: trade, policy space, food environment, obesity, INFORMAS

144/1005

DOES LOVE MAKE MOTHERS BLIND? A TRANS-CONTINENTAL LARGE PAN STUDY ON MOTHERS' UNDERESTIMATION OF THEIR OVERWEIGHT/OBESE CHILDREN'S WEIGHT

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Background and objectives: Assessing factors that affect the likelihood to change weight is crucial to develop effective public health strategies fighting the concerning obesity epidemic occurring worldwide. Recently, it has been suggested that parents' misperception of their children body size may affect children's likelihood of losing weight. The present study aimed at assessing

maternal misperception rates (in terms of perception as normal of an overweight/obese child), and the role played by misperception in affecting the chance of implementing actions changing kids' weight in Latin American children.

Methods: Large multicenter cross-sectional study enrolling children from five Latin American countries: Chile, Argentina, Brazil, and Mexico. Kids' eating habits, lifestyles, and families' characteristics were evaluated through a cultural specific validated tool, and mother's perception of children weight status was assessed using a projective test. Children underwent anthropometric assessment, and their Body Mass Index (BMI) was classified in underweight, normal weight and overweight/obese (OWO) according to CDC standards. For the purpose of the analysis, we considered only OWO children.

Results: Six hundred eighty children were enrolled, of these 235 (35%) were OWO. Most of mothers (164, 70%) of OWO children did not correctly perceived their body size, underestimating it. OWO misperceived children were significantly younger (p-value <0.001) compared to those perceived correctly. At multivariable analysis, OWO misperceived children were less likely to be involved in a program to lose weight (p-value <0.001), together with those who ate more frequently snacks (cookies particularly).

Conclusions: Present findings clearly showed that the chance of being involved in a program to lose weight is affected by maternal perception of her child's body size. These results highlight the fact that parental misperception must be taken into account in the planning of public health interventions fighting childhood obesity, since it might negatively affect the effectiveness of such interventions.

Keywords: Children, Overweight, Obesity, Misperception, Weight-loss

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144/1007

IMPACT OF CHILEAN LAW ON FOOD LABELLING AND ADVERTISING ON CHILEAN POPULATION'S KNOWLEDGE ABOUT AND ATTITUDES TOWARDS FOOD LABELLING: A BEFORE-AFTER STUDY

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Background and objectives: Childhood obesity represents a severe public health burden, especially in South American coun-

tries where the highest obesity rates worldwide have been registered. Several governments are trying to fight such epidemic by adopting food labelling interventions aimed at reducing the purchase of caloric-dense food. However, real-world data on effectiveness of such interventions are lacking, in particular in this area. The present study aimed to compare Chilean population knowledge about and attitudes towards food labelling before and after the introduction of the Chilean Law on food labelling and advertising.

Methods: A Computer-Assisted Telephone Interview (CATI) was performed in 2012 and 2016 on a sample of Chilean population, enrolled in 2012, using a stratified random sampling procedure. The questionnaire aimed at investigating subjects' socio-demographic characteristics, attitudes towards nutrition and food labelling, willingness-to-pay an additional fee for detailed labels.

Results: One hundred and sixty-seven subjects were interviewed in both 2012 and 2016. Subjects declared to read usually food labelling, and a significantly higher proportion of subjects (32% in 2016 vs 9% in 2012, p-value 0.003) thought that food labelling is the most effective intervention fighting obesity epidemic introduced so far. Unfortunately, the proportion of subjects who provided a correct definition of GDA (guideline daily amount), "per 100 grams", and "per 100 Kcal", did not improve, along with subjects' willingness to pay (46% of subjects in 2016 stated to be not willing to pay an additional fee for more detailed labels compared to none in 2012, p-value <0.001).

Conclusions: Despite the declared interest by consumers in food labeling, worryingly, consumers' understanding of food labelling did not improve after the introduction of the Law in 2016.

Keywords: Chilean Law, Food labelling, Attitudes

144/1011

PRESENCE OF A RISK POLYMORPHISM FOR OBESITY IN NORTHWEST MEXICO

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Background and objectives: Obesity is an important public health problem due to morbidity and mortality associated to it. There are polymorphisms that may explain, in part, the interaction between obesity and some risk factors. We searched for the presence of FTO SNP rs8050136 and its possible relationship with obesity, diet and metabolic condition, in a cross-sectional study in young-adults from Northwest Mexico.

Methods: Blood samples were collected from 18 young-adults and a fragment of the FTO gene was sequenced, body mass index (BMI) and two-compartment body composition were determined. Dietary intake and physical activity were recorded.

Results: The SNP rs8050136 risk polymorphism (variant A) was found in 33.33% of subjects. Risk carriers were more likely to be obese, they had higher weight (71.97 ± 11.07 vs 60.66 ± 8.39 kg, p = 0.015), Body Mass Index (BMI) (25.57 ± 3.09 vs. 22.65 ± 2.30 kg / M2, p = 0.021) and energy intake (2684.94 ± 689.01 vs 1828.72 ± 343.06 kcal, p = 0.004) compared to no-risk polymorphism. Also variant A carriers showed higher fasting plasma glucose levels (89.66 ± 4.48 vs 84.71 ± 5.45 mg/dL, p=0.036) and tended to have higher triglycerides levels (p=0.093) and lower HDL-cholesterol levels (p=0.059).

Conclusions: Circulating polymorphism SNP rs8050136 of the FTO gene, was found among young-adults from Northwest Mexico (Sonora) and is an important risk factor for obesity.

Keywords: Obesity, Young-adults, FTO, snp rs8050136

144/1015

DEVELOPMENT OF COMPETENCY SCALE FOR HEALTHCARE STAFF WORKING ON NON-COMMUNICABLE DISEASE PREVENTION AND CONTROL IN FIJI

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Background and objectives: This study aimed to develop a scale of competency in healthcare workers for prevention and control of non-communicable diseases in Fiji, and to examine their competency by social factors.

Methods: A cross-sectional survey was conducted with 378 healthcare workers in central Fiji from May to June 2016, and data from 179 complete responses (47.4%) were used for analysis. The survey comprised social factors (sex, age, marital status, academic qualification, ethnic background and religion), working situation factors (facility type, professional qualifications, experience, and location), and competency in 42 items based on previous studies on public health. Exploratory factor analysis was used for competency, and validity and reliability of scale items were assessed using Cronbach's α coefficient, item–total analysis, good–poor analysis, and analysis of variance. The respondents' factor score was compared by social and working situation factors.

Results: Using factor analysis, 16 items were selected to identify four work types of competency: work management, monitoring and evaluation, community partnership, and community diagnosis. The reliability and the validity were confirmed. Ethnic background was related to work management (p = 0.014), monitoring and evaluation (p = 0.002), and community partnership (p = 0.003). Academic qualification was related to monitoring and evaluation (p = 0.026) and community diagnosis (p = 0.004).

Conclusions: We developed a scale of competency for four work types, and found that social factors such as ethnic background and academic qualification were related to the competency. The scale will help healthcare workers to engage in better management of residents with non-communicable diseases in Fiji.

Keywords: Non-communicable diseases, healthcare worker, competency, social factors, Fiji

144/1018

CHANGES IN DIET QUALITY INDEXES AND SUBSEQUENT RISK OF MORTALITY IN THE MULTIETHNIC COHORT

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Background and objectives: Healthy eating patterns assessed by diet quality indexes (DQIs) have been related to longevity. Little is known about the influence of changes in diet quality over time on subsequent risk of mortality. We investigated the associations between changes in 4 DQIs (the Healthy Eating Index 2010, the Alternative Healthy Eating Index 2010, the alternate Mediterranean diet score [aMED], and the Dietary Approaches to Stop Hypertension [DASH] score) and mortality in Multiethnic Cohort Study (MEC).

Methods: We analyzed data from the food frequency questionnaires on changes in the 4 DQIs between the baseline (1993-1996) and the 10-year follow-up (2003-2007) in relation to subsequent mortality among 58,837 participants in the MEC in Hawaii and California. The participants were African American, Native Hawaiian, Japanese American, Latino, and white, aged 45-75 years at baseline, and did not report heart diseases or cancer at either survey. Cox proportional hazards model was used with multivariate adjustment.

Results: During an average of 8.2 years of follow-up after the 10-year survey, 7,480 deaths were identified. Compared with individuals whose DQIs changed minimally, those with the largest increase showed the lowest risk for all-cause mortality (8-14%), while those with the largest decrease had the highest risk of death (14-39%) for all 4 DQIs both in men and women (P's for trend < 0.001, P's for heterogeneity by sex > 0.33). In men and women combined, the associations did not vary by age group (45-54, 55-64, and ≥65 years at baseline, P's for heterogeneity > 0.08) and race/ethnicity (P's for heterogeneity > 0.16). An inverse trend for cardiovascular disease mortality was found with all 4 DQIs (P's for trend < 0.004), whereas for cancer mortality this was only found with aMED and DASH.

Conclusions: Our findings suggest that improving diet quality is related to a reduced risk of mortality and a decline in diet quality is related to an elevated risk of mortality. These relationships seen in older adults imply that it is probably never too late to improve the quality of one's diet to achieve better health.

Keywords: cohort, diet quality index, mortality, multiethnic population

144/1023

ANAEMIA AND IRON DEFICIENCY IN PREGNANT WOMEN LIVING IN AREAS OF LOW AND HIGH IRON IN GROUNDWATER IN BANGLADESH: IMPLICATIONS FOR IRON-FOLIC ACID SUPPLEMENTATION PROGRAMME

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Background and objectives: National Micronutrient Status Survey 2011-12 showed a low prevalence of iron deficiency anaemia (IDA) in reproductive-age women of Bangladesh. It was attributed to drinking water. IFA supplementation during pregnancy has been running in Bangladesh for few decades. Given findings of Micronutrient Status Survey 2011-12, relevancy of this intervention needs investigation. Therefore, the objective of this study was to assess the benefits and/or risks of routine IFA supplementation in pregnant women living in both low and high groundwater iron areas in Bangladesh.

Methods: Pregnant women living in low groundwater iron areas (n = 260) and high groundwater iron areas (n = 262) were given iron (60 mg) and folic acid (400 μg) supplements daily for 3.5 months. Data on socio-demographic, pregnancy-related information and dietary pattern were collected. Blood samples were collected at baseline and at the end the supplementation. Haemoglobin and serum ferritin concentrations were measured at both points.

Results: At baseline, mean haemoglobin and serum ferritin concentrations were significantly higher in women of high groundwater iron areas. However, post-supplementation haemoglobin concentrations in two groups were not different, but mean ferritin concentration was significantly higher in the women of high iron areas. Mean change in haemoglobin in women of low groundwater iron areas was higher than in the women in high iron areas and approached statistical significance (p = 0.052). Mean change in serum ferritin did not differ significantly between the groups. No significant changes were observed in the prevalence of anaemia and iron deficiency in either group, while IDA decreased significantly in the women of low groundwater iron areas. However, a significant proportion of pregnant women in areas of high and low iron in groundwater remained anaemic and iron deficient after IFA supplementation for 3.5 months. The risk of anaemia, iron deficiency and IDA after supplementation did not differ significantly between the groups. None had iron overload.

Conclusions: IFA supplementation significantly increased haemoglobin concentration in pregnant women living in low

groundwater iron areas. Routine supplementation with 60 mg iron and 400 µg folic acid, do not pose any significant risk haemoconcentration or iron overload.

Keywords: Anaemia, iron deficiency, iron deficiency anaemia, pregnant women, Bangladesh

144/1030

THE VITAMIN D STATUS AND ITS RELATIONSHIP WITH SLEEP PATTERN AMONG ADULTS IN SOUTH CHINA

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Background and objectives: Previous studies have suggested that vitamin D may be involved in the regulation of sleep. While, no study focused this issue on Chinese adults. Here we aimed to assess the vitamin D level among adults in South China, and to examine the association between adult's vitamin D level and sleep pattern.

Methods: Cross-sectional data on 1056 subjects aged 20-70 years old in South China were analyzed. Using PSQI questionnaire, we obtained main sleep information. The total score of questionnaire ranged from 0 to 21: the lower the score was, the better the quality of sleep was. And the nap time of subjects were collected according to the answer by the question, "How many days do you have a nap in a week? How long does it takes each time". Total sleep duration was calculated as a sum of the night sleep duration and nap time. Anthropometric parameters, including weight and height, were measured to calculate body mass index (BMI). The concentration of serum 25(OH)D3 was detected by HPLC.

Results: The median of 25(OH)D3 concentration among all of subjects was 20.90 ng/mL, 19.70 ng/mL for male and 22.10 ng/mL for female. The concentration of serum 25 (OH) D3 in male was lower than that in female ($p < 0.0001$). Percentages of Vitamin D deficiency (defined as 25 (OH) D3 concentration < 20 ng/mL) was 47.16% (n = 498). For women, 25(OH)D3 concentration was not correlated with sleep quality, total sleep duration or nap time ($p > 0.05$). For men, the concentration of serum 25(OH)D3 was positively correlated with nap time ($p<0.05$), but not with sleep quality or total sleep duration ($p > 0.05$). After adjusting for age, season and BMI, however, the relationship between nap time and male 25 (OH) D3 concentration disappeared ($p>0.05$).

Conclusions: Our data suggests, in South China, deficiency of vitamin D levels are prevalent, and vitamin D level might not associate with sleep pattern.

Keywords: PSQI, Vitamin D, 25(OH)D3, Sleep pattern

Further collaborators: All phases of this study were supported by research grant from the National Nature Science Foundation of China (No.81472976).

144/1045

DIETARY-LIFESTYLE PATTERNS IN YOUNG MEN: A CROSS-SECTIONAL STUDY (MEDISH PROJECT)

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Background and objectives: Although some evidence that dietary and lifestyle behaviours may cluster together exist [1], not much is known about the coexistence of different dietary and lifestyle behaviours in a population of young men. Objective: to identify dietary-lifestyle patterns in young men.

Methods: In all, 235 men 19-40 years old participated in the study. Food frequency method was applied. Dietary and lifestyle characteristics were collected using food frequency questionnaire (KomPAN) [2]. To identify dietary-lifestyle patterns 31 standardised variables were included in Principal Component Analysis: 25 dietary characteristics and 6 lifestyle characteristics.

Results: Four dietary-lifestyle patterns were found explaining 34% of variance (14%,8%,6%,6%). 'Guidelines followers' were characterised by frequent consumption of eggs (factor loading 0.67), groats, oats wholegrain pasta (0.62), poultry (0.59), white rice, pasta, fine groats (0.58), vegetables (0.45), fish (0.45), beans and sprouts (0.43), fruit (0.41), higher number of meals/day (0.55) and leisure-time physical activity (0.54). 'Western diet–active workers' were characterised by frequent consumption of tinned meat (0.49), butter (0.48), red meat (0.47), fried foods (0.46), white bread (0.44), lard (0.42), sweetened beverages (0.37), cheese and processed cheese (0.33), sweets (0.33) and work-time physical activity (0.41). 'Dairy and plant eaters' were characterised by frequent consumption of fermented dairy products (0.59), cheese curd (0.58), milk (0.51), fruit (0.49), wholegrain bread (0.47), vegetables (0.42) and butter (0.32). 'Convenient foods and stimulation seekers' were characterised by frequent consumption of energy drinks (0.55), alcohol (0.46), sweetened beverages (0.41), meat, sausages, frankfurters (0.40), fast foods (0.30) and current and past smoking (0.69 and 0.59, respectively).

Conclusions: Two patterns, among four identified, clustered both: dietary and lifestyle behaviours. Only one pattern was consistent with nutritional and physical activity recommendations. Two dietary-lifestyle patterns were clearly unhealthy. One unhealthy pattern clustered work-related activity with western diet, and another: fast foods consumption with stimulants. In prevention programs, focus should be laid on blue-collar workers and stimulants' users.

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144/1049

DIETARY CARBOHYDRATES: A REVIEW OF INTERNATIONAL RECOMMENDATIONS AND THE METHODS USED TO DERIVE THEM

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Background and objectives: Renewed dietary recommendations for carbohydrates have recently been published by various international health authorities. The present work 1) reviews the methods and processes (systematic approach/review, inclusion of public consultation) used to identify, select and grade the evidence underpinning the recommendations, particularly for total carbohydrate (CHO), fibre and sugar consumption, and 2) examines the extent to which variation in the methods and processes applied relates to any differences in the final recommendations.

Methods: A search of WHO, US, Canada, Australia and European sources identified 13 authoritative documents with the desired detailed information. Processes and methods applied to derive recommendations were compiled and compared.

Results: 1) A relatively high total CHO and fibre intake and limited intake of (added or free) sugars are generally recommended. 2) Even where recommendations are similar, the specific justifications for quantitative/qualitative recommendations sometimes differ across authorities. 3) Differences in recommendations mainly arise from differences in the underlying definitions of CHO exposure and classifications, the degree to which specific CHO-providing foods and food components were considered, and the choice and number of health outcomes selected. 4) Differences in the selection of source material, time frames or data aggregation and grading methods appeared to have minor influence.

Conclusions: Despite general consistency, apparent differences among the recommendations of different authorities would likely be minimized by: 1) More explicit quantitative justifications for numerical recommendations and communication of uncertainty, and 2) greater international harmonization, particularly in the underlying definitions of exposures and range of relevant nutrition-related outcomes.

144/1060

NUTRIENT PATTERNS WITH HYPERTENSION AND THEIR ASSOCIATIONS TO SOCIO ECONOMIC VARIABLES AND OBESITY IN TRIBAL POPULATION OF ADULTS IN INDIA

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Background and objectives: Tribal people constitute 8.6% of the nation's total population, over 104 million people according to the 2011 census. The Objective of the study was to identify nutrient patterns and how they associate with socio-demographic,

and body mass index, WHR and hypertension with nutrient patterns in tribal adults in India.

Methods: A total of 4965 men and 7612 women (≥ 20 year of age) in the selected households were covered for various investigations. Nutrients were calculated from 24hr recall diet survey. Factor Analysis was applied to study the nutrient patterns. Multiple linear regression models were fitted and computed respectively for each of the retained factor scores on socio-demographic and obesity variables. Prevalence of hypertension was calculated and associations with nutrient patterns by logistic regression.

Results: Three nutrient patterns explaining 69% of the total variance were identified in both genders: First factor explained 28% of variation by protein & fat; Second factor (24%) by B vitamins, thiamine and niacin; 3rd factor (17%) by Vitamin A & C nutrients. Nutrient patterns were significantly associated with various obesity variables. Prevalence of hypertension was 23.5% and 20.6% respectively for men and women. Hypertension was inversely associated with 1st component and positively related with 3rd component after adjusting confounding variables of obesity, age and socio economic variables.

Conclusions: Three components namely macro nutrients, B vitamins and Vitamins A & C were explained 69% of total variance. Nutrient patterns were significantly associated with obesity variables. Also hypertension was associated with nutrient patterns.

Keywords: Nutrient Pattern, Factor Analysis, Hypertension, Obesity , B Vitamins

144/1061

PREVALENCE OF LOW BIRTH WEIGHT IN DHAKA CITY AND ITS ASSOCIATION WITH MOTHER'S AGE

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Background and objectives: Low birth weight (LBW) is a major risk factor for perinatal and infant mortality. In Bangladesh, LBW rate was 36% in 2004. Due to lack of information, estimating the current birth weight situation was necessary. The study was conducted to estimate the current rate of low birth weight in Urban Dhaka and to observe its association with mother's age.

Methods: This was a cross- sectional study, carried out at six government and non-government hospitals in Dhaka city. Birth weight of seven hundred and thirty six babies born from 2014-2016 was taken from the databases of the selected hospitals in Dhaka City. Information on Mother's age, father's occupation was also taken from mothers of new born babies who were present during data collection.

Results: The prevalence of LBW was 30.2%. The mean birth weight was 2.65kg. About 16% of the mothers were adolescent (≤19 years), 82% were between 20-35 years and only 2% was above 35 years. Among the adolescent mothers, the LBW rate was 41%, mothers aged from 20 to 35 years, the percentage was 28 and mothers aged ≥36 years the rate was 27%. There was a significant association between mother's age and birth weight (p value=0.020). A linear co-relationship has been found between mother's age and birth weight. The LBW rate was 14%, 19% and 35% whose fathers were businessmen, service holder and day laborer, respectively (p value=0.046). About two third of the samples were taken from government facilities having LBW of 38% while the rest one third were taken from non-government facilities having LBW rate of 17%.

Conclusions: The results of the study indicated that at least three children in every ten live births are born with low birth weight in urban Dhaka per day. The teenage mothers experienced significantly more low birth weight babies than adult mothers. The findings of the study will help to initiate preventive programs and to develop public health nutrition interventions to reduce low birth weight.

Keywords: Low birth weight, preterm birth, IUGR, mother's age, Dhaka City.

144/1063

TYPOLOGY OF FOOD CONSUMPTION AND ITS ASSOCIATION WITH CALCIUM AND PHOSPHORUS METABOLISM AMONG MOROCCAN WOMEN

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Background and objectives: The Moroccan diet, characterized as a Mediterranean regime, has accused a decline in his nutritional quality which affects the health of Moroccan individual particularly the health of the musculoskeletal system. The objective of this study is to describe the typology of food consumption among Moroccan women in Meknes region and to highlight the association between these food profiles and the biological concentration of calcium and phosphorus metabolism.

Methods: We enrolled 116 women from a randomized sample. No exclusion criteria have been retained in order to ensure the representativeness of the sample. The data focused on sociodemographic parameters, sun exposure during a week ("less versus

more" than 15 minutes per week), and food frequency questionnaire divided into nine items. A fasting blood sample was made in order to characterize the concentration of : calcium, phosphorus and 25 hydroxyvitamin D (25OHD). Sun exposure was used as an adjustment factor. Factor analysis (FA) described the typology of food consumption. The association between the calcium and phosphorus metabolism and the sun-adjusted dietary profiles was assessed. The sun-adjusted multiple linear regression model (SAMLRM) was used to identify the food items associated with calcium-phosphorus parameters.

Results: The mean age was 50.1 ± 15.3 years. The FA made a state of two profiles: one based on vegetable consumption and the other on animal consumption. The adjusted-food vegetable profile was associated with phosphorus ($p=0.09$) however, the adjusted food animal profile was associated with calcium($p<0.001$) and 25OHD ($p<0.001$). The SAMLRM showed that item of oilseeds was associated with the concentration of calcium, phosphorus, and 25OHD ($p<0.001$).The frequency intake of fruits & vegetable item and fishes item was different depending on personal income ($p=0.002$) and marital status ($p=0.05$).

Conclusions: The typology of food consumption among Moroccan women in Meknes region was split into two profiles one focusing on vegetable diet and the other on animal diet. Each sun-adjusted food profile was differently associated with calcium and phosphorus metabolism.

Keywords: Food, Calcium, Phosphorus, Women, Morocco

144/1066

MULTISECTORAL ACTION TO IMPROVE NUTRITION IN BANGGAI DISTRICT, INDONESIA

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Background and objectives: Implementation of the Scaling Up Nutrition program requires strong commitment from local leaders and multisectoral action. The present study's objectives were to show evidence of how a multisectoral approach was implemented and to determine whether this approach affected indicators related to the nutrition-sensitive intervention.

Methods: We interviewed and collected data from the key informants at the departments and organizations serving as stakeholders for the multisectoral approach, such as the district's irrigation, social, health, family planning, planning and development, agriculture and horticulture, and food security offices. We analyzed the data by examining the results after both the first year (2015) and the second year (2016) of implementation.

Results: Multisectoral action was started in the beginning of 2015. All stakeholders received information about the importance of nutrition in the first 1,000 days of life and the role of multisectoral approach from seminars, discussions, posters, and leaflets. Two regulations were produced, and a task force was established to coordinate implementation. After two years, we found that clean water coverage increased, from 81.8% in 2015 to 83.4% in 2016; that the percentage of households using latrines increased from 66.8% to 71.8%; that the median age for the first marriage for women has increased from 21 to 25; that the percentage of women using contraception increased from 62% to 65%; that the percentage of poor people with insurance increased from 39% to 51%; and that the percentage of poor people decreased from 9.84% to 9.48%.

Conclusions: Commitment from local leaders has been earned, and indicators related to the nutrition-sensitive intervention have shown increases. However, analysis of nutrition-specific indicators is needed.

Keywords: Multisector, nutrition, nutrition-sensitive intervention

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144/1070

INTEGRATING NUTRITION SERVICES INTO THE MATERNAL, NEWBORN, CHILD HEALTH AND FAMILY PLANNING SERVICES IN RURAL BANGLADESH: SUCCESSES AND CHALLENGES

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Background and objectives: Attention has increasingly focused on mainstreaming nutrition services in public health programs at different levels, when 14% children <5 years of age are wasted and 33% are underweight in Bangladesh. National Nutrition Services (NNS) of Ministry of Health and Family Welfare and USAID's MaMoni Health Systems Strengthening (MaMoni HSS)

project supports integrated nutrition service delivery through existing maternal, newborn, child health and family planning (MNCH/FP) platforms within the district health system. Aim of this analysis is to understand the contributions of these interventions using DHIS2 data.

Methods: Building on existing MNCH/FP services from community to district levels, NNS and MaMoni HSS collaborated to strengthen integrated delivery of nutrition interventions in four low performing districts. This joint effort supported competency based training of all government service providers followed by regular GMP for early case screening and referral at every contact and set up "malnutrition corner' at referral facilities equipped to manage SAM children. The project also institutionalized Joint Supervision Visits (JSV), strengthened record keeping, reporting and use of information for regular performance review.

Results: Implementation districts show progress on case screening and referral over the last two years. The integration helped to reach 388,017 children (about 50% of total) to access GMP services between January 2015 and December 2016. As a result, 9,624 children (2.5%) with MAM were identified to receive food based IYCF counseling and all 2,352 (0.6%) children with SAM referred for in-patient care. Only 352 SAM cases admitted to in-patient and managed under existing facility based SAM care protocol that observed very low cure rate (20%) and high defaulter rate (75%).

Conclusions: Integration of nutrition interventions into existing MNCH/FP platforms helped leveraging all opportunities to screen a large number of children under 5 years with undernutrition. Immediate attention is crucial to ensure implementation of CMAM in Bangladesh including to improve service readiness, quality and so treatment outcome within the existing program.

Keywords: Wasting, health-systems, integration, community, Bangladesh.

NUTRITION INTERVENTION MAKING A DIFFERENCE: ASSESSMENT OF THE IMPACT OF A FEEDING PROGRAMME ON THE NUTRITIONAL STATUS OF PRE-SCHOOL CHILDREN IN GAUTENG PROVINCE, SOUTH AFRICA

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Background and objectives: Feeding programmes are interventions that offer meals at schools with the aim of improving short-term hunger and the nutritional status of the children (Kearney 2009:6). Effective feeding interventions alleviate micro-nutrient, vitamin and mineral deficiencies that have a negative effect on growth and development during childhood (Kounnavong et al. 2011:5).

The purpose of this paper is to report on the impact of a feeding programme on the nutritional status of pre-school children from in Evaton West, Gauteng Province, South Africa.

Methods: A cross-sectional survey and descriptive design was used to conduct the study. Nutritional status data was collected from of 100 randomly selected children attending pre-school in Evaton West. Three pre-schools were purposively selected from the area. Four techniques were used for pre and post data collection, namely; dietary intake questionnaire, anthropometric measurements and hemocue. Anthropometric measurements included weight; height and mid-upper-arm-circumference (MUAC) were used to assess the nutritional status. A Hemocue was used to assess haemoglobin levels.

Results: During the follow-up study, 37 children dropped out from the study. Malnutrition is still prevalence at baseline; stunting (20.7%), wasting (12.7%) underweight (1.6%) and overweight 7.0%. Improvement was observed after the intervention, whereby 17.4%, 3.2%, 6.4%, 6.9% and 2.1% respectively. The mean±SD for MUAC measurements of the pre-school children was 15.89±1.29 cm and after and 15.97± 1.35cm. These results indicated that more than 95 percent of the children were normal and less than 5 percent were moderately malnourished before and after the intervention. The mean±SD serum Hb levels were normal, however, IDA was observed in 12 percent of the participants and after the intervention, the percentage increased to 20 percent.

Conclusions: Few statistically significant differences were observed with regard to nutritional status and IDA, however positive changes were observed, indicating that food provision may have a positive impact on an impoverished and malnourished community.

Keywords: Pre-school children, nutritional and biochemical status, feeding programme

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EARLY INTRODUCTION OF FOOD AND FLUIDS FOR HEALTHY INFANTS IN 6 MONTHS OF FOLLOW-UP

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Background and objectives: Complementary feeding before six months of age are associated with detriment on health of mother and child . Modifiable determinants of early introduction of foods into an infant diet within the six first months of life warrant further investigation in Brazil. To examine determinants of timing and type of additional food on the zero to six months old infants' diet.

Methods: In a prospective cohort design, 656 pairs of 0- to 6-month-old children and mother were selected from June/2015

to January/2016 in the public health neonatal service, covering 80% of the population of Botucatu, in Brazil. Sociodemographic, biological, health status information were documented at the baseline. Mothers were inquired over the introduction of 48 food items into an infant's diet (e.g. water, tea, non-maternal milk, cereal, vegetables, fruits, etc). The age of the introduction of tree foods groups - non-maternal milk, fluids, and solid/semi-solid foods- were classified into: before 2-months-old, two to four-months-old, and four to six-months-old. The median age when these

food groups were introduced into an infant's diet was assessed using Kaplan-Meier survival curve for the entire population and per income, education, mother's working status, delivery mode, and the pacifier use as determinants of early introduction of foods into diet. The log-rank test was used to compare the survival distributions.

Results: From 656, 595 children completed the 6-months of follow-up. Of this, 80.5% initiated the use of non-maternal milk at 90 days-old (median), 99.7% initiated fluids at 120 days-old (median), and 97.5% initiated solid/semi-solid foods at 135 days-old (median). 33.9% of the study participants added non-maternal milk and 20.8% added fluids foods into an infant's diet before the 2-months of age. Between 2- and 4-months of age, 40.9% of infants had eaten solid or semi-solid foods. Introduction of non-maternal milk happened 30 days earlier for Infants who used pacifier than non-users (p=0,0001) and 15 days earlier for

infants from cesarean (p=0,007).

Conclusions: Modifiable determinants such as cesarean and the pacifier use influenced early introduction of complementary foods into infants' diet before 6-months-old, indicating nutritional vulnerability that demands intervention in public health service.

Keywords: Breastfeeding, infant diet, complementary feeding, survival curve.

144/1121

NUTRITIONAL STATUS IN CHILDREN FROM 1 TO 19 YEARS OLD IN BULGARIA AND RELATION OF SOME RISK FACTORS

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Background and objectives: Nutritional status of children has an impact on their health and development and it is important to identify the problems and associated risk factors for adequate interventions.

The aim of this study is to evaluate the prevalence of underweight, overweight and obesity and and relation of some risk factors in children from 1 to 19 years of age.

Methods: Cross-sectional study on dietary intake and nutritional status of a representative sample of 991 children aged

1-18 years was conducted in 2014. Height and weight of all children were measured. International anthropometric indices and standards were used for assessment of children's nutritional status (WHO Child Growth Standards, 2006 for children from 1 to 5 years old and WHO Growth Reference, 2007 for children 5-18 years old). The relationship between anthropometric status of children and breastfeeding of children, as well as basic socio-economic factors were investigated.

Results: The underweight prevalence in children from 1 to 5 years old (Weight-for-age <-2Z) was 1.9% and for children 5-18 years was 1.6%. Stunting (Height-for-age<-2Z) was determined in 7.0% of children from 1 to 5 years and 2,3% of children aged 5-18 years. Rate of stunting was the highest in boys from 1 to 3 years old – 21,4%. Overweight among children from 1 to 5 was 8,3% (Body-mass-index-for-age>+2Z), but in children aged 5-18 years (BMI-for-age>+1Z) it was 30,1%. Obesity were respectively 5,1% (BMI-for-age>+3Z), and 10,3% (BMI-for-age>+2Z). The highest frequency was identified among boys aged 10-13 years (46,2% overweight, 19,8% obesity). Higher prevalence of overweight in children from 1 to 19 years old with mothers with lower education, lower employment status and single mothers was revealed, but statistically significant differences wasn't established (p>0.05). Breastfeeding of infants was related to lower rate of overweight in children from 1 to 5 years old (p<0.05).

Conclusions: The study revealed relationship between overweight/obesity among children and some risk factors. Social-economic factors didn't influence the problems in child growth in Bulgaria.

Keywords: children, obesity, risk factors

144/1126

THE IMPACT OF COMMUNITY VOLUNTEER ACTIONS ON CHILD NUTRITION

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Background and objectives: Despite the age long tradition of involving Community-based volunteers in nutrition and health service delivery as a primary health care concept, gaps exist in literature on the impact of their actions on various service outcomes. The study aimed at assessing the effect of volunteer actions on addressing childhood malnutrition in the KEEA Municipality.

Methods: Using a quasi-experimental study design, a pre- and post- surveys were conducted within a period of 9 months for two groups (intervention and control). Six intervention communities of three sub-districts in the KEEA- Municipality where community-based volunteers administer nutrition services for children

under age two and three control communities (one from each selected sub-district) without community health volunteers were involved in this study. Data on socio-demographic and cultural factors, child nutrition, mother/caregiver infant and child feeding and care knowledge and practice and factors sustaining volunteerism were collected from beneficiary mothers with children under age two years, community leaders and programme implementers by mixed methods.

Results: A total of 308 and 282 mother-child pairs were assessed at baseline and endline respectively. The interventions and controls were comparable in various characteristics except for formal education which intervention mothers had significantly higher proportion of mothers with formal education (83.8%) compared to controls (73.1%). No significant variations were observed in prevalence of child under two malnutrition comparing the intervention to controls both at baseline and endline. The utilisation of nutrition services generally was high among communities with volunteers. Both groups recorded significantly lower maternal/caregiver knowledge scores at endline however, the mean change in knowledge scores were not significantly different comparing the two groups. Continuous breastfeeding (for children after 6 months old) frequency at endline was significantly high for intervention groups (94.5%) compared to the controls (85.5%).

Conclusions: Community volunteer activities had no direct impact on child nutrition outcomes however, engaging community volunteers in nutrition service delivery has the potential improving the utilisation of child nutrition services.

Keywords: Community-based, volunteers, child nutrition, impact

144/1146

HOUSEHOLD-BASED NUTRITION SURVEILLANCE SYSTEM IS AN ESSENTIAL INSTRUMENT FOR MONITORING EFFORT TO ACCELERATING SCALING-UP NUTRITION IN INDONESIA

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Background and objectives: Household-based nutrition surveillance is an essential instrument for detection of nutrition and nutrition-related issues that can accelerate implementation of the policy and intervention programs of scaling-up of nutrition. Objective: to develop sentinel Household-based nutrition surveillance on Posyandu (integrated post unit) to ensure availability of periodic data as the target of interventions, and monitoring effort of nutrition management program

Methods: Through a process of review (literature, programs and expert panels), workshops, and roundtable taskforce and after field trials, then formulated a model-based sentinel survailanse family with three guides, the operational model of the field, indicators and measurement instruments and data management. This surveillance will to Ensure availability of periodic records: by characteristics of the family, by names, by the addresses as the targets of interventions, and monitoring effort of nutrition management program

Results: Basic data of 8 posyandu development region HH sentinel surveillance of basic data obtained in 1538 families with 6114 individuals, which periodically updates and monitoring is done periodically. Where the family data every 1 year, every 6 months the individual data and measurement data every three months. Monitoring is carried out by students of nutrition s1 Hasanuddin university where every student watching the 30-40 families. Results: **Conclusions:** The role of HH nutritional surveillance in detecting trends of nutritional problems and predicting their risks has become more important as its strong scientifically based method and evidences may provide insights on addresse to accelerate scaling-up nutrition

Keywords: Household-based; nutrition surveillance; scaling-up nutrition

144/1155

FACTORS ASSOCIATED WITH ANOREXIA IN SCHOOLED ADOLESCENTS IN MOROCCO: FEZ CITY REGION

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Background and objectives: Anorexia is an eating disorder (ED) that mainly affects adolescents.The objective was to estimate the prevalence of anorexia and to identify the factors associated with this disorder.

Methods: A cross-sectional study on a representative sample of 367 students from colleges and high schools degree both from the public and private. A self-questionnaire with items on socio-demographic characteristics and lifestyle and food was administered. The screening of ED was made using a specific Eating Attitudes Test (EAT-26). Depressive disorders were assessed by the Hospital scale Anxiety and Depression (HAD). Anthropometric measurements were carried out in a standard manner in all adolescents.

Results: The mean age was 15.58 ± 2.01 years with the range of [12-19]. The mean body mass index (BMI) was 19.99 ± 2.47. The sex ratio M/F =0.94. The prevalence of anorexia was 10.1%, this prevalence is higher among girls than boys (70.3% vs 29.7%, p <0.015). The depression HAD score was positive in 43.2% of adolescents with anorexia versus 15.1 % in students without anorexia (p <0.000). Anorexia is higher in students with normal BMI (67.6%) compared to those with underweight and overweight (16.2%, p <0.000). The diet was the most widely used method of weight control in adolescents with anorexia (48.5%, p <0.000).

Conclusions: Anorexia is a frequent public health problem in our context, where from the necessity of undertaking preventive measures of this pathology.

Keywords: Adolescent, anorexia, prevalence, depression, Fez.

144/1157

RISK FACTORS FOR HEALTH OF CHILDREN AGED 1-6 YEARS

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Background and objectives: National program for prevention of chronic non-communicable diseases has been launched in 2014 in Bulgaria. The main objective of the program is to improve public health and to enhance quality of life by reducing premature mortality, morbidity and disability. National survey of risk factors for health among the population has been conducted under the program (smoking, drinking alcohol, low physical activity, unhealthy diet) which are causes for the development of chronic non-communicable diseases.

The aim is to examine the level of the leading risk factors for health-related lifestyle of the population.

Methods: A cross-sectional study of a representative sample of 307 children aged 1-6 years and their mothers is carried out. The study included direct face-to-face interviews with the mother of each child tested. Major risk factors were studied, which are related to pregnancy, periods of breastfeeding, complementary feeding and socio-economical status.

Results: In families with two parents who have entered into an official marriage or de facto marital cohabitation live 93% of the children; The percentage of mothers with secondary (22.6%) or higher (68.2%) education is relatively high.

The proportion of mothers with low weight before pregnancy is 4%, and 12.3% of the mothers are overweight, 4% of mothers have inadequate weight gain during pregnancy; A relatively small proportion of women consumed alcohol during pregnancy (7.3%); 11.1% of the mothers smoked during pregnancy.

The rate of children that were breast-fed in the first days after birth is 86.3%. Only 9.9% were breast-fed during their first hour; 21.7% of the infants were at exclusive breast-feeding. Up to 1 month were breast-fed 13.6%, up to 2 months – 10.5%, up to 6 months – 7.4%. A positive trend for breastfeeding beyond 6 months is observed in 44% of children. Early inclusion of fruit juices is observed in 87.3% of infants up to 6 months of age.

Conclusions: National study of risk factors for health among children aged 1-6 years, provide reliable information on the prevalence of major risk factors, leading to the development of chronic non-communicable diseases in later life.

Keywords: children, risk factors, survey

144/1158

NUTRITION POLICY: A NEW PUBLIC ACTION MODEL

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Background and objectives: French National Nutrition and Health Program (PNNS) was implemented in 2001 succeeding many years of separated policy acts. This study analyses how the French government acts and changes to take action on nutrition issue which challenges its traditional intervention strategies. Are the existing traditional regulation strategies adequate or is it necessary to develop other regulation modalities? The study aims to understand the specificity of government action concerning nutrition and how it could constitute a new model for public action.

Methods: This empirical research adopts a qualitative approach through the lens of policy instruments. The method applied is longitudinal study (Pettigrew, 1990). Data was gathered through 40 semi-structured recorded and transcribed interviews with public and private players involved in food policy and agrifood sectors, through observation, original written and audio sources and specialized literature. This material was collected between 2007 and 2015. Data was analyzed using table structures for organizing, comparing and ranking.

Results: This work demonstrates the emergence of a new original regulation model based on state intervention on food demand and supply. It combines innovative policy instruments (eg. new type of voluntary agreements) with traditional ones in a particular complementary arrangement which we qualified as "discrete coupling of food supply and demand".

By coupling supply and demand in a non-directive way, the state tries to discreetly transform : i) food firms, which invest in developing new skills and capacities of innovation, ii) its food products, which become healthier iii) consumers, who adopt dietary guidelines and new lifestyles. The stake of this long term process is that supply and demand meet in a more desirable position.

We show that policy intervention on nutrition : i) cannot be reduced to the alignment of practices of demand and supply, ii) must allow state to build a frame of legitimacy for its actions, iii)

must consider the offer and supply network and their interactions and iv) time necessary to allow behavior changes.

Conclusions: This new model constitutes a new theory for contemporary state action. It allows economic growth with purpose which goes far beyond economic benefit and which produces a common good, improving individual and collective welfare.

Keywords: Nutrition policy, common good, voluntary agreement, public action, discrete coupling

144/1164
RISK FACTOR INFLUENCING FOOD SECURITY OF THE CHILDREN DURING FLOOD DISASTER

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Background and objectives: Food security is when all people at all times have access to adequate, safe, healthy food to sustain a healthy and active life. Food security in children expressed that the children have adequate food daily and have a normal growth development without suffering any malnutrition. During flood situation, the food security and insecurity may happen to children due to the unavoided risk factor. Bera, Pahang had been selected as the area of research as it was one of the most severe flooding districts in December 2014. In this study, the risk factor of food security faced by children during the flood disaster are being identified. Secondly is the nutritional status of the respected informant are evaluated by using the anthropometry data.

Methods: The methodologies used are observation and interview with the respected victims to collect further information and opinion regarding the flood disaster. The selected informant consist of five female and four male from a different village. The post-flood questionnaires are being used to guide the responds from the informant. The data collected are being analysed by using thematic analysis to determine the risk factor of food security associated with children.

Results: Findings showed that food supply, food choice and food intolerance might play as a vital part in food security during flood disaster. Children who move to the relocation centre said that they eat less quantity of food during flood due to the repeated menu being cooked everyday. Even though, they may eat less quantity of food than normal, their nutritional status after the flood disaster such as weight and height only had minimal differences as compared to the control subject.Most of them didn't lose any weight during and after the flood.

Conclusions: In conclusion, even though there are risk factors associated with the food security, the effect on their nutritional status such as weight and height are minimal.

Keywords: Risk factor; Children; Flood disaster; Food security

144/1181
COVERAGE OF FOOD INTAKE ASSESSMENT IN THE BRAZILIAN FOOD AND NUTRITION SURVEILLANCE SYSTEM: 2008 AND 2013

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Background and objectives: The Food and Nutrition Surveillance System continuously provide data on nutritional status and food intake of the population attended by the Primary Healthcare services for the formulation of actions, programs and policies. This study aims to describe and analyze the coverage of the assessment of the food intake of the users of the public health services registered on this System between 2008 and 2013.

Methods: This is an ecological study. The population registered on the System is described according to federation units, macro-regions and/or life stages. The indicators used were: percentage of registration and use and coverage. The analyses were performed using descriptive statistics, linear regression models and Spearman's correlation.

Results: More the 99% of municipalities presented at least one individual registered and the percentage of utilization varied from 19.39% in 2008 to 32.5% in 2013. The national coverage ranged from 0.13% to 0.41%, with a statistically significant trend of increase. The Center-West region had the highest regional coverage. All life stages presented statistically significant trends of increase in the coverage, especially children and pregnant women. The presence of nutritionists remained close to the statistical significance threshold.

Conclusions: Despite the continuity of the collection of these indicators, the assessment of food consumption as a food and nutritional surveillance dimension was incipient and little-lined in Brazilian municipalities.

Keywords: Nutrition Programs and Policies; Nutritional Surveillance; State Health Care Coverage.

144/1182

THE CONSUMPTION OF ULTRA-PROCESSED FOODS AND THE OVERALL NUTRITIONAL QUALITY OF DIETS IN THE UK

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Background and objectives: Population-based studies conducted in the United States, Brazil, and Canada suggest an inverse relationship between the dietary share of ultra-processed foods, as defined by NOVA classification, and the overall dietary nutritional quality. This study aimed to describe food intake in UK according to NOVA classification and the association between the dietary share of ultra-processed foods and the dietary nutritional profile.

Methods: Data from cross-sectional UK National Diet and Nutrition Survey (2008–12) were evaluated. Dietary information was collected using four-day, unweighted, food-diaries. Total energy intake and percentage provided by each of the NOVA food groups as well as the average nutrient content of the overall diet across quintiles of dietary share of ultra-processed foods.

Results: The average energy intake was 1,790.52 kcal/day, 56.8% of calories coming from ultra-processed foods, 30% from natural or minimally processed foods, 9.1% from processed foods, and 4.1% from processed culinary ingredients. As the ultra-processed food consumption increased, the dietary content in carbohydrates, free sugars, total fat, saturated fat, and sodium increased significantly. Most important was the difference in free sugars content which increased by 51% (from 10.1 to 15.2% of total energy) from the first to the last quintile. Protein content and fibre and potassium densities decreased significantly as the dietary share of ultra-processed foods increased. Particularly relevant was the decrease across quintiles in protein from 17.3 to 13.9% of total energy from the first to the last quintile (p<0.05).

Conclusions: These results are consistent with previous findings from other countries suggesting that decreasing the dietary share of ultra-processed foods may improve substantially the nutritional quality of diets.

Keywords: Food processing; ultra-processed; diet quality; dietary intake; UK.

144/1189

COMPARISON OF CONSUMERS' OPINIONS FOR GENETICALLY MODIFIED ORGANISM (GMO)

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Background and objectives: The food label policy for Genetically Modified Organism (GMO) products is different in Japan and USA. In the USA, GMO ingredients are allowed to be used for food products. However, in Japan food using the GMO ingredients are prohibited with the exception of 8 items and 7 additives. Japanese consumers do not accept GMO containing food and normally do not buy these foods and they discard them if they learn that they have GMO which leads to food waste. The same could be true in the USA, consumers do not accept GMO food that can increase the food waste as well. The purpose of this study, therefore, was to investigate and to compare consumers' opinions for GMO in Japan and the USA.

Methods: Questionnaire survey were administrated among 123 students at Montclair State University. In Japan, the government have conducted the questionnaires on "The opinion for GMO and biotechnology" to 500 Japanese peoples. Additional questionnaires were conducted among of employees of the supermarket in Japan.

Results: The opinion for GMO is different in these two countries. Fifty one percent (51%) of Japanese and 7% of the supermarket employees had negative image of GMO. It was also observed the majority of people (64%), were not satisfy with the information about GMO labeling in Japan. When the question about the non -GMO food label, was asked, 73% of supermarket employees preferred and bought the non-GMO labeled foods. Furthermore, when it was asked, "Do you prefer to purchase the following food items with a non-GMO label? thirty three percent (33%) answered for daily foods, 28% for vegetable and fruits. Majority of Japanese (73%) request for the certification of non-GMO on the food label. It is important to explore the optimum labeling policy of non-GMO foods in order the consumers have correct information about the food they are purchasing.

Conclusions: The food label policy and education regarding GMO food is inadequate in Japan. It is desired that consumers and employees in food supermarket be educated so can convey the correct information to consumers.

Keywords: Genetically Modified Organism, Consumer Behavior, Food Label, Food Waste, Supermarket

144/1206

ASSESSING THE RETAIL FOOD ENVIRONMENT IN CANADA: PROCESS, PROGRESS, AND PRACTICAL IMPLICATIONS

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Background and objectives: Canada's retail food environment is an important setting for population dietary health and equity, since 70 cents of every food dollar is spent in food stores, and this proportion increases with decreasing household income. The objective of this presentation is to share the process, progress to date, and practical implications of assessing the retail food environment in Canada using a standard assessment tool.

Methods: A brief history of retail food environments research in Canada will be described, and findings will be synthesized and compared with international research. The process of developing a Canadian retail food environment assessment manual, and international partnerships to advance the retail food environments research agenda will be discussed. Practical implications for the fields of public health nutrition and for urban plan planning will be summarized in terms of research, policy and practice.

Results: In 2015, Canada's first Food Environments Symposium was hosted by researchers in partnership with Canada's federal Office of Nutrition Policy and Promotion. Canadian retail food environments researchers came together to present new information and methods, to network, and to build consensus around future directions. With support from the Office of Nutrition Policy and Promotion, a Canadian retail food environment assessment manual was created, and is currently being pilot tested by several urban, rural, and remote Canadian communities. New connections between Canadian researchers and the INFORMAS network have the potential to take existing local, provincial, and national research partnerships in Canada to an international scale. Future research will examine time-space food environment exposures in epidemiological research, future municipal policy will consider zoning and other urban planning approaches to create health-promoting retail food environments, and future practice should include capacity building for community food environment assessment within diverse Canadian contexts.

Conclusions: The field of retail food environments research in Canada is relatively new. Momentum at the local, provincial, and national scale has been building, and there is great potential for long-term, practical application of research findings to municipal policy, and to public health and urban planning practice. Embedding the Canadian research within the INFORMAS network will encourage best practices in food environment research, surveillance, and monitoring.

Keywords: food environment; partnerships; public health nutrition; surveillance; monitoring

144/1207

EATING OUT: FREQUENCY OF EATING FOODS PREPARED AWAY FROM HOME AND ASSOCIATIONS WITH DIETARY AND WEIGHT OUTCOMES IN A POPULATION-BASED SAMPLE FROM ONTARIO, CANADA

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Background and objectives: Eating foods prepared away from home is a growing trend in Canada, and has implications for long-term health. The types of restaurants and other sources of prepared foods where people usually go can influence their overall diet quality and health. This study will describe the frequency with which Waterloo Region residents eat out, reasons for choosing different outlet types, and the extent to which eating out is associated with diet quality, fruit and vegetable intake, and weight outcomes.

Methods: A stratified random sample of households in Waterloo Region, Ontario, Canada, were recruited in 2009/2010 to participate in the NEWPATH study. Data from 2223 household (n=4102 individuals over 10 years of age) were used to examine associations between participants' frequency of eating out and dietary- and weight-related outcomes using generalized linear models to account for the nested structure of the data. All analyses accounted for participants' age, sex, education level, and household income.

Results: About 30% of residents ate at a fast food restaurant at least once per week. Almost half (49%) ate at a coffee shop and 18% ate at a sit-down restaurant at least once per week. The most popular reasons for people patronizing fast food outlets were: 1) a lack of time to prepare food, 2) convenience (easy to get to), and 3) the taste of the food. Diet quality and fruit and vegetable consumption were poorer among those who frequently patronized fast food outlets compared to those who did not. People who frequently patronized fast food outlets and coffee shops had significantly higher BMI and waist circumference than those who did not.

Conclusions: Dietary and weight outcomes vary significantly by participants' eating-out behaviours. Fast food outlets and coffee shops might be especially relevant settings for health promotion interventions, which should consider 1) convenience (in terms of proximity and time), and 2) taste of the food.

Keywords: restaurants; public health nutrition; food purchasing; diet quality; foods prepared away from home

144/1212

ESTABLISHING A PLATFORM FOR BUSINESS ENGAGEMENT ON NUTRITION. THE SUN BUSINESS NETWORK IN NIGERIA

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Background and objectives: The Scaling Up Nutrition (SUN) Movement was established in 2010 to encourage government led, collective action to end malnutrition in all forms. The SUN Business Network (SBN) is one of four networks supporting the SUN Movement and acts to engage and support the private sector to undertake business action on nutrition in support of national nutrition objectives. SBN operates at the global and national levels, with 13 national networks engaging the private sector on nutrition in Africa, Asia and Latin America.

SBN wanted to establish a functioning private sector engagement and commitment platform on nutrition in Nigeria, aligned with the Government's nutrition strategy.

Methods: Between August 2015 and April 2016 a strategy for private sector engagement was developed, following a review of national nutrition priorities, stakeholder interviews and analysis of existing business activities to address malnutrition in Nigeria. Priority areas for business action on nutrition were identified and a business engagement and commitment platform on nutrition developed.

Results: 'Increasing consumer awareness and demand creation for nutritious foods' and 'nutrition in the agriculture value chain' were identified as priority areas for business action. These areas were validated by stakeholders including the Federal Ministries of Health, Agriculture and Budget and National Planning.

SBN Nigeria launched its membership and commitment platform in April 2016, with 20 business members signing up with commitments to address malnutrition. As of end March 2017, the membership has grown to 44 businesses (59% small-medium enterprises, 23% multinationals). Commitments made include activities to include availability and/or affordability of nutritious products (47%), increasing consumer awareness of nutrition (26%) and increased food fortification and use of bio-fortified crops (13%). Businesses have also signed up to activities within the priority workstreams.

Conclusions: SBN Nigeria was successfully launched as the only business platform dedicated to nutrition in the country. In order to deliver impact and ensure business action to improve nutrition, SBN Nigeria will convene workstreams for action in priority areas, facilitate partnerships and the provision of technical assistance as well as track progress of members' nutrition commitments. SBN Nigeria will monitor business progress towards their nutrition commitments and business impact on nutrition.

Keywords: Nigeria, multi-sector, scaling up nutrition, business
Conflict of Interest Disclosure: HT, UI, IKH, EAA, DS, FA & JT all work or have worked for the SUN Business Network, one of the four support networks of the Scaling Up Nutrition Movement. The SUN Business Network works to encourage private sector action on nutrition and is made up of more than 350 business members. The SUN Business Network does not receive any fees from business members.

144/1216

PREGNANCY OUTCOMES AND THE DIAGNOSTIC ABILITY OF TWO STANDARDS TO ASSESS ADEQUACY OF MATERNAL BODY MASS INDEX IN URUGUAY

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Background and objectives: The Rosso and Mardones (RM) and the Atalah et al (AEA) maternal weight gain charts are widely used in Latin America. The purpose of this study was to compare birth length (BL) and birth weight (BW) outcomes of both charts at the beginning and at the end of pregnancy using national data from Uruguay.

Methods: Data of pregnant women and their children registered at the national level in the maternity hospitals between 2010 and 2012 were considered: 51,420 women and newborns (RN) with valid records were obtained. Just healthy pregnant women and term single live births were included. Maternal nutritional status was classified at the beginning and at the end of pregnancy according to both curves. The diagnostic ability of both instruments regarding inadequate fetal growth was compared using sensitivity and specificity values. Inadequate fetal growth was defined as birth weight < 3000 g, birth weight > 4,250 g, and birth length < 50 cm.

Results: The selected sample reached 23,832 pregnant women and their newborns. Proportions of BL < 50 cm and both BW < 3000 g and > 4250 g were similar at each nutritional category of both charts; absolute figures for at risk newborns were much higher in the RM underweight and obese women. The RM chart showed higher sensitivity values than the AEA chart, both at the beginning and at the end of the pregnancy.

144/1229

HOW MANY ANTHROPOMETRIC BODY PHENOTYPES A UNDER BODY MASS INDEX MEASURE? AN ALTERNATIVE TO DESCRIBE RISK FOR NON-COMMUNICABLE DISEASE FROM BODY MEASURES

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Background and objectives: Body mass index (BMI) is always under critics by predicting risk for non-communicable disease imprecisely. Body phenotypes (BP) based on anthropometrics and body composition measures has raised as one response to overcome those handicaps. To describe body phenotypes anthropometric-based in adults and to correlate them to BMI.

Methods: We select 7 anthropometric and 3 body composition variables from adults in NHANES 1988-1994 and 1999-2006. We have performed Principal Component Analysis and estimated individual scores for 4 components (C#) at first and 3 at second surveys. We have described components with eigenvalues >= 0.7 and characterized them by variables with loadings >= 0.20. We measured correlation among components and BMI using Pearson coefficient.

Results: In 1988-1994, C1 was characterized by bones length and weight variables; C2 by circumference and skinfold; C3 by skinfold and waist circumference and bi-iliac breadth; C4 by bioelectrical impedance variables. In 1999-2006, C1 was characterized by circumference and adiposity body composition measures; C2 by bone length and lean mass body composition measures; C3 by bioelectrical impedance and lean mass body composition variables. Correlation among BMI and components was 0.32, 0.78, 0.77 and -0.61, respectively, in 1988-1994 and 0.96, 0.56 and 0.48, respectively, in 1999-2006. Body composition measures were relevant but anthropometric measures were prevalent within leading components in both surveys.

Conclusions: BMI was well correlated with BP characterized by adiposity. BP scores offer possibilities will to identify individuals with high adiposity body composition from BMI spectrum and improve estimating nutritional risk at clinical epidemiology context.

Keywords: BMI; non-communicable disease; Body phenotypes; Nutritional assessment.

144/1232

COMPARISON OF TWO MEDITERRANEAN DIETARY INDEXES AS INDICATORS OF FOOD INTAKE QUALITY IN A REPRESENTATIVE SAMPLE OF URBAN CHILEAN POPULATION: FINDINGS FROM ELANS-CHILE SUBSAMPLE

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Background and objectives: Mediterranean diet (MD) has been consistently associated with decreased cardiovascular risk factors and chronic diseases as well as increased longevity. Different scores have assessed the adherence to a MD pattern and its association with risk factors and chronic diseases. We evaluated the adherence to MD in Chilean population, comparing two validated MD indexes (a Spanish index used in the PREDIMED study, and a local one, the Chilean Mediterranean Diet Index, Chilean-MDI) and their association with socio-economic variables.

Methods: We used data from a representative sample of 879 Chilean subjects (15-65 years-old) -included in a cross-sectional Latin American Study on Nutrition and Health (ELANS)- and calculated a posteriori both Mediterranean diet scores obtained from two 24-hour dietary recalls. All participants had socio-demographic information.

Results: Chilean population exhibited poor adherence to MD measured by Chilean-MDI (3.28 ± 1.40 points, range 0-9.5 points) and by the PREDIMED index (3.27 ± 1.50 points, range 0-8 points). Score averages were similar (p=0.394) with a high significant correlation between them (r=0.551, p<0.001). Higher adherence to MD was found in women, people older than 50 years of age, higher socio-economic levels, and residents in Central Chile.

Conclusions: Despite their differences in three of 14 items, both scores qualifies adherence to MD similarly in the Chilean population. Both indexes were higher in Chilean regions with Mediterranean ecosystems and showed demographic trends that are comparable to those obtained with analogous scores in other countries. Thus, Chilean-MDI and PREDIMED indexes can be used to assess overall diet quality in the Chilean population.

Keywords: Mediterranean diet, Mediterranean diet indexes

144/1233

ANTHROPOMETRIC BODY PHENOTYPES RELATE TO MORTALITY IN US ADULTS

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Background and objectives: Body mass index (BMI) covers a great diversity of body phenotypes (BP). Some of phenotypes are associated to body fat and could be linked to risk for non-communicable disease and mortality. Body phenotypes based on anthropometrics and body composition measures has raised as one response to overcome those handicap. To describe nutritional status from BP anthropometric-based in adults and correlate them to mortality.

Methods: We select 3 body composition variables from adults in NHANES 1999-2006. We have performed Principal Component Analysis and estimated individual scores for 4 components (C#) at first and 3 at second surveys. We have described components with eigenvalues >=.7 and characterized them by variables with loadings >=.20. Finally, we linked dataset with diabetes or hypertension mortality register. We estimated each component mortality risk (IRR) by Poisson model adjusting for age at survey.

Results: In 1999-2006, C1 was characterized by circumference and adiposity body composition measures; C2 by bone length and lean mass body composition measures; C3 by bioelectrical impedance reactance and lean mass body composition variables. IRR for diabetes mortality was higher in component linked to adiposity: 1.3 for man and 1.1 for woman. For hypertension mortality, BP characterized by lean mass was protection: 0.4 for all sexes combined. For diabetes/hypertension combined mortality, IRR from adiposity pattern (C1) was similar for man and woman: 1.1.

Conclusions: Adiposity BP it's a risk for diabetes and diabetes/hypertension mortalities among men and women. BP refine risk to morbi-mortality estimation and offer possibilities of identifying individuals with BMI characterized by high adiposity to avois negative or fatal outcomes.

Keywords: BMI; Body phenotypes; Mortality; Nutritional assessment; US adults.

144/1240

NUTRITIONAL STATUS IN RURAL SCHOOL CHILDREN IN MOROCCO

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Background and objectives: Nutritional status is the best indicator of the global well-being of children. However, malnutrition affects physical growth, cognitive development, physical work capacity, and it consequently influences human performance and health. The present study was designed to identify factors that may influence the nutritional status and educational achievements of the children in a rural area of ANTI Atlas of Morocco

Methods: The nutritional status of 162 children (12 to 15 years of age) was assessed by nutritional anthropometry and compared with tables of weight-for-age and height-for-age z-scores (WAZ and HAZ) identifying wasting and stunting, respectively. A questionnaire was developed to collect information about socio-economic and demographic status of the children's families. Also, educational achievements were assessed by their score in mathematics

Results: A total of 162 children (64 boys and 98 girls), aged 12 –15 years. Results: **Conclusions:** In this area of study, malnutrition remains a major problem among adolescents' school performances, which can affect their future. The main causes of malnutrition seem to be the bad weaning practices among school children and cultural attitudes of food. The educational achievements of school children are influenced by maternal education and stunting.

Keywords: Malnutrition, School Achievements, Morocco

144/1244

FACTORIAL TRIAL OF LIPID-BASED NUTRIENT SUPPLEMENTS WITH INFANT AND YOUNG CHILD FEEDING COUNSELING WITH OR WITHOUT IMPROVED WASH IN KENYA: EFFECTS ON ANEMIA, IRON, VITAMIN A, VITAMIN B12 AND FOLATE

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Background and objectives: Anemia may be caused by micronutrient deficiencies, infection, and genetic hemoglobin disorders among children. Nutritional supplementation and improvements in water, sanitation, and handwashing may reduce the burden of anemia and improve micronutrient status.

Methods: We conducted a cluster-randomized controlled trial in rural western Kenya enrolling pregnant women and following their children for 2y. A biochemical subsample included children in four intervention groups: combined water, sanitation, and handwashing improvements (WSH); nutrition improvements, including lipid-based nutrient supplements (LNS) for children 6-24 mo and infant and young child feeding counseling (N); WSH+N; and control. Blood samples were collected at the 2y follow-up and hemoglobin, serum ferritin, transferrin receptor, folate, vitamin B12, retinol binding protein, c-reactive protein (CRP), and alpha-1 acid glycoprotein (AGP) measured.

Results: 699 children were included in this analysis at a mean (SD) age of 22.1 (1.8) mo. In the control group, there was a high prevalence of anemia (48.8%), iron deficiency (80.9%), and vitamin A deficiency (52.9%), but lower prevalence of folate deficiency (9.6%) or B12 depletion (21.8%). The N and WSH+N groups had significantly lower prevalence of anemia ([Prevalence Ratio, 95% CI] N: 0.74, 0.58-0.94; WSH+N: 0.56, 0.42-0.75), iron deficiency (N: 0.71, 0.62-0.80; WSH+N: 0.77, 0.66-0.90), vitamin A deficiency (N: 0.66, 0.41-0.87; WSH+N: 0.54, 0.40-0.72), folate deficiency (N: 0.12, 0.03-0.54; WSH+N: 0.07, 0.01-0.49), and B12 depletion (N: 0.66, 0.50-0.87; WSH+N: 0.54, 0.40-0.72). Additionally, the prevalence of high folate (>45.3 nmol/L) increased in the N and WSH+N groups. There was a marginally significant 25% lower prevalence of anemia in WSH+N compared to N. There were no differences in micronutrient status or anemia between the WSH and the control groups.

Conclusions: The nutrition intervention reduced the prevalence of anemia and deficiencies in iron, vitamin A, folate and B12. It also increased prevalence of high folate status. The WSH intervention did not reduce the risk of anemia, but WSH+N appeared to reduce anemia more than the nutrition-specific intervention. LNS combined with infant and young child feeding behavior change communication is an effective strategy to improve nutritional status.

Keywords: Lipid-based nutrient supplement, anemia, micronutrient, children

144/1247

EXPLORING THE RELATIONSHIP BETWEEN ENVIRONMENTAL IMPACT AND NUTRIENT CONTENT OF SANDWICHES & BEVERAGES AVAILABLE IN CAFES IN A UK UNIVERSITY

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Background and objectives: Current dietary patterns in the UK are having a negative impact on health and the environment. Adoption of healthier and more environmentally sustainable diets is needed, yet concerns over the nutritional quality of low environmental impact diets have been raised.

We examined the relationship between the environmental impact and nutrient content of sandwiches and beverages commonly consumed in cafes in a UK university to explore how choosing low environmental impact options would affect nutrient intake and subsequent health.

Methods: Greenhouse Gas Emission (GHGE) and Water Footprint (WF) values for ingredient foods of sandwiches and beverages were combined with recipe information to calculate GHGEs (gCO2e per portion/serving) and scarcity weighted WFs (litres per portion/serving). These estimates were then combined via orthogonal regression to give a single environmental impact

score (EIS). The relationship between EIS and nutrient content was explored by correlation.

Results: Sandwiches that contained meat and animal products (i.e. roast beef, corned beef, cheese and pork) and beverages that contained milk, cocoa and/or coffee had the highest EIS. EIS was positively associated with portion size of sandwiches, but not serving size of drinks. EIS was positively correlated with nutrients to limit for health, namely sodium (sandwiches rs= .67 p<0.01, beverages rs= .76 p<0.01), saturated fat (sandwiches rs= .37 p<0.01, beverages rs=.80 p<0.01), and free sugars (sandwiches rs=.44, p<0.01). However, EIS was also positively correlated with nutrients to encourage for health; protein (sandwiches rs = .45 p<0.01, beverages rs.83 p<0.01), iron (sandwiches rs=.44 p<0.01, beverages rs=.38 p<0.01), calcium (beverages rs =.78 p<0.01) and B12 (beverages rs=.76, p<0.01).

Conclusions: Choosing plant-based sandwiches and drinks without milk may help to reduce environmental impact. Selecting smaller sandwiches would also help to reduce environmental burden and calorie intake. However, intakes of health-promoting nutrients may be adversely affected if consumers adhere to environmental dietary messages. This reduction may have health implications for individuals in the population already vulnerable to micronutrient deficiencies.

Keywords: Nutrients, Public Health, Greenhouse Gas Emissions, Water Footprint, Environment

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144/1254

INTERVENTIONAL PROMOTION FOR CONSUMPTION OF FRUITS AND VEGETABLES IN A PRIMARY HEALTHCARE SERVICE - A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: The consumption of fruits and vegetables (FV) is one of the ten main factors in the global burden of disease. Futhermore, the studies are usually developed far from the subjects' reality, with respect to availability to health services in particular. A most of intervention nutritional do not regard to the individual's perception of their consumption. To assess the impact of an intervention aimed to increase fruit and vegetable (FV) consumption.

Methods: A seven-month assessment of a randomized controlled trial of a nutritional intervention in the promotion of FV intake was conducted with 3,778 adults (≥20 years of age) in the healthcare service – Brazil. In 18 units' healthcare were randomly assigned to a control (n=9) or intervention group (n=9). The intervention was based on the Transtheoretical Model and Paulo Freire pedagogy and included: group educational sessions, motivational messages by postcard, written material and environment-based activities. The control received periodic health intervention (lecture on nutrition) at the health service. Control and intervention group members participated in physical activity, for three times a week during one hour. The primary outcome was change in FV consumption (grams). Intermediate outcomes included: increase self-efficacy, decrease perceived of barriers of FV consumption and progress of action stages. Analyses utilized a generalized estimating equation analysis.

Results: We assessed 3,778 individuals, of these 364 were excluded (112 were not meeting inclusion criteria and 252 declined to participate). 3,414 individuals (intervention group= 1,931; control= 1,483) had completed follow-up at seven month, of whom 1,305 in the intervention group and 936 in the control group. The intervention group participants reported improvement in self-efficacy (<0.001), fewer perceived of barriers (0.003) and greater progression to action stages (57.2% to 70.1%; p<0.001); and participants in the lowest quartile of FV consumption at baseline increased their FV intake (β=27.5; CI95%:6.4 to 48.6) compared to the control group.

Conclusions: The intervention reached the goal. The intervention promoted consumption among people who had low FH consumption, maintenance along with adequate of the FV intake, of decreasing perceived barriers and to increase self-efficacy. More research on longer-term FV intake maintenance is needed.

Keywords: Fruit, Vegetable, Feeding Behavior, Nutrition Education, Clinical Trial

Further collaborators:

144/1256

RELATIONSHIP OF SOCIO-DEMOGRAPHY, PARENTAL ANTHROPOMETRY AND BIRTH HISTORY WITH WEIGHT STATUS AMONG URBAN AND RURAL ADOLESCENTS (13-18 YEARS)

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Background and objectives: Increasing prevalence of adolescent obesity in a developing country like India, undergoing socio-economic and epidemiologic transition warrants assessment of associated risk factors. The study aims to determine socio-demographic, birth history and parental characteristics among adolescents and assess their relationship with weight status.

Methods: Using a cross-sectional study design, a total of 499 school-going adolescents (13-18 years) belonging to urban (New Delhi; n=261) and rural areas (Harsaru Village, District Gurgaon and Duhai Village, District Ghaziabad; n=238) of north India were enrolled. Information on socio-demography, including date of birth, gender, location (urban/rural), facilities at home (car, television, computer, air conditioner, cooler), number of living rooms (<3, 3-5, >5), ownership of house; birth history, including birth weight, number of siblings (0, 1-2, ≥3), birth order (1, 2-3, >3), total breastfeeding duration; information on parents anthropometry and weight status computation based on BMI (WHO), educational status (≤high school/ ≥graduation), occupational status (working/not working), smoking and alcohol status (never/sporadic/regular), were obtained by a parent-administered questionnaire. Anthropometric measurements including height and weight were measured and adolescents were classified based on weight status (overweight/obese [OW/OB], normal [NW] and lean weight [LW], respectively) using BMI for age reference values (WHO).

Results: Parental educational status, paternal occupational status, facilities at home and number of living rooms were significantly higher among OW/OB as compared to NW and LW group, respectively (p<0.05). Mean values of paternal height, parental weight and BMI were significantly higher among OW/OB group as well (p values ranging from <0.001-0.039). Furthermore, OW/OB adolescents had significantly higher birth weights, were least breastfed, were first born and majority were less likely to have siblings (p values ranging from <0.001-0.038). Logistic regression analyses adjusted for age, gender and location showed higher maternal educational status (OR:2.60), paternal (OW, OR:1.84; OB, OR:3.27) and maternal (OW, OR:4.16; OB, OR:3.35) weight status, regular parental smoking (OR:2.56) and higher birth weight (OR:2.64) increased, and ≥3 siblings (OR:0.25) and higher breastfeeding duration (OR:0.95) significantly decreased the odds of developing OW/obesity among adolescents (p values <0.001-0.046).

Conclusions: The results highlight the importance of socio-demographic, parental characteristics and birth history in the development of OW/obesity among adolescents.

Keywords: socio-demography, adolescent obesity.

144/1262

THE EFFECT OF DOUBLE FORTIFIED SALT ON HEMOGLOBIN CONCENTRATIONS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: Background: Double-fortified salt (DFS), containing iron and iodine, has been proposed as a feasible and cost-effective alternative for iron fortification in low and middle-income countries (LMICs). Objectives: The aims of this meta-analysis were to 1) examine the effect of DFS on hemoglobin concentrations, and 2) assess differential effects on hemoglobin by iron concentrations and type of formulations (ferrous sulfate, ferrous fumarate and ferric pyrophosphate).

Methods: A systematic search of randomized and quasi-randomized controlled trials using MEDLINE, EMBASE, Cochrane, Web of science, and other sources identified 220 articles. A total of 12 studies, all efficacy studies, met pre-specified inclusion criteria.

Results: All studies were conducted in LMICs; eight in India, two in Morocco, one in Cote d'Ivoire and one in Ghana. The pooled analysis showed that DFS increased hemoglobin concentrations significantly (SMD 0.28; 95% CI: 0.11, 0.44; P< 0.001). Significant heterogeneity was observed and random effects models were used. Stratified analyses by population sub-groups indicated significant effects among school-age children (SMD 0.32; 95% CI: 0.04, 0.60; P< 0.05; n=7) and women of childbearing age (SMD 0.24; 95% CI: 0.04, 0.44; P< 0.05; n=6). Ferrous fumarate (SMD 0.22; 95% CI: 0.05, 0.38; P< 0.05; n=3) and ferrous sulfate (SMD 0.23; 95% CI: 0.01, 0.46; P< 0.05; n=6) showed similar effects. Hemoglobin concentrations and deworming at baseline, sample size, study duration and study quality were not associated with effect size.

Conclusions: DFS is efficacious in increasing hemoglobin concentrations in LMIC populations. Effectiveness studies are needed.

Keywords: Hemoglobin, double fortified salt, fortification, salt iodization, iron

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144/1263

PREVALENCE OF OVERWEIGHT AND OBESITY AMONG CHILDREN IN PRIVATE PRIMARY SCHOOLS IN KENITRA, MOROCCO

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Background and objectives: Background. The rising prevalence of childhood obesity poses a major public health challenge in both developed and developing countries by increasing the burden of chronic non communicable diseases.

Objectives . The aim of our study was to estimate the prevalence of overweight and obesity among primary school age children in Kenitra.

Methods: We conducted a cross-sectional study of a random sample of 331 school children including 173 boys and 158 girls aged 6-7 years. Children were recruited from private primary schools. Anthropometric parameters (weight, height, body mass index) were measured. Obesity indices (Thinness, Severe thinness,

normal weight, overweight and obesity) were defined according to WHO standards published in 2007. Data were collected using a questionnaire. Statistical analysis was performed using SPSS version 20.0 and using a macro of WHO Anthro plus .

Results: The results showed that 17.8% of school children are overweight/obese, and 2.7% are Thinness /Severe thinness . Age and anthropometric parameters between BMI for age groups showed that the weight, height, BMI z score of weight, size and z score of BMI z score at very high Among overweight/obese groups than other groups. Groups of BMI for age are not influenced by gender as p = 0.665.

Conclusions: The prevalence of obesity and overweight among school children is high. School children are at risk of developing diseases associated with obesity. Which may cause problems at the age of adolescence and adulthood. Several studies of nutritional status are recommended for preschool children in Morocco.

Keywords: Overweight, obesity, children, Morocco,6-7 years

144/1268

HEALTH STATIONS PROGRAM IN THE CITY OF BUENOS AIRES

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Background and objectives: As a response to the growing burden of non-communicable diseases (NCD), in 2012 the Health Stations Program (HS) was created by the Directorate-General of Health Development of the Deputy Mayor's Office of the Buenos Aires City Government.

Among its objectives are the detection of NCD risk factors and the promotion of healthy lifestyles in children and adults. It is available to the community free of charge through 40 health promotion points located within Buenos Aires City.

The object of this paper is to describe the scope of the HS Program through a series of indicators.

Methods: Cross-sectional study based on data from HS user database.

Results: Since its start in 2012, a total of 1 044 641 people visited the HS 3.4 times on average, totalizing 3 937 422 sessions (3 593 454 health checkups and 693 820 nutritional counselings). Fifty-six percent of users were female, 44% were male, and 56% were over 45 years of age. Fifty-six percent resided in Buenos Aires City and 27% in Buenos Aires Province.

During the past year 13 300 new monthly contacts were made on average, and an estimated one out of five Buenos Aires City residents have attended HS at least once.

Blood pressure controls were carried out on 762 124 people, glycemia on 248 083 people and body weight controls on 346 278

people. Among the latter, over half (56.2%) were overweight, this being the principal reason for consultation among nutritional counseling users.

Outdoor gym classes are offered within the HS premises, as well as other programs such as Healthy Awakening, consisting of cognitive stimulation exercises and physical activity for senior citizens, and Game Zones, where physical activities for children are offered. Furthermore, conferences open to the community have convened 16 200 people.

Conclusions: The HS Program enables access to the control of a series of NCD risk factors in the population and constitutes an original strategy for promoting healthy lifestyles.

Keywords: Health Stations – Health Promotion – Non Communicable Diseases

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144/1288

ASSOCIATION BETWEEN MARKERS OF INFLAMMATION WITH CARDIO-METABOLIC RISK FACTORS, DIET AND PHYSICAL ACTIVITY AMONG APPARENTLY HEALTHY INDIAN ADOLESCENTS

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Background and objectives: Obesity is associated with metabolic derangements and sub-clinical inflammation, coexisting with adverse lifestyle behaviours. The study aims to assess the relationship between cardio-metabolic risk factors, diet and physical activity (PA) with inflammatory markers among adolescents.

Methods: Using a statistical approach, a total of 499 school-going adolescents from urban (New Delhi; n=261; 3 schools) and rural areas (Harsaru Village, District Gurgaon and Duhai Village, District Ghaziabad; n=238; 3 schools) of north India, were enrolled, based on weight status (overweight/obese [OW/OB], normal weight and lean weight) using BMI for age WHO guidelines, in this cross-sectional study. Measurements of anthropometry, body composition, blood pressure and fasting blood samples for cardio-metabolic variables including glucose, HbA1c, total cholesterol, LDL-c, HDL-c, TG, urea, creatinine, uric acid and inflammatory markers including CRP, IL-6, TNF-alpha, resistin, leptin and adiponectin were done. Diet information was obtained using 24hr diet recall for three non-consecutive days (2 school-days and 1 weekend-day) and Global PA Questionnaire (v.2) was used to compute METs/week spent on total PA and its domains.

Results: OW/OB group had higher concentrations of cardio-metabolic and inflammatory markers as compared to other groups (except HDL-c and adiponectin, which were lower; p<0.05). Mean dietary intakes of energy, macronutrients, fatty acids [FA], fibre and select micronutrients were significantly high-

er (p<0.05), with lower METs/week for total PA and for activities related to work, transport and recreation among OW/OB adolescents (p<0.001). Individual linear regression models adjusted for age, gender, location, BMI and fat mass showed significant association of CRP with dietary vitamin B12 (β:-0.28); TNF-alpha with LDL-c (β:0.45), urea (β:2.31), PUFA (β:6.09), sodium (β:0.14), vitamin A (β:0.17); IL-6 with LDL-c (β:0.13), moderate work (β:-0.02); resistin with glucose (β:0.13), PUFA (β:0.68), MUFA (β:-0.45), fibre (β:-0.22); leptin with TG (β:0.01), uric acid (β:0.15), trans-fat (β:0.20), β-carotene (β:0.01); adiponectin with HDL-c (β:14.24), HbA1c (β:298.63), β-carotene (β:0.11) (p values <0.001-0.047).

Conclusions: Significant positive associations of TNF-alpha, IL-6, resistin and leptin with select cardio-metabolic variables, dietary PUFA, trans-fat, sodium and vitamin A, and negative associations with MUFA and fibre, highlight the importance of early identification and modification of risk factors to delay the onset of cardio-metabolic complications among adolescents.

Keywords: cardio-metabolic risk; inflammation.

144/1289

DEVELOPMENT OF A NEW METHODOLOGY TO DEFINE AN OPTIMAL PORTION SIZE OF FOOD TAKING INTO ACCOUNT CONSUMER SATISFACTION, APPETITE SENSATIONS AND ENERGY INTAKE

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Background and objectives: Food portion size has increased over the last decades and can be influenced by a wide variety of internal and external factors (individual characteristics, food related characteristics and food environment). Recommended food portion size are mainly based on calories and recommended daily intake without considering consumers' needs and expectations. The aim of our studies was to develop a new methodology to help defining an optimal portion size by taking into account three dimensions: energy intake, fullness and overall satisfaction.

Methods: To achieve this goal quantitative consumer studies were run on different food categories (baked potato snacks and chocolate). The baked potato snacks study was launched on 120 consumers and was repeated in 2 countries. 3 hours after their lunch, 200 g of baked potato snacks were provided in a dispenser so that the consumers did not have visual clues of the quantity provided and eaten. Consumers were asked to eat as much as they wanted to feel fully satisfied for a snack at this moment of the day. Actual consumption (g and Kcal), appetite sensations before and after consumption and liking were assessed. Satisfaction related to the overall eating experience was measured with a questionnaire designed for the study. A similar protocol was used for the study on chocolate and the satisfaction questionnaire was improved by adding sensory dimensions.

Results: The study on potato snacks allowed to identify the optimal portion size that reduced significantly the appetite while bringing the maximum of satisfaction (between 30 to 40g). For chocolate, drivers of satisfaction and reason to stop consumption were also identified.

Conclusions: This new approach has provided promising results to recommend an optimal portion size. It provides relevant information to design satisfying portion sizes of snacks for consumers to help them better manage their daily energy intakes and to adopt healthier food pattern.

Keywords: portion size, satisfaction, appetite, consumer studies, sensory drivers

Conflict of Interest Disclosure: All authors worked for Mondelez international at the moment of the study. No specific conflict of interest.

144/1290

DESIGN, VALIDATION AND APPLICATION OF A MEDITERRANEAN DIETARY INDEX IN CHILE

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Background and objectives: Diet quality is considered a key factor in the development of chronic diseases. Availability of brief dietary indexes that can effectively evaluate dietary patterns and their association with health is critical for prevention and management of chronic diseases. Based on the increasing scientific evidence that supports the health benefits of adopting a Mediterranean diet, the objective of this study was to develop a valid and self-applicable Chilean Mediterranean Diet Index (Chilean-MDI)

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that evaluates food intake quality -based on adherence to this dietary pattern- in our population.

Methods: The Chilean-MDI was developed based on a previous Mediterranean eating score that was adapted to Chilean dietary habits. This index was further validated in a sample of 153 adults by comparing the concordance between the results obtained by self-application of the Chilean-MDI with those obtained by a trained nutritionist. Additionally, this index was applied in 53,366 Chilean adults in order to describe the diet quality of our population.

Results: There was an adequate concordance (kappa>0.69 in all items) and high correlation (r=0.94, p<0.001) between findings obtained by self-application of the Chilean-MDI and those achieved by the nutritionist. The application of the index in Chilean adult population showed a better diet quality (high Mediterranean diet adherence) among women, with advanced age and in higher educational levels.

Conclusions: The Chilean-MDI can be successfully self-applied to portray the overall diet quality in the Chilean adult population. Additionally, this index showed demographic trends in food intake that are comparable to those obtained with similar indexes applied in other populations. Supported by Fundación Banmédica.

Keywords: Mediterranean diet, diet index / diet score, chronic diseases prevention

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144/1293

GLOBAL EVIDENCE ON NUTRIENT PROFILE MODELS WITH APPLICATIONS IN GOVERNMENT-LED NUTRITION POLICIES AIMED AT HEALTH PROMOTION AND NONCOMMUNICABLE DISEASE PREVENTION: A SYSTEMATIC REVIEW

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Background and objectives: Worldwide, government bodies increasingly recognize the importance of using transparent and reproducible methods to evaluate the nutritional quality of foods and beverages for nutrition-related policies. Nutrient profile (NP) models meet this need, but an up-to-date, accessible, and global resource summarizing existing NP models is currently unavailable. The aim of this study was to develop such a resource which summarizes and evaluates key characteristics of NP models with applications in government-led nutrition policies.

Methods: NP models were first identified from a key, but unpublished catalogue of NP models built in 2012 by Rayner and colleagues. A systematic literature search was also conducted in three databases of the peer-reviewed literature (e.g. PubMed) and fifteen grey literature databases (e.g. PAIS Index). Included models had to meet the following characteristics (out of twelve eligibility criteria): a) Developed or endorsed by governmental or intergovernmental organizations; b) Allow for the evaluation of single food items; c) Consider multiple nutrients or food components; d) Have publicly available nutritional criteria.

Results: A total of 387 potential NP models were initially identified, including n=119 models from Rayner's catalogue and n=268 models from the full text assessment of >600 publications. Seventy-eight models were included. The majority of models (n=75; 96%) provide summary ratings of the healthfulness of food products as opposed to separate ratings for individual nutrients. Almost half of the models originate from the Americas, followed by the Asia/Pacific region (23%) and Europe (22%). Most (n=55; 71%) were introduced within the last 10 years, and only 6 models (8%) were endorsed as opposed to specifically developed by a governmental or intergovernmental organization. The most common primary applications of the models included school food standards or guidelines (n=27), food labelling (e.g. front-of-pack; n=12), restriction of the promotion of foods to children (n=10), and claims (e.g. health claims; n=7).

Conclusions: Given the proliferation of NP models worldwide, this new resource will be highly valuable for assisting health professionals, nutrition professionals and policy makers in the adoption or adaptation of an existing model appropriate for the establishment of specific nutrition policies that require the use of nutrient profiling.

Keywords: nutrient profiling, nutritional quality, systematic review, nutrition policy

Conflict of Interest Disclosure: Prior to this study, Beatriz Franco-Arellano was a PepsiCo employee. Also, Theresa Poon is currently employed part-time by Intertek Scientific & Regulatory Consultancy. These companies had no connection with the present research. The other authors have no conflicts of interest.

GENDER IS ASSOCIATED TO MINIMUM ACCEPTABLE DIET AMONG INFANT AND YOUNG CHILDREN AGED 6-23 MONTHS IN SOUTHERN OF BENIN

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Background and objectives: Socio-demographics factors, childcare practices, poverty, low levels of education, women's disempowerment are the most important factors contributing to persistent child under-nutrition in developing countries including Benin. The achievement of healthy growth and survival of young children in their early years requires appropriate complementary feeding practices. This study aimed to identify socio-economic and demographic factors associated with adequate complementary feeding (CF) practices.

Methods: A cross-sectional study of 1219 children aged 6-23 months was carried out in Bopa and Houeyogbe districts in Southern Benin. Socio-demographic information was obtained using a semi-structured questionnaire administered to the child primary caregivers. CF practices were assessed through WHO/UNICEF infant and young child feeding (IYCF) indicators. "Random Forest" was used to eliminate confounding factors. Logistic mixed regression models performed in "R" software were used to test significant effects of explanatory variables on CF practices.

Results: Majority of mothers (67%) did not attend formal school and 6% of households are female-headed. Poor nutritional status was observed in study area with 27% of stunting and 5% of wasting. The proportion of children who achieved minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) was 60%, 71% and 46%, respectively. Education level of mothers was not significant as main effect on MAD. However, there was a significant two ways interaction effect of sex of household head and education level of mothers on MAD (Coef β =2.8; OR = 16.5; 95%IC: 1.8-50.7; P=0.013). The probability that a child meets the minimum acceptable diet increased drastically among female-headed households with higher schooling level.

Conclusions: The study findings suggest that empowerment of women and their level of education have an important role to play as factors contributing to appropriate IYCF practices. A combination of nutrition specific and nutrition-sensitive interventions including gender aspect are necessary to address child under-nutrition.

Keywords: Gender, complementary feeding, diet, children, Benin

COST AND COST-EFFECTIVENESS OF FOOD-ASSISTED MATERNAL AND CHILD HEALTH AND NUTRITION PROGRAMS IN BURUNDI AND GUATEMALA

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Background and objectives: Despite the popularity of food-assisted maternal and child health and nutrition (FA-MCHN) programs, little is known about their (cost-)effectiveness. This study examines the cost and cost-effectiveness of two FA-MCHN programs implemented during the first 1,000 days in Burundi and Guatemala. Both programs included food assistance (family + individual ration), strengthening of health services, and a nutrition/health behavior change communications strategy. Using a cluster-randomized controlled trial (c-RCT), the Burundi study evaluated the optimal timing and duration of food assistance: from pregnancy until the child is 24 months (T24), until the child is 18 months (T18), and birth until 24 months (TNFP). The 5-treatment arm Guatemala c-RCT compared the optimal composition of the individual ration (corn-soy blend (CSB), micronutrient sprinkles (MNP), lipid-based supplements) and optimal size of the family ration (full, reduced, none).

Methods: We used the activity-based costing-ingredients method and collected detailed data on program activities, inputs (e.g., labor, supplies), and input allocation across activities. We calculated total costs, activity-specific costs, and start-up costs. We also estimated the cost and cost-effectiveness for each version using stunting as the outcome. Since a cost-effectiveness ratio only accommodates one outcome, it is artificially inflated for integrated programs. We thus compare versions across a range of outcomes.

Results: In Burundi, T24 was the most expensive (766 USD/beneficiary), had a large range of impacts, and was the most cost-effective in reducing stunting (108 USD/beneficiary/percentage point (pp) reduction in stunting). In Guatemala, the full family ration combined with CSB or MNP were the most expensive (1,076 and 1,086 USD/beneficiary respectively), had the highest concentrations of positive impacts, and were the only versions that reduced stunting. The CSB version led to the largest stunting reductions and was more cost-effective than the MNP version (97 and 161 USD/beneficiary/pp reduction in stunting, respectively). However, the CSB version also had unintended negative effects. In both countries, start-up costs accounted for a significant share of non-food costs (17.3%, Guatemala; 10.1%, Burundi).

Conclusions: In both countries, the most expensive program versions were also the most cost-effective. Longer implementa-

tion periods would reduce the share of start-up costs and increase cost-effectiveness.

Keywords: cost-effectiveness, food-assisted maternal and child health and nutrition programs, Preventing Malnutrition in Children Under 2 Approach, Burundi, Guatemala

Further collaborators:

144/1304

ADHERENCE TO MEDITERRANEAN DIET INTAKE IS INVERSELY ASSOCIATED WITH OVERWEIGHT/ OBESITY AND METABOLIC SYNDROME IN CHILEAN ADULT POPULATION

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Background and objectives: Obesity and metabolic syndrome (MetS) are associated with high risk for a variety of chronic diseases. Dietary patterns are critical for development and persistence of obesity and MetS, yet very little information is available on the link between food intake quality and these conditions in Chile. The objective of this study was to evaluate adherence to a Mediterranean diet (MD) pattern -using a locally validated dietary index (Chilean-MDI)- and its correlations with overweight/obesity and MetS prevalence in Chilean adult population.

Methods: We conducted a nationwide, cross-sectional survey using a non-representative, self-selecting sample of 24,882 Chilean adults registered in Aliméntate Sano (www.alimentatesano. cl), an online educational program on MD, healthy lifestyle and chronic disease prevention.

Results: A strong, monotonic inverse association was observed between adherence to MD and both overweight/obesity and MetS. Overweight/obesity prevalence increased across diet categories: 45%, 51% and 61% (p<0.001) from healthy to moderately healthy to unhealthy food intake, respectively. MetS prevalence behaved similarly, increasing from healthy (13%), moderately healthy

(19%) to unhealthy (29%) dietary pattern (p<0.001). Relative risks for overweight/obesity were significantly higher for individuals in moderately healthy (OR=1.58) and unhealthy (OR=2.20) diet groups compared with the high MD adherence group, as well as for MetS (moderately healthy vs. healthy: OR=1.54; unhealthy vs. healthy: OR=1.83).

Conclusions: This study shows a strong inverse relationship between adherence to Mediterranean diet intake and overweight/ obesity and MetS in Chile, corroborating previous findings from other world regions. Increasing MD consumption may represent an effective approach to decrease chronic disease risk in the Chilean adult population. Supported by Fundación Banmédica.

Keywords: Mediterranean diet, diet index / diet score, Overweight and obesity, chronic diseases prevention, metabolic syndrome

144/1310

IS PSYCHOLOGICAL WELLBEING ASSOCIATED WITH A HEALTHY LIFESTYLE? CROSS-SECTIONAL SURVEY OF MEDITERRANEAN DIET INTAKE, PHYSICAL ACTIVITY, SMOKING AND WELLBEING IN CHILEAN ADULTS

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Background and objectives: In developed countries, wellbeing indicators are usually associated with healthier lifestyles and reduced cardiovascular risk. However, similar information is very scarce in populations from developing countries. The objective of this study was to evaluate psychological wellbeing and its relationship with Mediterranean diet (MD) intake and other lifestyle components in Chile.

Methods: We applied a cross-sectional internet survey of psychological wellbeing -including measurements of positive mental health (Mental Health Continuum (MHC) questionnaire), optimism, and subjective vitality- and lifestyle habits. We assessed diet quality by a

Chilean Mediterranean Diet Index (Chilean-MDI, range from 0-14 points), physical activity using IPAQ, and current smoking.

Results: In this study sample, 44% of Chilean adults displayed high wellbeing measured by MHC, and higher MHC scores were found among older than younger people. MHC correlated with optimism, but not subjective vitality. Regarding lifestyle, only 21% of the sample exhibited a healthy eating behavior based in high adherence to MD (Chilean-MDI ≥9 points), 27% reported low physical activity and 32% were smokers. Healthy eating -defined as a high Mediterranean diet score- was significantly associated with all wellbeing measures. In addition, people with higher wellbeing showed a healthier overall lifestyle.

Conclusions: Our findings support a link between wellbeing and different components of a healthy lifestyle behavior in Chile. Interventions aimed to increase wellbeing may lead to a better lifestyle as well as reduced risk of chronic diseases. Supported by Fundación Banmédica.

Keywords: Mediterranean diet, healthy lifestyle, Psychological wellbeing, Mental health continuum, chronic diseases prevention

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EDOREXY AND CORPORAL COMPOSITION OF SOCCER PLAYERS

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Background and objectives: Edorexy is a recent term, and refers to episodes of appetite produced by various forms: "addiction" to food, stress or by anxious / depressive episodes. Eating disorders often occur in athletes, and can affect the performance of players. Therefore, we determine the frequency of edorexy, nutritional status and body composition in soccer players.

Methods: We conducted a cross-sectional study of 36 male players from the Intermediate Division, who play soccer at Club Tacuary during May and July 2016. We evaluated edorexia using the self-administered questionnaire of López Morales (2013). We used the ISAK procedure for anthropometric measurements.

Results: We found that median age was of 22 years. The average of fat mass percentage (% FM) was 24.3 ± 4.0% (High) and fat-free mass (% FFM) was 38.1 ± 2.6% (Adequate). Mesomorphic and meso-endomorphic component was the mostly frecuent, not suitable for the type of sport practiced. The psychological data of the Edorexy Inventory showed an overall score of 50.2 ± 7.0pts. Risk of having edorexy syndrome was present in 19/36 of the players surveyed and 8/36 players were diagnosis with edorexy syndrome. The players with edorexy have lower % FFM (difference 2.80%, p = 0.021) and higher % FM (difference 4.40%, p=0.033).

Conclusions: We find that in soccer players the % FM is above the recommendations for this sport.

Keywords: Eating disorder, soccer, somatotype, body composition

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CHARACTERIZATION OF THE CONSUMPTION OF BEVERAGES IN THE CLIENTELE IN COMMERCIAL RESTAURANT OF THE TYPE "SELF-SERVICE", RIO DE JANEIRO-RJ BRAZIL

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Background and objectives: This study aimed to characterize the customers of a self-service commercial restaurant concerning the consumption beverages.

Methods: We investigated individuals of both sexes who have eaten lunch at a self-service restaurant located on a university campus in Rio de Janeiro-RJ. Participants fulfilled a personal data form and semi-quantitative questionnaire on beverage consumption, which was evaluated according to its validity and reproducibility. The consumption of beverages was classified as: did not consume beverages (no-beverage), consumed water, sugar sweetened beverages (SSB), low-calorie beverages. Data were stratified for sex, age, position related to the university, and physical activity. Statistical analyzes were performed using the chi-square test considering the statistical significance p-value <0.05.

Results: 143 individuals were investigated (mean age = 32 years, standard deviation = 11), 59% were men, 44% practiced physical activity regularly, 57% were university students, 26%, university staff or faculty, and 17%, external workers. It was observed that 36% of the participants did not consume any drink at lunch, 28% consumed SSB, 27% consumed water, and 9%, low-calorie beverages. Compared to men, a higher proportion of women did not consume any beverage on the day investigated (45% vs. 30%). The consumption of SSB was more frequent in men than in women (36% vs. 15%, p = 0.04). Individuals over 45 years old had higher consumption of SSB (35%) when compared to those younger than 25 years old (29%). Those who reported regular physical activity practice had higher proportion (49%) of no-beverage at lunch than those who were not active (20%). Conversely, those who did not perform physical activity regularly reported consuming SSB (48%) more frequently than their counterparts (21%). Among the external workers, there was higher frequency of no-beverages

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(46%) when compared to students (33%) and university staff and faculty (35%).

Conclusions: There was high consumption of sugar-sweetened beverages and the results point out to the need of interventions aiming to healthy beverages consumption in commercial restaurants.

Keywords: beverages, sugar sweetened beverages, university, healthy eating promotion, food consumption.

ASSOCIATION BETWEEN INFLAMMATORY DIET SCORE, OBESITY AND BREAST CANCER IN CÓRDOBA, ARGENTINA

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Background and objectives: Breast cancer (BC) is a multifactorial disease; several environmental factors have been linked to this pathology. Specifically, obesity and inflammatory diet have been associated with an increased risk of BC in women. Endocrine changes related to these factors trigger an inflammatory response, which favors the occurrence of BC. The aim of this research was to assess the association between the consumption of an inflammatory diet and BC risk, taking into account nutritional status, in Córdoba province (Argentina).

Methods: A case-control study was conducted during 2008-2016 period (346 cases of BC and 566 controls). An inflammatory diet score was developed including 15 dietary variables (nutrients and food groups consumption), obtained through a validated FFQ. A score (0, 0.5 or 1) was assigned for each variable included in the score depending on the compliance of dietary recommendations. A higher score indicated a higher degree of adherence to an inflammatory diet. For each woman an inflammatory score was calculated. A multiple logistic regression model was performed to assess the association between BC occurrence and inflammatory diet, stratifying by nutritional status.

Results: The inflammatory diet score mean was 6.7 (0.9) in all women included in the study. 20% of the women studied were obese. An increased risk of BC of 42% was observed for each unit of increased in the inflammatory diet score in this group (Odds Ratio: 1.42; Confidence Interval: 1.1-1.84).

Conclusions: Obese women with an inflammatory diet have a greater risk of BC in Córdoba (Argentina).

Keywords: Inflammatory diet index - Obesity -Breast cancer- Argentina - case-control study.

EVALUATION OF HYDRATION STATUS OF A BRAZILIAN FLAG FOOTBALL TEAM

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Background and objectives: The Flag Football holds many similarities to rugby, but with less contact and with the difference that the play has to stop when a flag is withdraw from the side of the players' bodies. For being an outdoor sport, the body temperature can rise significantly, dissipating more heat to the environment and therefore requiring a greater hydration control. According to the percentage of body dehydration in relation to the weight variation, the physiological effects can lead to compromised performance. Thus, this study aimed to identify the status of hydration after Flag Football training.

Methods: We evaluate 17 female athletes from a Brazilian Flag Football team, aged 26,24 ± 3.8 years. This work was approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A bioelectrical impedance was use to obtain body mass before and after training. To evaluate the hydration status, it was calculated the percentage of weight variation (%WV). Variables such as self-reported height (m) and percentage of body fat (%BF), calculated by body density (BD) through the sum of three skinfolds, were also collected. The hydration during the training was performed with water ad libitum and the amount ingested was accounted in the %WV.

Results: The average high and body fat was 1,65 ± 0,03 m and 23,23 ± 6,87%. Regarding the weight variation, at the end of training eight athletes has gained weight (0,72 ± 0,51%) and eight has lost (0,50 ± 0,36%). Only one player neither gained nor lost weight. As a weight variation was between ±1%, the athletes finished training normohydrated.

Conclusions: The post training hydration status showed that the fluid replacements strategies were adequate. Given the importance of being adequately hydrated, nutritional counseling and follow-up become essential to avoid detriment to athlete's health and performance.

Keywords: Hydration. Dehydration. Football. Physical Activity.

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NUTRITIONAL PROFILE OF PRE-SCHOOL CHILDREN, SCHOOLCHILDREN AND TEENAGERS FROM PUBLIC SCHOOLS IN THE GUARULHOS CITY. BRAZIL

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Background and objectives: Front of the epidemiological scenario of Brazil indicating increased obesity in all age groups including children and adolescents, to diagnose the health and nutritional status of schoolchildren in the city of Guarulhos to guide the municipal departments of health and Education in educational programmes and to intervene in possible deviations found. Such a problem is alarming and affects several countries, necessitating effective interventions to minimize the above panorama. The main objective of this study was to identify the health and nutritional status of pre-school children, schoolchildren and teenagers, that attend public schools in Guarulhos City, aged 5 to 12 years.

Methods: Cross-sectional study, approved by the Committee of ethics in research. The study was carried out in 09 schools, located in central and peripheral region of the city, with 3612 students with anthropometric measurements assessment of weight and stature. The nutritional evaluation was based on indicators stature/age and BMI/age, expressed as z-score, and being adopted as the standard reference WHO (2007).

Results: The IMC showed that among the Group of children named preschoolers and schoolchildren, 1.27% are with low weight, while 16.33% and 13.02% showed overweight and obesity respectively. As for teenagers, 1.97% presented low weight, while 18.34% and 12.98% showed overweight and obesity respectively. There were no statistically significant differences between boys and girls in both of groups: children and teens. The data of obesity were more consistent in the schools located at the central region of the city where social conditions are more favorable. Height for age, with 95% confidence, was about 97.76% of children and 97.18% of the adolescents.

Conclusions: The data confirm the decline in child malnutrition and the increasing prevalence of overweight and obesity. The stature of the almost whole population was adequate. The study was presented to the Health and Education Departments of the municipality to corroborate with the public policies of intervention and health promotion, showing the importance of this partnership so that intervention programmes are actually implemented.

Keywords: Nutritional status. Child obesity.

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SCHOOL-FOOD ENVIRONMENT REVIEW AND SUPPORT TOOL (SCHOOL-FERST): A NATIONAL SURVEY OF POLICY AND PRACTICE IN NEW ZEALAND SCHOOLS

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Background and objectives: Research consistently demonstrates the positive links between healthy school environments, educational outcomes and student well-being. Yet New Zealand (NZ) school food and nutrition environments are not consistently monitored and evaluated. A valid, efficient and valuable monitoring and feedback system is needed to show trends in the healthiness of NZ school food environments and to stimulate action.

Methods: Participants from 819 (Response Rate = 33%) primary, intermediate, secondary and composite schools completed a cross-sectional, validated school food survey (School-FERST). Policies were analysed using an adapted version of the Well-SAT tool. Canteen menus were analysed using the national Food and Beverage Classification System for NZ schools, and a sample of menus from Auckland, Taupo, Christchurch and Timaru schools (n=54) were validated using fieldworker observations. Key informant interviews (n=18) were conducted to ascertain the best ways in which to give feedback to schools.

Results: Forty percent of schools stated they had a food and nutrition policy. Most of these policies (n = 146) were vague, lacked comprehensiveness and contained weak statements. Seventy one percent of schools sold food and beverages to students during the school day, with 58% offering only milk and water as beverage options. The average menu score was 2 out of 5, indicating only 20-40% of items on canteen menus were 'healthy'. A large proportion of schools (81%) used food and beverages for fundraising with 90% of these schools using 'unhealthy' items. Most schools had fruit orchards and/or vegetable gardens (80%), included nutrition education in curriculum (90%), are not sponsored by food and beverage companies (94%), and do not have commercial advertising on school grounds (97%). Key informant interviews revealed that schools engaged with comparative, visual feedback with minimal text. They also noted the usefulness of recommendations and positive stories from other schools.

Conclusions: School food and nutrition policies remain weak, and canteen and fundraising menus remain largely unhealthy. Students remain exposed to inconsistent messages and practices across the school that contribute to unhealthy food choices. Therefore a sustainable monitoring and feedback system is required to initiate change and improve outcomes over time.

Keywords: school food, food environment, obesity prevention, food policy

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SYSTEMS MAPPING OF UNHEALTHY FOOD ENVIRONMENTS IN AUCKLAND SCHOOLS: A CASE STUDY

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Background and objectives: Group model building (GMB), a method of systems science, is a systematic process of involving key stakeholders in a structured process to create mental maps of their relevant food systems and combining these into one overall causal loop diagram (CLD). By having multiple stakeholders around the table, this process fosters mutual understanding, shared insights, consensus, motivation for implementing the results and catalyses change. Systems science was used to build a CLD to understand the complexity of school food systems, and identify sustainable, low-burden intervention points that can be easily embedded into an already existing system. This is the first time systems science was used to understand unhealthy food environments in Auckland schools.

Methods: GMB sessions were conducted in two schools. Each session consisted of three workshops spread over 6-8 weeks. Schools nominated a group of representatives (staff, students, parents, canteen providers, etc.) to participate in building a CLD to identify the causes and effects of an unhealthy food environment. Using a set of engagement activities, scripts and software participants created a visual map of their school food environment to build shared understanding, allowing them to better able to identify leverage points for a healthier environment.

Results: Participants developed a CLD that represented their own perceptions of the contributors and causes of unhealthy food environments at their school. Several themes were identified, each unique to the individual school but transferrable to other schools in their community, due to their shared lived environments. Schools identified intervention points, as the dynamic CLD allowed them to envision the possible outcomes of such interventions.

Conclusions: This participatory process empowered schools to take ownership while motivating them to act as agents of change. It allowed them to visualize, process and plan a prevention response that engages with multiple levels of their school food system, allowing for the best possible chance at achieving sustainable positive outcomes.

Keywords: schools, food environment, systems dynamics, participatory research, obesity prevention

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AVAILABILITY OF ADEQUATELY IODIZED SALT IN PARAGUAYAN HOUSEHOLDS DURING 2011-2015

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Background and objectives: Iodine Deficiency Disorders (DDY) has been an endemic problem in Paraguay due to the low Iodine content in its land considering that it's a Mediterranean country. The main strategy for the sustained elimination of IDD has been the universal salt iodization. Determine the availability of adequately iodized salt in Paraguayan households during 2011-2015.

Methods: Descriptive cross-sectional study with secondary data.

Results: 12.126 salt samples distributed in the five year period were included. The fine salt was the most frequently consumed; most samples came from urban areas and the origin was mainly national. Adequate iodine values remained above 52% during the study periods, showing a value of 57, 9% in 2015. During the five year period, iodine deficiency was higher in rural areas and in unregistered salt samples ($\chi 2p<0,05$). According to the geographical area, iodine deficiency was variable across the five year period. Deficiency levels have shown a tendency to increase (4,7% en 2011 vs. 34,3% en 2015, $\chi 2$ p=0,0001), while excessive levels have declined (35,6% en 2011 vs. 7,7% en 2015, $\chi 2$ p=0,0001). Mean values of salt iodine content have decreased showing a median of 23 ppm in 2015, significantly lower than previous years (Kruskal Wallis p=0,0001).

Conclusions: 6 of each 10 households have an adequately iodized salt consumption. Iodine deficiency in salt is mainly concentrated in rural areas and in unregistered samples. This represents a public health problem that needs to be addressed.

Keywords: salt, iodine, iodine deficiency, households

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INFANT AND YOUNG CHILD FEEDING PRACTICES AND NUTRITIONAL STATUS OF 6-24 MONTHS-OLD IN GREATER ACCRA REGION, GHANA

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Background and objectives: Good nutrition is the basis for child survival, physical growth, mental development, performance, productivity, health and general well-being throughout human life (WHO, 2016). The research assessed the caregivers' infant feeding practices and nutritional status of their 6-24-month-old children.

Methods: Cross-sectional survey using stratified random sampling technique was used to select 408 children from eight health facilities in the Greater Accra Region of Ghana. Dietary data was collected using the 24-hour recall and analysed using the Esha Fpro for nutrient analysis. The WHO Anthro software (version 3.2.2) was used to generate indices of nutrition (stunting, wasting, underweight, and obesity) from weight (kg) and length/height measurements (cm).

Results: The study showed that caregivers' age (p=0.058), education (p=0.00), employment status (p=0.00), spouse's financial support (p=0.00), alternative means of care (p=0.00), hygiene (p=0.026; p<0.05), and source of knowledge of infant feeding (p=0.017), as well as age of their child (p=0.005), significantly influenced nutritional status. Infant feeding practices that was found to significantly influence nutritional status included, duration of exclusive breastfeeding (p=0.01), safe preparation and storage of food (p=0.00). In comparison to the Dietary Reference Intakes, only children from Osu recorded above the RDA for calories (963.6kcal), fat (48.6g), and Ridge for protein (27.9g). However, about 63% of the infants and young children who participated in the research did not meet their iron and zinc requirements. Food items that significantly contribute to the nutritional status, include cereals (p=0.014), animal protein (p=0.020), vegetables (p=0.004), fruits (p=0.034), and fats & oils (p=0.048). In total, 12.5% of IYC were found to be underweight, 9.4% wasted, and 41.5% stunted, whilst 17% of the infants were overweight. Highest incidences for stunting, wasting and overweight were recorded by children in Adabraka (38.6%), Osu (21.6%), and Tema (33.3%).

Conclusions: Malnutrition is still prevalent in Greater Accra, showing a worrying increase in the double burden of stunting and obesity. The findings of the study will contribute to having targeted interventions to improve IYCF practices in especially the Greater Accra region of Ghana. When malnutrition is minimized through improved infant feeding practices it may lead to better socio-economic development for sustainable quality life.

Keywords: Child Feeding Practices, Nutritional status, Dietary Reference Intakes

144/1347

KNOWLEDGE, INTERPRETATION AND USE OF FRONT OF PACK LABELLING OF FOODS AND BEVERAGES IN COLLEGE STUDENTS FROM MEXICO CITY

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Background and objectives: Several international organizations recognize the Front of Pack Labelling of Foods and Beverages (FoPL) as a Public Health strategy to fight overweight (OW) and obesity (OB), a regulatory measure that has already been implemented in several countries. The objective of this study was to explore and identify the degree of knowledge, interpretation and use of FoPL, mainly from the Guideline Daily Amounts (GDA's) system, in college students.

Methods: Data was obtained from 97 college students from Mexico City who answered a questionnaire. This included previously validated questions divided into four sections: 1) general knowledge of FoPL, 2) interpretation of GDA's, 3) use of GDA's for purchase decision and 4) interpretation and preference of GDA's (Mexican) vs. octagonal labeling (Chilean). In addition, information on height and weight was collected by self-report and the body mass index (BMI) was calculated as kg/m2.

Results: The prevalence of OW or OB in the overall sample was 30.2%. From the total population, 39% answered correctly the amount of daily average calories that should be eaten (2500 kcal). 94% reported consumption of products with FoPL, predominantly of dairy products (73.1%), sweet snacks (72%) and salty snacks (63%); 31.9% reported buying products with FoPL due to nutritional information and 17.5% for claims. The GDA's was familiar mainly to women (65.5%) and subjects with OW (64.9%) and OB (33.3%). However, 86.9% of the women and 85.9% of the men did not interpret correctly the GDA's, and the same happened with 70.4% of the people with OW and OB. The highest GDA's interpretation score was in the age group of >24 years (25%). It was found that 11.4% of the women and 8.3% of the men purchase based on the GDA's. None of the obese respondents uses GDA's to buy their products. Finally, 71% of the respondents preferred octagonal labeling.

Conclusions: Including the FoPL in the Mexican legislation is a good first step. However, it´s necessary a full impact assessment of the labeling regulation, with the intention of developing a tool that supports consumers on having a comprehensible, complete and reliable source of dietary information.

Keywords: Front-of-Pack Labelling, Food-packaged, regulation, GDA's.

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EATING OUT AND THE CONSUMPTION OF UL-TRA-PROCESSED FOOD AMONG BRAZILIAN ADOLESCENTS AND ADULTS

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Background and objectives: Background: Eating out has been related to higher consumption of food characterized by high degree of processing, such as soft drinks, sweets and fast foods.

Objectives: To describe food consumption away from home and at home, according to the purpose and extension of industrial food processing. Evaluate the association between eating out and consumption of ultra-processed food.

Methods: Cross-sectional study using the 2008-2009 Brazilian Dietary Survey, carried out with 34,003 individuals aged 10 years or older. Food items were classified in food groups using the NOVA classification. Eating out was evaluated through two indicators: percentage of calories eaten out and frequency of days each individual reported eating out. Both indicators were described according to sociodemographic characteristics. Percentage of food calories per food group was estimated according to location of consumption. Multilevel model was used to evaluate the association between eating out and the participation of ultra-processed food in the diet.

Results: Although most of the calories consumed away from home in Brazil come from the culinary preparations food group, there were a higher contribution of calories from ultra-processed food when away from home, especially from items such as soft drinks and ready-to-eat meals. Compared to consumption at home, eating out increased the consumption of ultra-processed food by 51%.

Conclusions: In Brazil, eating out was associated with ul-tra-processed food consumption. In order to discourage consumption of ultra-processed food away from home, public policies such as food taxation and limitation of sales outlets should be considered.

Keywords: Eating out; Ultra-processed food; Multilevel analysis.

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FORMULATION AND NUTRITIONAL EVALUA-TION OF COMPLEMENTARY FOODS PREPARED FROM MAIZE, SORGHUM, GROUNDNUT, CRAY-FISH, AND BEANS

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Background and objectives: Undernutrition among infants has risen to such an extent that it has become a major public health problems especially in the developing countries. In many developing countries, the traditional complementary foods are the gruels prepared from cereals. The gruels from these cereals had been found to be of poor nutritional value, this is majorly responsible for high prevalence of undernutrition, notably protein-energy malnutrition (PEM) in Nigeria. The objective of this study was to formulate and prepare cheap and nutritious local complementary foods that can be used by Nigerian mothers

Methods: The study was an experimental study. Sorghum (Sorghum bicolor), maize, cowpea and (Vigna unguiculata), groundnut and crayfish were obtained from a local market in Ijebu-ode, Nigeria. The sorghum and maize were manually cleaned and were processed into flour using standardized fermentation and germination methods as described by (Ariahu, et al 2009), beans was processed using boiling method, groundnut, roasting method and crayfish drying method. The dried form of the items were dry milled into flour and packed into hermetically sealed container, eighteen samples were derived from the flour and thereafter, proximate and sensory analyses were conducted and results were presented in tables.

Results: The results of the proximate analysis of the complementary foods (CFs) showed that the moisture content of the CFs ranged from 4.00±1.79% for samples 1 to 9.12% for sample 10. The crude protein content ranged from 17.84±1.12% for samples 16 to 25.63v±0.89% for sample 6. The crude fibre content ranged from 1.64±0,36% to 4.63±2.89%. The antinutrient content of the complementary foods (phytate, oxalate and trypsin inhibitor) were determined. The phytate content ranged from 0.09±0.00mg/100g in sample 13 to 4.95±0.41mg/100g in sample 10. The results of the sensory evaluation of the best six complementary foods with the highest protein contents were conducted. In terms of colour and overall acceptability, sample 4 was most acceptable (7.76 and 7.67 respectively) and was more significantly different from others.

Conclusions: The protein content of the complementary foods increased as the content of both legumes increased since the content of the crayfish was constant.

Keywords: Complementary food, Malnutrition, Proximate analyses, Sensory Analyses

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DETERMINANTS OF UNDERNUTRITION AMONG YOUNG CHILDREN IN SOTNIKUM OPERATION DISTRICT, SIEM REAP, CAMBODIA

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Background and objectives: According to the UNICEF framework on the determinants of malnutrition, immediate causes of poor child nutritional status are inadequate dietary intake and poor health status which are, in turn, determined by access to food, to care to health (underlying determinants). To help at improving impact of nutrition programme, a better understanding of causes of malnutrition is essential especially in areas where malnutrition affects a significant proportion of young children. In Cambodia, stunting and wasting affect 32% and 10% of children below five years of age respectively. In Siem Reap province, these proportions are at 36% and 10%. The objective of this study is to assess the relationship between child nutritional status and its immediate and underlying determinants among a population of Cambodian young children.

Methods: Data of a current clinical trial investigating the impact of consumption and promotion of local foods on child nutritional status will be further analysed to respond to the aforementioned objective. The clinical study is a cluster-randomized controlled trial among children 6-23 months old (n=360) living in 14 randomly selected villages. Data on nutritional (anthropometry, haemoglobin, ferritin) and health status (c-reactive protein, intestinal parasites in faeces, occurrence of illnesses), dietary intake (24-hour recalls), food and health practices, household food security, access to health and socioeconomics have been collected at baseline and will be collected at endline. Anthropometry data were analysed using WHO Anthro. Dietary intake are currently assessed using Nutrific software. Household food security (HFI) will be assessed using the HFI Scale. The adequacy of dietary practices will be estimated using WHO indicators. Scores will be developed to assess health practices and health and responsive feeding. Descriptive analyses will be used to assess differences in nutritional status and correlations will be performed to test for association between nutrition status and its determinants. Regressions will be used to identify predictors of nutritional status.

Results: Data are currently analysed since baseline study has been finalized in February. Preliminary results on nutritional status reveal lower rates of undernutrition than expected: 19,5% stunting and 7,9% wasting. Moreover 7 out of 10 children (n=375) had a haemoglobin value below 11g/dl.

Conclusions: To come.

Keywords: young children, undernutrition, determinants, Cambodia

144/1365

LIVESTOCK OWNERSHIP IS ASSOCIATED WITH INCREASED ODDS OF ANEMIA AMONG PRE-SCHOOL-AGED CHILDREN, BUT NOT WOMEN OF REPRODUCTIVE AGE IN GHANA

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Background and objectives: Animal agriculture may help to mitigate anemia by providing access to nutrient-dense animal-source foods, but may also increase exposure to infections that increase the risk of anemia. The objective of this study was to determine the association between livestock ownership and anemia among women and children in Ghana.

Methods: We analyzed data from the 2014 Ghana Demographic and Health Survey (GDHS) using information on household livestock ownership that was collected through a quantitative survey. Capillary blood samples from women of reproductive age (15-49 years) (n = 4,798) and preschool-aged children (6-59 months) (n = 2,736) were analyzed using HemoCue photometer systems to assess hemoglobin (Hb) concentrations. Anemia was defined among non-pregnant women of reproductive age as Hb < 120 g/L, and among preschool-aged children as Hb < 110 g/L. In separate multiple logistic regression analyses for women and children we examined the association of household livestock ownership with anemia adjusting for the complex survey design of the GDHS and potential confounding covariates including socioeconomic status and infection indicators.

Results: In unadjusted analyses, household ownership of any livestock was positively associated with the prevalence of anemia among both women of reproductive age (44.3% of women from households with livestock were anemic vs. 40.3% without livestock; 2 = 7.8; P=0.005), and preschool-aged children (74.0% of children from households with livestock were anemic vs. 62.4% without livestock; 2 = 42.5; P<0.001). In multiple logistic regression analysis, household livestock ownership was not associated with anemia among women (OR (95% CI): 1.1 (0.88, 1.3)), but was associated with anemia among children (1.5 (1.1, 2.1)). Household ownership of chickens was associated with anemia in children (1.7 (1.3, 2.4), but ownership of no other animal species was independently associated with anemia risk in children.

Conclusions: Independent of socioeconomic status and infection indicators, livestock ownership in Ghana was associated with increased odds of anemia among young children, but not

among women. The association between livestock and anemia among children appears to be driven principally by ownership of poultry. Further research is needed to understand the potential nutrition- and/or infection-related mechanisms underlying these associations.

Keywords: livestock, anemia, poultry, malaria, Ghana

144/1374

UNFAVORABLE CONDITIONS FOR PHYSICAL ACTIVITY IN MEXICAN URBAN SCHOOLCHILDREN, A CHALLENGE TO OVERCOME IN PUBLIC POLICIES

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Background and objectives: Considering the need to have information about the physical activity performed by school children in order to design interventions for the prevention of childhood obesity, the purpose of this study was to describe the physical performance, self-efficacy for physical activity and physical inactivity in Mexican urban schoolchildren by gender and type of school, as well as to determine the differences by nutritional status.

Methods: A cross-sectional study was conducted in 396 schoolchildren from two public and two private schools from urban municipalities in the state of Hidalgo, Mexico. Weight, height and waist circumference (WC) assessments were performed with standardized personnel and calibrated equipment; a six-minute walk test (TM6), physical activity self-efficacy questionnaire (PASQ), and physical activity and inactivity questionnaire for the Mexican population (CAINM) were applied. The nutritional status was classified according to scores Z BMI (BMIZ) with WHO 2007 and school children with values> 90th percentile were diagnosed with abdominal obesity.

Results: In general, schoolchildren registered more than 50% of negative responses regarding the ability to perform physical activity in the PASQ; and an average of 3.2 ± 1.9 hours in front of the screen, being higher in male schoolchildren than in women

$(3.6 \pm 2.1$ vs $2.7 \pm 1.6)$ (p <0.01). Students with abdominal obesity ran a lower total distance compared to non-obese schoolchildren both in public schools $(509.3 \pm 51.5$ vs 541.4 ± 67.5 vs) and private schools $(548.7 \pm 70.8$ vs $526.1 \pm 54.3)$ (p <0.01), without detecting differences by nutritional status with BMIZ. A low correlation of hours of physical inactivity with the nutritional status was found $(r \leq 0.17, p <0.05)$.

Conclusions: Schoolchildren with abdominal obesity showed a lower physical performance compared to normal weight children. Self-efficacy for physical activity in schoolchildren was notoriously low, and the majority did not fulfill the recommendation of spending less than two hours watching TV or playing video games; the above is a challenge to overcome in public policies to promote physical activity in schoolchildren.

Keywords: Physical performance, physical inactivity, childhood obesity, self-efficacy

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DETERMINATION OF BODY MASS INDEX, PHYSICAL ACTIVITY LEVELS, PHYSICAL ACTIVITY'S BEHAVIOR AND AUTO-EFFICACY AND THEIR RELATIONSHIP IN ECUADORIAN WORKERS DURING 2006

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Background and objectives: Physical inactivity (PI) is a major risk factor for morbidity and premature mortality. However, the prevalence of PI, physical activity's behavior, barriers and auto-efficacy are unknown in Ecuadorian workers. This study aimed to determine Body Mass Index (BMI), Physical Activity (PA) levels, physical activity's behavior, PA barriers and auto-efficacy, and their relationship in Ecuadorian workers during 2006.

Methods: Through a medical story the following information was collected: 1. Sociodemographic information; 2. BMI; 3. PA levels were measured by the International Physical Activity Questionnaire; 4. Stage of Change (SOC) behaviors were measured in accordance to the Trans Theoretical Model; 5. Auto-efficacy and PA barriers were measured by questionnaire. Descriptive statistics, chi- squared test and factorial analysis of multiple correspondences were used.

Results: The prevalence of PI is 65.3%. The prevalence of excess of weight is 50% (40.8% overweight, 9.4% obesity). Overweight is higher in men (p<0.001), married (p=0.000), with primary educa-

tion (p=0.024) and increase with age (p<0.000). Physical activity SOC is associated with PA levels (p=0.000). Sedentary and inactive subjects are classified mainly in lower PA SOC (contemplation, pre contemplation and preparation), whereas active and very active subjects are categorized mostly in PA SOC maintenance. Subjects who are classified in PA SOC action and maintenance are mainly men (39.8%), with high school education (41.8%) and belong to 18-29 group age (41.6%). PA auto-efficacy levels are associated with BMI. Lower PA auto-efficacy is associated with overweight and obesity.

Conclusions: The prevalence of physical inactivity and obesity is high in apparently healthy workers at a private enterprise in Ecuador.. Being obese and lack of time are common barriers for practicing PA. The PA's SOC are associated with PA levels. Research findings were used for designing and implementing a life promotion program at workplace investigated. It includes PA counselling for preventing and managing PI. It includes physical activity SOC and PA auto-efficacy levels.

Keywords: physical inactivity, behavior, obesity
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144/1378

EFFECTS OF MASIMA: A NATIONWIDE STRATEGY TO REDUCE SALT INTAKE IN SAMOA

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Background and objectives: Salt reduction is considered one of the most cost-effective and affordable interventions for the prevention of non-communicable diseases, but there are no studies evaluating the effectiveness of national strategies in low or lower-middle income countries. This study aimed to measure the effect of a national salt reduction strategy in Samoa with a view to sharing experiences to enhance future large-scale programs.

Methods: An 18-month multi-faceted salt reduction program was implemented in Samoa comprising of activities designed to influence policy, mobilise the community and raise awareness. Two nationally representative cross-sectional surveys of adults aged 18 to 64 years, measuring salt intake through 24-hour urine and knowledge, attitudes and behaviours related to salt, were conducted before (2013) and after (2015) the intervention to evaluate its impact.

Results: There were 234 participants at baseline (RR 47%) and 479 at 18 months (RR 61%) and samples were balanced in terms of age, gender, area, education and employment. There was no significant change in mean population salt intake between 2013 (7.31g/d) and 2015 (7.50g/d) (0.19, 95% CI -0.50 to 0.88; p=0.588). However, there were significant reductions in the proportion of the population who always or often; use discretionary salt when eating (-16.2%, p=0.002) and consume processed foods (-11.0%, p=0.02), increases in the population who understood the adverse health effects of high salt consumption (+9.0%, p=0.049) and used one or more methods to control their salt intake (+20.9%, p<0.001). 73% of the population reported that they had heard or seen messages from the salt reduction campaign.

Conclusions: Despite some population improvements in salt-related behaviours and knowledge after the intervention, there was no change in 24-hour urinary salt excretion. Inconsistencies in survey methodology, limited intervention dose and duration and the influence of a secular upward trend in salt intake are potential reasons for this. The widespread reach of the salt reduction messages and improvements in knowledge and behaviour suggest that the foundation for further interventions and improvements is in place. Structural policies to lower salt in the food supply and improve the environment are required to achieve a sustained reduction in population salt intake and blood pressure.

Keywords: sodium, public health nutrition, hypertension, NCDs, low and middle income countries.

Conflict of Interest Disclosure: JW is Director of the World Health Organization Collaborating Centre on Population Salt Reduction with a remit to support countries to implement and evaluate salt reduction programs in line with the WHO target for all countries to reduce population salt intake by 30% by 2025. All other authors declare that they have no conflicts of interests related to this study.

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MEAN DIETARY SALT INTAKE AND THE ASSOCIATION WITH KNOWLEDGE, ATTITUDES AND BEHAVIOURS IN A POPULATION FROM NORTH AND SOUTH INDIA

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Background and objectives: The scientific evidence base in support of population wide salt reduction is strong but current high quality data about salt intake levels in India are mostly absent. We sought to establish any associations between estimated daily salt consumption levels measured through 24-hour urinary sodium excretion and knowledge, attitudes and behaviours towards salt in selected communities of Delhi and Haryana in North India and Andhra Pradesh in South India.

Methods: Data were collected through a cross-sectional survey comprising a single 24-hour urine sample, participants' physical measurements and questionnaire data on consumer knowledge, attitudes and behaviour towards salt, in an age-and sex-stratified random sample of 1395 participants in urban and rural areas of North and South India. Measures were made for the overall population of each region and major subgroups by weighting the survey data to the population of Delhi and Haryana, and Andhra Pradesh.

Results: Complete 24-hour urine samples and data on KAB were available for 637 individuals from Delhi and Haryana and 758 from Andhra Pradesh (65% and 68% response rate, respectively). The mean age of participants was 40 years, 47% were women and mean 24-hour urinary salt excretion was 9.3 (8.9–9.7) g/day. Many participants reported favourable knowledge and behaviours to minimise risks related to salt. Several of these behaviours were associated with reduced salt intake—less use of salt while cooking, avoidance of snacks, namkeens (savoury snacks), and avoidance of pickles (all $p < 0.003$).

Conclusions: Salt consumption in India is high, with mean population intake well above the WHO recommended maximum of 5g/day. Several consumer behaviours related to use of salt during food preparation and consumption of salty products were related to actual salt consumption and therefore appear to offer an opportunity for intervention. A national salt reduction programme, including community-wide education as part of a multifaceted strategy, would prevent large numbers of cases of hypertension as well as strokes and heart attacks, averting much premature death and disability

Keywords: India, salt, sodium, hypertension, 24-hour urinary sodium

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TRADITIONAL DIETARY PATTERNS INCREASE THE RISK OF BREAST AND PROSTATE CANCER IN SMOKERS WITH OVERWEIGHT IN ARGENTINA

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Background and objectives: Traditional dietary patterns characterized by fatty red meat, processed meat, starchy vegetables, sugars and sweets, candies, fats and vegetable oils in male and by fatty meat, barkery products and vegetable oils in female population, were identified in Córdoba (Argentina). A high adherence to these dietary patterns has been associated with an increased risk of prostate cancer (PC) and breast cancer (BC), in men and women respectively. The aim of this study was to analyze whether the association between adherence to Traditional Pattern and the risk of PC and BC differs according to smoking habit and weight status.

Methods: Two case-control studies were conducted in Córdoba in 2008-2014 including 147/300 cases/controls of PC and

318/526 of BC. Adherence of each subject to Traditional Pattern identified through a principal component factor analysis was estimated. Two level logistic regression models were fitted using interaction terms of smoking habit (smoker-no smoker), weight status (normal weight-overweight) and tertiles of adherence to Traditional Pattern as covariates at level 1, and family history of the disease as clustering variable at level 2.

Results: An increased risk of BC was stronger in smokers with overweight who simultaneously have a high adherence to Traditional Pattern (OR: 2.54; 95%CI: 1.16-5.56). Interaction of high adherence to Traditional Pattern and overweight was significant and associated with an increased risk of PC (OR 2.73; 95%CI: 0.97-7.67). There were no interactions among smoking habit and weight status on PC risk. When stratifying by smoking habit, a greater risk of PC in smokers with overweight and high adherence to Traditional Pattern (OR: 3.52; 95%CI: 0.97–12.76) was found.

Conclusions: A particular emphasis would be made on smoking and other lifestyle conditions, when promoting healthy eating habits.

Keywords: Dietary patterns; breast cancer; prostate cancer; smoking habit; overweight.

144/1385

THE CO-OCCURRENCE OF ANEMIA AND STUNTING IN YOUNG CHILDREN

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Background and objectives: Anemia and stunting are prevalent nutritional problems among children of low- and middle-income countries that have profound effects on child development, morbidity, and mortality. A single conceptual framework is used often to identify the basic determinants of these and other forms of malnutrition. One would expect that problems with matching underlying determinants should co-occur in effected communities and individuals to a greater degree than by chance. We know from ecological analyses that stunting and anemia cluster across types of countries and their regions but is this also the case at the level of individuals, a question seldom asked and which we address.

Methods: In two separate populations of children – ages 6-18 months in Bihar, India (n=5664) and 0-36 months in Lambayeque, Peru (n=840) – we measured the frequency of the co-occurrence of anemia and stunting. We compared this value to the value expected by chance, the product of the prevalence of anemia and stunting using a chi-square test. Using an iterative model selection process, we built explanatory logistic regression models for each condition.

Results: The frequency of co-occurrence in the Indian population was 21.5%, and in the Peruvian population it was 27.1%, which are similar to frequencies expected by chance, 21.3%

(p=0.97) and 28.0% (p=0.87) respectively. In both populations, anemia was associated with sex, while stunting was associated with age, sex, wealth, and social standing (caste or indigenous). In the Peruvian population, anemia was also associated with age, while stunting was associated with dietary diversity over the past month. In the Indian population, anemia was also associated with caste, dietary diversity over one day, and household hunger, while stunting was associated with maternal illiteracy.

Conclusions: These results suggest that the co-occurrence of anemia and stunting in individuals is as expected by chance, despite some shared basic factors (sex, age, and caste). Anemia and stunting should be treated as independent and addressed according to their context-specific causes.

Keywords: anemia, stunting, co-occurrence, infant nutrition

Conflict of Interest Disclosure: The authors have no conflicts of interest to declare. The Bill and Melinda Gates Foundation funded the original trial in Bihar, India. The regional government of Lambayeque, Peru funded its baseline survey.

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EVALUATION OF THE NUMBER OF DEATHS FROM MALNUTRITION IN SOUTH AMERICA IN THE PERIOD 1997 TO 2012

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Background and objectives: Background: Hunger is one of the main references in world politics, however thousands of people die every year because of the food starvation, South America is a reference of great availability and variety of foods, but it is no stranger to deaths from malnutrition. Objective: To evaluate the number of deaths from malnutrition in South America in the period 1997 to 2012.

Methods: Materials and methods: We used the database reported by the Pan America Health Organization (PAHO) which was accessed in March 2017 and complemented with databases of food availability and GDP from the FAOSTAT. The GENERAL LINEAR MODEL was used in order to carry out the contrasts between countries of South America incorporating the Tukey test, based on a statistical significance level of 5% Additionally the multivariate Biplot technique was carried out, which aims to relate the different years evaluated by projecting the countries and was complemented with cluster analysis, to establish typologies or groups according with the dynamics of the variables. We used statistical packages SAS UNIVERSITY and R version 3.0.0.

Results: The highest number of deaths occur in child under one year, from one to four years and from 65 years of age. Brazil

is the country of South America where more deaths from malnutrition presented, followed by Colombia and Argentina. The countries in which are presented under statistics of deaths from malnutrition are Uruguay, Bolivia, Paraguay, and Chile.

Conclusions: Notwithstanding that the countries of South America have great availability of foods, the deaths from malnutrition are still prevalent in most of the continent.

Keywords: Hunger, malnutrition, Food safety

144/1387

IN-STORE FOOD ADVERTISING IN BRAZIL: DIFFERENCES BY STORE TYPE AND NEIGHBORHOOD CHARACTERISTICS

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Background and objectives: Exposure to advertising within retail food stores may influence food purchase and consumption, and ultimately health conditions. Understanding the nature and heterogeneity of in-store advertising is therefore crucial. The objectives of this study were to: (1) describe the availability of in-store food advertising; and (2) examine differences in the availability of in-store advertising by store type and neighborhood socioeconomic characteristics.

Methods: This was a cross-sectional study conducted in 2010-2011 in Sao Paulo city, Brazil. Our sample included all retail food stores in 52 census tracts, representing neighborhoods of high, medium and low socioeconomic strata. Retail food stores were categorized as (1) grocery stores and supermarkets and (2) limited-service stores [fruit and vegetable (F&V) specialty stores, convenience stores, bakeries/delis, and corner stores]. Data were collected using a reliable Food Store Observational Tool. Counts of different signs/advertisements of F&V, sugar-sweetened beverages (SSB) and snacks (cookies and salty snacks) were recorded. Mixed-effects Poisson regressions with robust variance and clustered at the census tract where each store were located were used to estimate the relationships between recorded foods and neighborhood socioeconomic characteristics (percent black and mixed-race residents and income of the head of the household) and store type.

Results: The sample included 9 grocery stores and supermarkets (2.9%), 229 corner stores (75.1%), 60 convenience stores (10.7%), and 7 F&V specialty markets (2.3%). F&V were advertised in 26.0% of the stores where F&V were sold (23.9% of the total sample of stores), and 19.0% had in-store advertising for SSB/snacks (96.1% of the stores sold these products). Advertising for both F&V and SSB/snacks was 2.5 times more prevalent in grocery

stores and supermarkets than in other store types. Availability of F&V in-store advertising did not vary by neighborhood characteristics. Although stores located in low-income areas were more likely to sell SSB/snacks, no differences were found for advertising.

Conclusions: Advertising for F&V and SSB/snacks was more prevalent in grocery stores and supermarkets. However, availability of advertising for these products did not vary by neighborhood socioeconomic characteristics. Policies aimed at regulating unhealthy foods advertising should include in-store advertising and reach people from different socioeconomic backgrounds.

Keywords: Advertising, Food Retail Stores, Brazil, Sugar-sweetened beverages

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144/1389

"HEALTHFULNESS" OF CANADIAN PACKAGED FOOD PRODUCTS WITH AND WITHOUT HEALTH-RELATED CLAIMS: AN INFORMAS-BASED APPROACH

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Background and objectives: The increase in diet-related non-communicable diseases (NCDs) is a concern and actions are needed to reduce this health burden. Obesogenic food environments are a key factor and it is therefore important to assess the nutritional quality (e.g., "healthfulness") of the food supply, including health-related labelling on food packages. In Canada, the "healthfulness" of foods is not a criterion required for a product to carry a health-related claim and it is unknown if products carrying health-related claims are "healthier" than those which do not. This study examined the health-related claims displayed on the "healthiest" and "least healthy" food categories in the Canadian food supply using the internationally standardized International Network for Food and Obesity/NCDs Research, Monitoring and Action Support (INFORMAS) taxonomy.

Methods: Cross-sectional analysis of the University of Toronto 2013 Food Label Information Program, a database that contains information on pre-packaged products (n=15,342) of the Canadian food supply. The six "healthiest" and six "least healthy" food categories were determined using the Food Standards Australia New Zealand Nutrient Profiling Scoring Criterion (FSANZ-NP-SC). Health-related claims were classified using the INFORMAS taxonomy.

Results: Analyses included 7055 products in the "healthiest" and "least healthy" food categories. Among these products,

38.6% of products were considered "healthy" (n=2,721). Any type of health-related claim was carried on 63.3% of products classified as "healthy", whereas 45.5% of "less healthy" foods displayed health-related claims on their food labels. Nutrient content claims were the most popular claims used on "healthy" (55.8%) and "less healthy" foods (30.5%). Nutrient-function type claims were the least used: 2.2% and 0.3%, respectively for "healthy" and "less healthy" foods.

Conclusions: A substantial proportion of health-related claims were displayed in "less healthy" foods, potentially misleading consumers towards less nutritious choices.

Keywords: Nutrition labelling, Health-related claims, Public health, INFORMAS

Conflict of Interest Disclosure: Prior this study Beatriz Franco-Arellano was a PepsiCo employee. The company had no connection with the research. The rest of the authors have no conflicts.

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144/1396

IMMIGRATION AND CULTURAL IDENTITY: HOW TO CONSIDER THESE DIMENSIONS IN THE NATIONAL SCHOOL FEEDING PROGRAM

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Background and objectives: The cultural dimension of eating, intricate in the symbolic value of food, is strongly related to the identity and sense of social belonging to a territory. Immigration is a constant movement in Brazil, making the environment changeable and alive. The present work intended to analyze and discuss the normative bases of the National School Feeding Program (Programa Nacional de Alimentação Escolar - PNAE) in relation to the incorporation of the perspectives of cultural identity, culture and immigration and to describe the profile of immigrant students enrolled in 2016 in the municipal education of São Paulo.

Methods: In relation to the incorporation of the cultural identity and immigration perspectives a documentary analysis and a PNAE's normative bases discussion were carried out using a qualitative approach. A description of the immigrant students profiles enrolled in the Sao Paulo's municipal education system in 2016 was also made.

Results: The word culture appears in the selected documents as a guide and reference for food choice, culinary traditions and habits. Regarding immigration and its derivations, no citation was found. In relation to the profile of the immigrant students enrolled in the network, it is noticed that the great majority of these students are Bolivian (58%), followed by Angolans (11%) and the Japanese (5%).

Conclusions: Judging from the numbers found in the databases, the number of immigrants enrolled in the municipal education network is still not significant for measures in the normative bases of the PNAE to be taken. However, discussing cultural identity through experiences among the students themselves and between the educators can represent a more respectful and receptive generation.

Keywords: Immigration, Cultural Identity, Brazilian National School Feeding Program.

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144/1412

RELATIONSHIP BETWEEN VITAMIN K INTAKE AND BODY COMPOSITION INDICATORS

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Background and objectives: In contrast to other fat-soluble vitamins,little is known about the association between vitamin K and adiposity. Is assumed that this vitamin is fat soluble,therefore it can be considering that the adipose tissue may physiologically serve as a storage site for the same. However,the action of vitamin K on adipose tissue as well as the metabolic implications are not yet elucidated.Research into the association between vitamin K intake and body composition may contribute to identifying additional metabolic pathways that relate micronutrient inadequacy to obesity.Thus,the objective of this study is to investigate the relationship between vitamin K intake and body composition indicators between adults and elderly.

Methods: We evaluated 293 individuals of both sexes,adults and elderly participants of the ISA- Capital 2014 survey (cross-sectional study using a population-based household survey). Vitamin K intake was evaluated by means of a 24-hour food recall performed on two non-consecutive days, with an interval of more than one week, in person and by telephone. In order to structure the data collection in detail, the procedures described in the Multiple Pass Method developed by the United States Department of Agriculture were used. Body composition was assessed by means of anthropometry (weight and height) and dual-energy X-ray absorptiometry(DXA) by means of which the absolute values of fat and lean mass were obtained and the Fat Mass Index (FMI) and Appendicular Lean Mass Index (ALMI) by IMC. Linear Person Correlation, Pearson's Chi-Square test and Multiple Linear Regression were used. Significance was set at $P < 0.05$.

Results: 28.86% of the individuals were classified as obese (BMI>30 kg/m²). According to the FMI, 74.83% of the individuals have excess body fat and in relation to the lean mass, 83.89% presented adequate values according to the ALMI (by BMI). Vitamin K intake was associated only with the FMI (p=0.027).There was no correlation between vitamin K intake (p=0.78),BMI (p=0.47), body fat and lean mass in kg (p=0.93 and p=0.85, respectively) and ALMI (p=0.79).

Conclusions: Intake of vitamin K was only associated with FMI.This fact may be related to a better quality of the diet, considering that vegetables are among the main sources of vitamin K.

Keywords: Vitamin K. Food intake. Body composition. Obesity.

144/1419

AN EVALUATION OF THE HEALTHINESS OF PACKAGED AND PROCESSED FOODS SOLD BY MAJOR MANUFACTURERS IN INDIA

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Background and objectives: India is one of many countries facing a rapid rise in overweight, obesity and diet-related non-communicable diseases. Around 20% of children and adolescents are overweight, and India now ranks third in absolute numbers of obese people after the United States and China. The traditional Indian diet based upon fruits, vegetables, unprocessed cereals and pulses is being eroded by packaged and processed foods high salt, sugar and harmful fats. To contribute to the first India Access To Nutrition Index, our objective was to determine the healthiness of packaged processed foods sold by major manufacturers in India.

Methods: Nutrient information for 943 packaged foods and drinks sold by the 11 largest manufacturers between 2014 and 2016 was obtained from product packaging, company websites or directly from the company. The Australian Health Star Rating (HSR) and the World Health Organization's European Regional Office (WHO EURO) nutrient profile models were used to analyse the nutritional quality of the products. Each company was ranked by the mean HSR of their portfolio, the proportion of 'healthy' products using a HSR cut-off of 3.5 out of 5.0 stars, and the proportion of products meeting WHO EURO criteria. Analysis was undertaken both at the company and food category level; both with and without sales-weighting.

Results: The mean HSR of products was low overall (1.9 out of 5.0) with substantial variation between companies (mean 0.6 to 2.7). Only one in six products were 'healthy' (HSR>=3.5) and only 9% met WHO criteria for marketing to children. There were marked differences in the healthiness of similar products within food categories. There was some variation of company rankings depending upon the metric of healthiness used and whether rankings used estimates that were or were not weighted for sales.

Conclusions: The healthiness of packaged food products made by the largest manufacturers in India was sub-optimal. Improvements in product mix and reformulation of less healthy products should be priorities for companies. The Government of India could support corporate actions by strengthening nutrition labelling requirements and establishing targets for reductions in salt, sugar and fat in packaged foods.

Keywords: public health, packaged foods, nutrient profiling, food manufacturers, India

Conflict of Interest Disclosure: Alexandra Jones, Elizabeth Dunford, Fraser Taylor, Thout Sudhir Raj, Mike Rayner and Bruce Neal received support of a grant from the Access to Nutrition Foundation for this research.

144/1434

INTAKE AND DIETARY SOURCES OF CALCIUM AMONG AUSTRALIAN ADOLESCENTS AND YOUNG ADULTS

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Background and objectives: Adolescence to young adulthood is an important transitional phase, with high requirements for calcium. The Nutrient Reference Values in Australia are 1300 mg for adolescents and 1000 mg for young adults. This study aimed to examine the calcium intake of adolescents and young adults in Australia from food sources and supplements, taking consideration of lifestyle, anthropometry and socio-demographic variables.

Methods: This study utilised dietary data from 490 adolescents (14-18 years) and 561 young adults (19-25 years) from the 2011-12 National Nutrition and Physical Activity Survey. A single 24-hour recall was used to the estimate the mean intake of calcium which included food and supplements. Descriptive statistics were used to report the calcium intake for plausible reporters (energy intake vs. Basal Metabolic Rate ≤0.87 to ≥2.67). Chi-square, trend analysis and linear regression were conducted to identify associations between calcium intake and anthropometric and demographic characteristics and consumption of other food groups.

Results: Total calcium intakes (foods and supplements) were a mean (SD) of 905.5 (501.9) mg for adolescents and 913.1 (504.3) mg for young adults. Calcium supplement use was relatively uncommon, and provided 0.8% and 1.0% of total intake for adolescents and young adults, respectively. Adolescent females had much

lower calcium intakes 775.5 (435.4) mg compared to males 1048.4 (588.7) mg, as did young adults 835.7 (474.6) mg for females and 1014.2 (544.3) for males. The food sources contributing to calcium were similar across age groups and gender, with regular milk (15-24%), cheese (10-12%), refined low fibre bread (10%) and low fat milk (7-9%) as the largest contributors of calcium. Alternative milk beverages contributed <1% to calcium intake. Higher intake of core food groups (vegetables, fruits, dairy) and BMI was associated with higher calcium intakes for adolescents and young adults adjusted for energy intake. For both adolescents and young adults, a higher socio-economic status was associated with greater intakes of calcium.

Conclusions: Mean calcium intake among Australian adolescents and young adults remains below recommendations, especially in females. The findings from this study will be used to inform the development of future interventions.

Keywords: Calcium, dairy, adolescents, young adults, nutrition survey

144/1447

PROCESSED MEAT CONSUMPTION WAS ASSOCIATED WITH HIGHER BODY MASS INDEX AND POORER DIET QUALITY, COMPARED TO RED MEAT AND POULTRY

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Background and objectives: The nature and extent of the relationship between red meat, poultry, and processed meat consumption and obesity and total diet quality has not been clearly established. This study aimed to investigate the associations between red meat/poultry/processed meat consumption and diet quality, taking consideration of demographic and anthropometric characteristic, lifestyle factors, consumption of other food groups and other relevant nutrients and nutrient biomarkers.

Methods: This study utilised 24-hour recalls of 9,113 adults participating in the 2011-12 National Nutrition and Physical Activity Survey and National Health Measures Survey. Red meat, poultry, and processed meat consumption data were captured in detail from all meals and recipes. Chi square analysis and multivariate regression models were conducted to examine the association between red meat/poultry/processed meat consumption and anthropometrics, demographic categories, weight status, intakes of different food groups, nutrients, and nutrient biomarkers.

Results: Approximately 49% of respondents consumed red meat (mean per-capita intake: 57g), 38% consumed poultry (42g), and 39% consumed processed meat (28g). Higher consumption of red meat and processed meat but not poultry was associated

with greater Body Mass Index (BMI). Red meat, poultry, and processed meat consumption all increased with Waist Circumference (WC). Consumption of vegetables was positively associated with red meat but inversely associated with poultry and processed meat consumption. Discretionary foods/beverages consumption was associated with processed meat consumption. Compared with the nutrient intake profiles from red meat and poultry, processed meat consumption was associated with lower protein, long-chain omega 3 fat, niacin equivalents, vitamin C, magnesium, and potassium intakes and vitamin D biomarker, and the highest total fat, saturated fat, and sodium intakes and sodium biomarker.

Conclusions: Processed meat consumption was associated with higher BMI/WC and poorer diet quality, compared to red meat and poultry.

Keywords: Processed meat; red meat; poultry; obesity; diet quality

144/1451

PRIMARY PREVENTION OF EXCESSIVE FAT GAIN AMONG 2-6 YEAR OLDS. RESULTS FROM THE "HEALTHY START" RANDOMIZED INTERVENTION

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Background and objectives: Previous obesity prevention interventions all targeted groups where both normal weight and overweight children were present, e.g. in school settings. Only about 1/4 of these previous interventions were effective in reducing weight gain, and studies have proposed, that the few positive effects were restricted to those already overweight, or to high-risk individuals. The objective of this primary prevention RCT was to examine, if excessive weight and fat gain over on average 1.3 years can be prevented among normal weight, but obesity susceptible, young children aged 2-6 years. ClinicalTrials.gov NCT01583335.

Methods: All children born in 2004-2007 from 11 greater Copenhagen municipalities, with either a high birth weight, maternal pre-pregnancy obesity, or maternal low education, were identified from public registries, and invited to participate. Totally 21% agreed to be included (n=635) and were randomized as interven-

tion or control children. All children who were already overweight or obese were subsequently excluded (n=92). The intervention delivered improvement in diet and activity habits, optimization of sleep quantity and quality, and reduction of stress.

Results: Intention-to-treat analyses showed a lower gain in %-fat mass in the intervention group compared to the control group (difference D=-2.1% (95% CI -3.7; -0.5; p=0.01)), but non-significant differences in BMI z-score gains (p=0.55).

Conclusions: Gain in fat may be prevented among normal weight young children at high risk of future obesity, suggesting not only a more favorable growth, despite a similar weight development, but also that primary prevention of obesity is possible.

Keywords: Primary weight gain intervention, individualized family intervention, pre-school age, sleep optimization, stress management.

ASSOCIATIONS BETWEEN BODY MASS INDEX AND EATING DISORDER SYMPTOMS AMONG ADOLESCENTS IN POLAND

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Background and objectives: Eating disorders are characterized by changes in eating patterns associated with low self-esteem, perfectionism, poor empathy, and an obsession with a body image. The aims of presented study were: 1. Determination of eating disorders risk among Polish adolescents; 2. Evaluation of the relationship between BMI and eating disorder symptoms.

Methods: A cross-sectional survey was performed in a random sample of adolescents from secondary and high schools of Southern Poland, aged between 13 and 19 years old. Information on weight control concerns and behaviors, and eating disorder symptoms (EDI) has been collected using a self-administrated questionnaire. Data obtained from questionnaire were analyzed with using multiple logistic regression model. Differences between categorical variables have been tested by chi-square test. Crude odds ratios (OR) have been calculated to evaluate the risk of independent variables and associated 95% confidence intervals. Statistical analysis has been performed with R software (2.15.3 version), GLM procedure.

Results: A total of 3572 adolescents (average age 16.13±1.54) have been analyzed (1899 girls and 1673 boys). Overweight was stated in 19.7% of examined girls and in 22.6% of boys, and underweight in 27.7% of girls and 6.5% of boys. Symptoms of eating disorders were observed in 11.6% of girls (n=414). There was no significant association between BMI and body dissatisfaction among boys. Weight control behaviors were more characteristic for girls. Overweight and underweight among girls were associated with high score of drive for thinness, body dissatisfaction, bulimia and low self-esteem.

Conclusions: Weight control behaviors may be considered as one of indicators of the association between BMI and eating disorder symptoms. The risk of eating disorders is more characteristic for adolescent girls and more educational and intervention programs is needed especially in this group of teenagers.

Keywords: Eating disorders, adolescents, BMI, self-esteem

"DISCRETIONARY FOODS" VERSUS "ULTRA-PROCESSED FOODS" – COMPARISON OF THE AUSTRALIAN DIETARY GUIDELINES FOOD CATEGORIZATION AND THE NOVA PROCESSED FOOD CLASSIFICATION SYSTEM

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Background and objectives: The Australian Dietary Guidelines (ADG) categorize foods into core and discretionary foods on the basis of their nutrient contribution, and advises limiting the intake of discretionary choices. A new food classification system (NOVA) has been proposed which categorizes foods by the level of processing, with processed foods, particularly the most highly processed category called ultra-processed foods, being associated with lower overall diet quality. This study aimed to apply the two systems to the current Australian diet and examine the coherence between discretionary food and ultra-processed food.

Methods: All foods, beverages, and recipes in the Australian Food and Nutrient database 2011 (AUSNUT) were categorised: 1) as core or discretionary food according to ADG criteria; and 2) according to the degree of processing based on the NOVA criteria (unprocessed food, culinary ingredient, processed food, ultra-processed food, or mixed dish containing multiple degrees of processing). Both categorisations were applied to dietary data collected using 24-hour recalls of 9,431 adults participating in the 2011-12 National Nutrition and Physical Activity Survey (NNPAS) in order to calculate the proportion of energy contribution from each category.

Results: Of the 1,616 discretionary food items within AUSNUT, 15% were classified under NOVA as processed, 40% as

ultra-processed and 40.5% as mixed dishes containing a large proportion of ultra-/processed food. Data from NNPAS showed discretionary food consumption contributed approximately 33.7% of total energy intake in Australia. In comparison, ultra-processed food (20.7%) and processed food (23.5%) together contributed 44.2% of total energy intake. Among Australian adults, less than a quarter of total energy intake was contributed by unprocessed foods (22.3%).

Conclusions: Ultra-processed foods make up a significant proportion of the discretionary food consumed by Australians. However, the definition of discretionary does not strongly correlate with the degree of food processing. The two food categorization systems thus measure different dietary features within the same population. It remains to establish their relative merits as guides for research, dietary advice and public health policy.

Keywords: Foods; processed; ultra-processed; database; NOVA

144/1456

ADDRESSING THE ROLE OF PROXIMAL DETERMINANTS OF UNDERNUTRITION: COMMUNITY BASED PARTICIPATORY RESEARCH (CBPR) IN BUKOBA RURAL, REPUBLIC OF TANZANIA

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Background and objectives: In Tanzania, undernutrition among children and mothers, especially in rural areas, is a common phenomenon. Evidence-based strategies for nutrition intervention mainly address direct determinants such as food intake whereas, community based interventions tend to have higher efficacy when combined other proximal determinants such as women's economic and social empowerment. Women's education, access to economic means of production, ownership of assets and ability to purchase inputs are very limited, which increases their income and food insecurity.

Objective: to create cooperative farming project a collective way to cultivate soybean to improve the quality of the existing diet and an infrastructure to effect the women's economic sustainability and empowerment.

Methods: The orientation of this project is Community Based Participatory Research (CBPR) which begin with a research topic of importance to the community with an aim of combining knowledge and action for social change to improve community health. Focus groups of Bukoba Women's empowerment Association (BUWEA) were conducted to share the findings of the first Tanzania Mainland Nutrition Survey. The focus group discussions led to identification of direct determinants of undernutrition as lack of availability; accessibility; and utilization of food whereas identified proximal determinants were women's lack of sustainable purchasing power; decision making power; business acumen; horticultural and technical assistance. These latter implied the lack

of women's social empowerment in their family and community context.

Results: BUWEA members (420) were provided minimal financial resources and technical expertise to grow soybean on 20 acres of land. After this initial harvesting, educational interventions on related topics as benefits and uses of soy in local diets; accounting and business skills; marketing; value added products, and grant writing. Women's Economic Development Personal and Social Impact Survey (WEDIS), administered in Swahili indicated significant consumption of soy in family diets, along with evidence of increased knowledge application in business and farming skills, utilization of technology, greater involvement in family decision-making, and more participation in social/political affairs. These are relevant indicators of women's personal and social empowerment in developing countries.

Conclusions: Recognizing a community as an essential research partner is key element of CBPR

Keywords: Community Based Participatory Research/CBPR, Social Empowerment, Undernutrition

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144/1474

NUTRITION TRANSITION ACROSS FOUR POPULATIONS IN PAPUA NEW GUINEA: DIFFERENCES IN DIETS, FOOD PREPARATION AND EATING BEHAVIOURS

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Background and objectives: As with most developing countries Papua New Guinea (PNG) is undergoing rapid economic development which is expected to have an important impact on dietary habits and population health. However, the type and rate of change is expected to vary greatly across cultural groups in PNG and affected by extent of economic development. Understanding these differences is fundamental to developing effective health promotion measures. This study examined dietary patterns in four populations groups in PNG with different exposures to a major project.

Methods: The study applied a cross-sectional design conducted in two phases. Phase one used observation and participatory methods to document diet patterns and validate methods. Phase two used the four step 24-hour recall to collect detailed descriptions of intakes. Study sites included two coastal locations (Hiri, Karkar) and two in the highlands (Hides/Komo, Asaro), with a major project affecting Hiri and Hides/Komo. In phase one, 220 households

and 448 adults were involved, and phase two had 3247 participants selected purposively to reflect SES profile in the populations.

Results: Major components of traditional diets continue to exist in rural areas with more than 70% of participants consuming traditional staples (sweet potato, banana). However, all study sites incorporated store-bought food items. A majority of participants in Komo/Hides, Asaro, and Karkar consumed 20-30% of their diet as rice and tinned fish while it was 70-80% in Hiri. Vegetable oil was widely used in food preparation though used differently across sites - in the Highlands added either when boiling food or after the food is cooked while in Hiri frequently used for frying. Eating behaviours (types of meals, number of meals per day, snacking behaviours) differed by sites reflecting cultural norms.

Conclusions: The level and nature of diet change differed across study sites. Even though traditional diets were common, modern Western foods were essential dietary components with extent of use associated with project exposure. This may predict both favourable and adverse health outcomes. The results show a need to consider differences across populations in the way that the nutrition transition occurs, and to ensure that health promotion measures are suitable.

Keywords: Papua New Guinea, diet, eating behaviour, Western food, traditional

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144/1477

IRON INTAKE ASSOCIATED WITH SOCIAL FACTORS AMONG WOMEN OF REPRODUCTIVE AGE IN JAPAN: FINDINGS FROM THE NIPPON DATA2010

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Background and objectives: This study aimed to examine the relationship between iron intake and social factors among women of reproductive age in Japan.

Methods: A baseline survey of a prospective cohort study, which is entitled NIPPON DATA2010, was conducted along with the National Health and Nutrition Survey of Japan in November 2010. A total of 486 women aged 20-49 years old participated in the study were included in the analysis after excluding ineligible observations. Adequate iron intake was defined if the amount of iron intake was 9mg and more per day in accordance with the recommendation amount of Dietary Reference Intakes for Japanese (2015). Multivariable logistic regressions were performed to assess the relations between social factors as independent variables and iron intake. Social factors were educational status, marital status, household income, job, regional area and BMI. Total energy and some food groups such as pulses and vegetables were included in this analysis as confounding factors.

Results: The prevalence of adequate iron intake among women of reproductive age was 21.0%. After adjustments for confounding factors, women with lower household income (adjusted odds ratio (OR) 2.28, 95% confidence interval (95%CI) 1.28-4.05) was more likely to have poor iron intake, while women lived in southwest Japan (OR 0.47, 95%CI 0.23-0.95), women with underweight (OR 0.48, 95%CI 0.24-0.99) were less likely to have poor iron intake.

Conclusions: Social factors such as household income, regional area, and BMI were statistically significantly associated with iron intake among women of reproductive age in Japan.

Keywords: Iron intake, social factor, income and regional disparity, women of reproductive age, Japan

Further collaborators:
NIPPON DATA2010 Research Group

144/1480

GLUTTONY AND GUILT: COMPARING MONTHLY TRENDS IN INTERNET SEARCH QUERY DATA WITH DATA FROM THE AUSTRALIAN NATIONAL NUTRITION AND PHYSICAL ACTIVITY SURVEY

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Background and objectives: Health professionals require contemporaneous information to assess progress and prioritize action relating to overweight and obesity, which is now a global epidemic. Yet, systems for monitoring population-level diet and nutritional intake have been considered insufficient in the majority of countries. The purpose of this study was to investigate whether trends in search query data related to behavioural change associated with obesity can be used to inform actual population nutritional intake and dieting behaviour.

Methods: We first examined long term (2004 to 2016) trends in Australian Google relative search volume (RSV) for the terms

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"weight loss", "diet" and "fitness" to establish monthly patterns in search term usage. We then examined the monthly energy, macronutrient, and food intake of the Australian population, and the proportion of self-reported dieters, using data collected from the National Nutrition and Physical Activity Survey (NNPAS) 2011/12. Decompositional time series analysis and least squares means contrasts of generalized linear mixed models (GLMMs) were used to examine monthly differences in RSV. Nutritional geometry and ANCOVA was used in the analysis of NNPAS data.

Results: We found that RSV was significantly higher than the mean during January, and lower during December, for all search terms. The decline in RSV was not linear, however, as there was a significantly lower RSV for terms during May to July, and significantly higher from August to October. The pattern of energy intake (kJ) (highest in December and lowest in February) of survey participants, and the percentage of self-reported dieters, closely followed monthly patterns in RSV. The proportion of energy from protein was consistent across months examined; however, energy from lipid and carbohydrate + fiber were variable between months. Likewise, patterns of food-group consumption was variable across months.

Conclusions: Our analysis suggests that search query data can be used to inform the timing of national public health strategies to combat obesity.

Keywords: Weight Loss; Google; Big Data; Diet; Nutritional Geometry

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144/1482

MAKING COLLABORATION THE DEFAULT TO DELIVER MULTISECTOR NUTRITION PROGRAMMING - A NEW APPROACH IN TIMOR-LESTE

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Background and objectives: Despite progress, preliminary data from the 2016 Demographic and Health Survey indicates that undernutrition in women and children continues to be a major development issue, across all municipalities, in urban and rural areas and across all wealth quintiles in Timor-Leste. On the contrary, the prevalence of overweight and obesity is increasing, raising concerns of the emerging double burden of malnutrition.

Global evidence suggests that no single policy or intervention can create sustained reductions in malnutrition. Instead, a mix of coordinated interventions, across sectors is required to address the immediate and underlying causes of malnutrition across the lifecycle .

While integrated multi-sector programming presents great potential, the evidence-base on which to achieve this potential remains weak. In practice, poor program targeting and evaluation has resulted in limited evidence demonstrating the impact of integrated programming on improving nutrition status . The Hamutuk ("together") program is using technology to make col-

laboration the 'default' behaviour and utilising existing platforms to deliver targeting messaging.

The objective is to reduce the prevalence of stunting in children under two years of age through collective multi-sector action

Methods: Hamutuk is taking an evidence based approach to improve the quality and coverage of nutrition promoting behaviours at the household level by:

1. Strengthening nutrition capacity across partners

2. Using m nutrition tools to trigger behaviour change and create a nutrition enabling environment amongst partners

Results: The program is in early implementation. Measured activities to date include partner workshops on behavioural insights, gender, nutrition and the making of a multisector nutrition video for household consumption.

The joint monitoring platforms has sped up the monitoring and evaluation cycle providing faster insights of intervention reach and impact

Conclusions: Hamutuk will allow the Government of Timor-Leste to measure the collective impact of existing nutrition specific and nutrition sensitive interventions on stunting , and model an approach to support effective scale up of multi-sector nutrition programming and m-nutrition interventions.

Keywords: Stunting, multisector nutrition programming, m-nutrition

Further collaborators:
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144/1485

PEOPLE'S CHOICE – FOOD AND MACRONUTRIENT SELECTION IN AN OBESOGENIC ENVIRONMENT

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Background and objectives: Studying intake of macronutrients and their inter-correlations is complex. People do not have one sum of food intake per day and do not typically plan the macronutrient ratios for their meals. Rather, people have a large variety of meals with variable nutrient ratios and complex dishes comprised by mixed foods throughout the day by spreading nutrient/food intakes into different meals/eating periods. This study aimed to investigate how people regulate their macronutrient intakes under free-living conditions, and whether protein is the regulatory priority, in relation to diet quality.

Methods: This study utilised 24-hour recalls of 9,113 adults participating in the 2011-12 National Nutrition and Physical Activity Survey and National Health Measures Survey. Nutritional Geometry was used to examine how people regulate proportions of macronutrients consumed meal by meal, and over the whole day, while also adjusting for significant anthropometric and demographic features.

Results: Respondents that consumed higher protein density food at the start of the day reduced their proportion of energy from protein during subsequent eating periods; however, their total daily protein intake remained high, and energy intake lower, by the end of the day. In contrast, respondents that consumed lower protein density food at the start of the day increased their proportion of energy from protein in the following meals, but remained low protein density and high energy intake for the day. Over the whole day, the percent protein consumed was inversely associated with total energy intake and positively associated with total diet quality, as indicated by higher consumption of healthy meat and alternatives, vegetable, and dairy products, and lower consumption of discretionary choices. Respondents that consumed a higher proportion of protein energy also reported significantly higher unprocessed food intake and lower processed and ultra-processed food intake.

Conclusions: Total daily energy intake is strongly associated with the proportion of protein in foods chosen early in the day, the proportion of protein over the entire day (daily diet), and the foods available in the environment.

Keywords: Protein; protein leverage hypothesis; energy intake; nutritional geometry; processed food

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144/1486

OVERWEIGHT AND OBESITY IN HEALTH PROFESSIONALS

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Background and objectives: According to World Health Organization in the world there are more than 1900 million adults overweight and obese. Health professionals are not stranger to this reality, and in them the impact is greater because they affect the health behaviors of the patients. The nutritional status of health professionals is important because they serve as health role models and because they are more likely to counsel their patients about health behavior change if they practice healthy habits themselves. Therefore, the objective of this study is evaluate the nutritional status of health professionals in a hospital.

Methods: Descriptive research with a quantitative approach and cross-sectional design was applied. The sample was composed of 106 health professionals from 5 specialties: nursing, medicine, obstetrics, nutrition and medical technology. The anthropometric nutritional status was evaluated according to Body Mass Index (BMI), Waist Circumference (WC), Body Fat Percentage (BFP) and Visceral Fat. The statistical program IBM SPSS Statistics 22.0 was used for the analysis of data.

Results: According BMI of health professionals evaluated, 45.3% were overweight, 20.8% were obese grade I, 1.9% were obese grade II, 2.8 were thin, and 29.2% were normal. About WC, 39.6% had a high cardiometabolic risk, 31.1% had a very high cardiometabolic risk and 29.2% had a low cardiometabolic risk. According to BFP, 58.5% presented a very high level, 30.2% high, 10.4% normal and 1% low. About visceral fat, 34% presented a high level. According to specialties, medical professionals had the highest prevalence of obesity (35.1%), very high percentage of body fat (67.6%) and high visceral fat (54.1%). Midwives had 61.1% of overweight and nurses presented 43.6% of very high cardiometabolic risk. Nutritionists were the only group with normal values of BMI, WC and visceral fat.

Conclusions: 70% of the health professionals evaluated were overweight and obese, in addition to high and very high cardiometabolic risk; also 90% had a high and very high body fat percentage, and 34% had a high level of visceral fat.

Keywords: Overweight, obesity, health professionals, nutritional status.

144/1490

EXPLORING THE EFFECT OF DIETARY INTAKE TO WEIGHT STATUS OF PREADOLESCENTS IN URBAN SETTING USING A NEW PROPOSED FOOD GROUP CLASSIFICATION – EVIDENCE FROM THAILAND

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Background and objectives: The rising trend in the prevalence of overweight and obesity has been recognized as a public health problem in Thailand, particularly in urban settings. However, comprehensive data on the dietary sources of energy and nutrients in Thai obese children are lacking. This study aimed to identify the dietary intake of urban Thai preadolescents by weight status and to determine food contributing to sex-, age-specific BMIz scores (BAZ), by using a new proposed food group classification.

Methods: Dietary intake of 263 children aged 10-12 y in Bangkok Metropolitan Regions, Thailand, was assessed through three non-consecutive 24-h recall interviews. Lifestyle and sociodemographic characteristics were obtained from questionnaires. BAZ was calculated from data obtained from the school health records, and was then classified into non-obese, and overweight/obese groups based on WHO Growth Charts. Differences in dietary intake and contribution to micronutrients were analyzed by analysis of covariance. Individual food items were classified into thirteen groups based on Thai dietary guidelines, and the context of Thailand's food environment around children, including

"street-side snacks". Street-side snacks was defined as a light meal or snack mostly available at a street vendor's, road-side shop, without food label, and included traditional fast food, local dishes, or western fast food and could be eaten between main meals. The relation between food consumption and BAZ was evaluated using multiple linear regression analysis.

Results: After adjustment for sex and misreporting of energy, overweight/obese children had higher intake of daily energy and all primary macronutrients, and consumed more cereal grains, meats/fish, eggs, flavored milk, and street-side snacks. Stepwise multiple regression showed that there were ten food groups that were significantly and positively associated with BAZ. Of these, consumption of street-side snacks had the highest impact to BAZ, and remained at the top even after further controlling for energy intake.

Conclusions: Our finding implies that children's weight status can be affected by the food environment around the school, by showing the association between the consumption of street-side snacks on BAZ. This may help in encouraging future dietary strategies on the prevention of childhood obesity through environmental approach in the Thailand context.

Keywords: dietary intake, food group, overweight/obesity, preadolescents, Thailand

Further collaborators:
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144/1498

RELATIONSHIP AMONG HYDRATION STATUS AND PHYSICAL ACTIVITY IN ADOLESCENTS. HYDRATION UP & DOWN SUBSTUDY

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Background and objectives: Hydration and physical activity are very important concepts on which we must go more deeply since they are essential for the evaluation of the nutritional status and health during adolescence, a key stage in the acquisition of behavioral habits.

The objective was to evaluate the possible relationship between hydration status and physical activity (PA) in adolescents.

Methods: This is a cross-sectional substudy from the Up & Down Study. A total sample of 67 adolescents (39 males and 28 females) was analyzed, with a mean age of 15.9 years ± 0.3. The subjects were grouped according to their sex. The PA level was measured through the Physician-based Assessment and Counseling for Exercise questionnaire (PACE), and the hydration parameters [Total Body Water (TBW) and ExtraCellular Water (ECW)] by bioimpedance.

Results: Adolescents showed normal weight in both sexes (mean BMI = 21 kg/m2). Triceps fold values were higher in girls (16.7 ± 5.6 mm) than in boys (10.3 ± 4.4 mm). Water composition values (TBW and ECW, in litres), were higher in boys than in girls (36.8 ± 5.2 vs 29 ± 2.7 and 15.9 ± 2.5 vs 12.7 ± 1.6), respectively.

Boys were more active than girls according to their score in the PACE questionnaire, obtaining 3.1 ± 1.7 vs 2.1 ± 1.3 days of commitment with PA recommendation of 60 min/day (p=0.028).

82.1% boys and 64.3% girls had an optimal ECW range. However, when evaluating hydration according to TBW, 33.3% boys were within the optimal range while none of the girls met this range.

When studying the relationship among hydration and physical activity, we observed that the subjects who had an optimal hydration range for TBW were the most active ones according to the PACE questionnaire (p=0.011).

Conclusions: Girls were less active than boys in general, and this inadequate habit may be related to a less optimal hydration status. Therefore, physical activity should be taken into account when promoting healthy habits among adolescents, particularly those related to their hydration status.

Keywords: Hydration, Physical activity, Adolescence.

144/1506

WHICH DIETARY CHANGES TO MOVE TOWARDS NUTRITIONALLY ADEQUATE DIETS WITHOUT INCREASING THEIR IMPACT ON BIODIVERSITY, WATER AND LAND-USE? THE CASE OF TUNISIA

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Background and objectives: As several Mediterranean countries, Tunisia has experienced an epidemiological and nutritional transition resulting in an increase in overweight, obesity

and co-morbidities. In the last decades, food consumption departed from traditional diets towards higher consumption of animal-based and sweet products. Tunisia also faces environmental issues such as water scarcity, soil erosion and biodiversity loss. This growing concern for health issues and climate change has emphasized the need to promote sustainable diets, i.e. nutritionally adequate, affordable, culturally acceptable, and with low environmental impact. The objective was to identify dietary changes needed to move towards nutritionally adequate diets without increasing their environmental impact.

Methods: Nutrient intakes were estimated using dietary data from the nationally representative Tunisian study on food consumption (n=7209, 35-70y), and food composition from a Tunisian database and the Food Processor software. Environmental impact of diets was assessed through 6 indicators - water scarcity, biodiversity, and 4 indicators for land-use (erosion resistance, mechanical filtration, groundwater replenishment, biotic production) – estimated for 161 foods. For each gender, two optimized diets respecting all nutritional recommendations from WHO and with minimized departure from the mean observed diet were designed with linear programming under 2 scenarios to fulfill: i) all nutritional constraints (NUTRI) and ii) all nutritional constraints without exceeding observed levels for the 6 environmental indicators (NUTRIENV).

Results: Calcium, copper, iron, magnesium, potassium and vitamin D intakes were below their recommendations in the mean observed diets, while sodium and fats exceeded them. Under the NUTRI scenario, i.e. reaching nutritional adequacy without controlling for the environmental impacts, the main dietary changes were the increases of fruits and dairy products, and decreases of meat and starchy foods. All the environmental indicators were impaired, except erosion resistance and biotic production. Under the NUTRIENV scenario, i.e. when environmental indicators were limited to their observed levels, the changes in fruits, dairy products and starchy foods quantities were lower than in the NUTRI scenario, in favor of vegetables.

Conclusions: Environmental impacts should be assessed when identifying food consumption changes to reach nutritional adequacy. Dietary changes identified to move towards more sustainable diets in Tunisia will be translated into action proposals.

Keywords: Sustainable diet; Nutritional adequacy; Environmental impact; Tunisia; Diet modeling

Further collaborators:

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TREND OF MATERNAL AND CHILD HEALTH AND NUTRITION INDICATORS IN KENYA: IMPLICATION FOR POLICY DEVELOPMENT

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Background and objectives: The Kenya Demographic and Health Surveys (KDHS) were published in 1989, 1993, 1999, 2003, 2009 and 2014. The objective of the study was to assess changes in key maternal and child health and nutrition indicators in this reports.

Methods: It was a desk study.

Results: Fertility steadily declined from 6.7 births in 1989 to 3.9 in 2014, as the use of contraceptives increased from 27% to 58%. One fifth of teenage girls had either given birth or were pregnant in each of the KDHS reports. By 19 years, 40 – 45% had their first child or pregnancy. Ante natal clinic attendance ranged from 92% to 96%. However, only about one half made the recommended minimum four visits. The proportion of women who delivered in health facilities was below 50%, except in 2014, when it was 61%. By 2014, over a quarter of the women, 28%, were still assisted by traditional birth attendants during birth. Full vaccination coverage among children was at a rate of 79% in 1989 and 2014, but 57% in 2003. Though universal breastfeeding was observed in all the reports, complementary foods were introduced to 25-75% of the babies by the age of two months. Initiation of breastfeeding was done within one hour after birth among only about half of the babies. The proportion of under five children (U5) who had received Vitamin A supplements was 30-33%, except in 2014, when it doubled to 62%. In the five reports from 1989 to 2009, the stunting rates of U5 remained constant, at one third, but reduced to 26% in 2014. The U5 mortality rates increased from 96 to 115 deaths per 1000 between 1993 and 2003, then dropped to 52 in 2014. The infant mortality rate followed a similar trend, increasing from 66 to 77 deaths per 1000, then decreasing to 39 in 2014.

Conclusions: The observed changes in the maternal and child health and nutrition indicators can be evaluated to inform policy and future programme interventions.

Keywords: Maternal, Child, Health, Nutrition, Kenya.

144/1523

DEVELOPMENT OF A ROADMAP FOR MAIN-STREAMING CONTEXTUAL NUTRITION-SENSITIVE INTERVENTIONS AT KEBBI AND ANAMBRA STATES, NIGERIA

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Background and objectives: Continued high prevalence of malnutrition in Nigeria calls for emerging strategies to tackle existing burden and prevent newer incidences. Applying sub-national contextual programming to nutrition-sensitive interventions creates a pathway to sustainable malnutrition reduction. Given the variations at these sub-national levels such as varying malnutrition profiles, political dynamics, state finances and program implementations. This study thus aims to evaluate the epidemiological, operational and socio-political domains of mainstreaming nutrition sensitive interventions in Kebbi and Anambra states, Nigeria to inform the development of roadmap.

Methods: This study employs the Mainstreaming Nutrition Initiative Framework in an explanatory sequential mixed methods design. Kebbi in the North-West geopolitical zone and Anambra in the South-East geopolitical zone was chosen purposively as a high undernutrition state (Stunting – 60.6%) and low undernutrition (Stunting – 18.4%)/emerging overweight state respectively. In Phase 1, the local government area estimates of malnutrition will be sought using Nigeria's Living Standard Measurement Survey. In Phase 2, Firstly, the program documents of ministries of agriculture, welfare, education and environment will be assessed using a nutrition-sensitivity assessment checklist and a potential-to-be nutrition-sensitive checklist. Finally, a program observation site visit will be carried out in which an in-depth interview (Program manager) and two exit interviews will also be conducted on participants that use the program. For Phase 3, a one-day workshop in both states will be conducted with the instrument Political Commitment and Opportunity Measurement – Rapid Assessment Tool (PCOM-RAT). Finally Phase 4 will include synthesis of results from the above phases to develop and validate a roadmap for mainstreaming nutrition-sensitive programming in the study states. The development will use program impact pathway and take cognizance of political, operational and epidemiology findings.

Results: Outcomes of this study will provide a case study to show that the Mainstreaming Nutrition Initiative framework provides a theoretical basis for mixed methods research to enable understanding of epidemiological, operational and socio-political domain of mainstreaming nutrition-sensitive actions.

Conclusions: If the pragmatic roadmap is implemented, this study provides a template for strengthening nutrition-sensitivity and aligning already existing programs in nutrition sensitive sectors.

144/1528

SALT REDUCTION IN BREAD AMONG MOROCCAN POPULATION

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Background and objectives: To contribute to the achievement of global voluntary targets for non-communicable diseases set by the World of Health Organization and the Second International Conference on Nutrition (ICN2), Morocco has developed a plan of reducing salt consumption to combat the non-communicable diseases. The objective of the present study is to assess acceptance of bread with different percentage reduction of salt by Moroccan population.

Methods: In this study, 201 participants (age >15 y.) were recruited to determine the level of salt reduction in bread. Different salt contents par 100g were tested and compared: 1,74g, 1,62g, 1,56g, 1,46g, 1,34g, 1,21g et 0,81g, corresponding to the reduction of salt of 0%, 7%, 10%, 16%, 23%, 30% and 53%, respectively, compared available bread in local market. Overall liking, "Just About Right" (JAR) and purchase scales was used to score the different salt contents in bread.

Results: Bread with a reduction of 10% and 16% is highly accepted by 76,11% and 78,60% of respondents. Based on JAR score, bread with 10% (1,56g/100g) and 16% (1,62g/100g) of reduction were considered as "just about right" by 50,54% and 56,92% respectively. Best average score of purchase intent is obtained for salt content in bread of 1,62g and 1,56g for a reduction of 10% and 16% respectively.

Conclusions: The results show that reducing salt levels is easily achievable and is acceptable to customers. Bread with a reduction on salt of 10% and 16% is highly accepted by respondents. Food Industry is needed to reduce salt in bread to accompany the national salt reduction strategy in Morocco.

Keywords: Salt reduction, acceptance, bread, Morocco

144/1538

VALIDITY OF WAIST TO HEIGHT RATIO IN PREDICTING DYSLIPIDAEMIA AMONG SRI LANKAN CHILDREN AGED 8-9 YEARS

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Background and objectives: Dyslipidaemia, an important risk factor associated with cardio vascular disease is increasingly observed among paediatric populations. There is a need for a simple and quick screening tool to predict this condition. The present study evaluated the validity of Waist to Height Ratio (WHtR) in predicting dyslipidaemia among 8-9 years old Sri Lankan children.

Methods: Cross sectional study was conducted among 8-9 years old school children within Colombo Municipal area comprising of 146 children with high adiposity (body fat > 28.6% in boys and >33.7% in girls) and 148 children with normal adiposity assessed by bioelectrical impedance analysis (BIA). Weight, height, waist circumference (WC) and serum lipids (Triglyceride-TG, HDL, LDL cholesterol and Total Cholesterol-TC after 12 hours of overnight fasting) were measured. Simple correlation analysis was done to investigate the association between the lipid parameters and anthropometric indices (Body mass index, WC and WHtR). Dyslipidaemia was defined as 2 or more abnormal parameters in the lipid profile. Receiver operating characteristic (ROC) curves were analyzed for WHtR in predicting dyslipidaemia. Youden index was used to determine the optimum cut off values for WHtR predicting dyslipidaemia.

Results: WHtR showed significant correlations with lipids in boys (TC-r=0.216, p<0.01, TG-r=0.362,p<0.001, LDL-r=0.230,p<0.01, HDL-r=-0.208,p<0.05) and in girls (TG-r= 0.329,p<0.001, LDL-r=0.175,p<0.05, HDL-r=-0.349,p<0.001)). The cut off value of WHtR was 0.486 for boys (sensitivity-69.4%, specificity-65.7) and 0.481for girls (sensitivity-61.4%, specificity- 64.5%). The positive and negative predictive values were 66.9% and 68.2% for boys whereas in girls these values were 63.4% and 62.6% respectively.

Conclusions: WHtR can be used as a screening tool to predict dislipidaemia among 8-9 year old Sri Lankan children. These cut off values are similar to the values defined in other populations. Since the WHtR is a simple, quick and non invasive anthropometric technique it could be feasible for use in screening for dyslipidaemia in this population group. A practical cut off for both genders would be 0.5.

Keywords: Dyslipidaemia, Waist-height ratio, Children, Screening tool

144/1539

DETERMINATION OF THE SALTY TASTE THRESHOLD IN THE MOROCCAN POPULATION

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Background and objectives: Following the recommendations of the World Health Organization to reduce the average salt consumption in the populations by 30% to reach a target of less than 5 g per day by 2025, Morocco has recently developed a plan of salt reduction in order to reinforce prevention of non-communicable diseases which is a major problem at the national level. The present study is a masterpiece of this national strategy since its objective is to determine the threshold of perception of salt taste in the Moroccan population. The national plan for the reduction of salt consumption will take this into account in order to gradually reduce the salt content in processed foods

Methods: The study involved 201 testers divided into 4 age groups [15-29 years], [30-44 years] [45-59 years] and over 60 years. The pannelists tested NaCl solutions at concentrations of 1, 2, 4, 8, 15, 30, 60, 125, 250, 500 mmol/l in random order using the blind Alternative Forced Choice method. The rinsing between each test was carried out using flat water. Informations on age, sex, height, weight and Body Mass Idex was collected and transcribed on SPSS software for statistical processing

Results: Results show that 38.80% of the testers began to perceive the salty taste from the concentration of 30 mmol/l (1.75 g/l) and 31.84% from the concentration of 15 mmol/l (0.875 g/l), while 10,94% and 13,93% of the testers perceived the salty taste respectively at concentrations of 8 mmol/l (0,46g/l) and 60 mmol/l (3,5g /l). The khi2 test shows a significant correlation between the perception of the salty taste and the sex (p value = 0,035) and the perception of the salty taste and the BMI (p value = 0,034). The age has no significant effect on the threshold of perception of the salty taste (p value 0.500).

Conclusions: The results obtained are very important data that can be used as part of the national salt reduction strategy to convince industrials to reduce salt levels in processed foods

Keywords: Determination, salty taste , perception, Morocco

IMPACT OF NUTRITION EDUCATION ON NUTRITIONAL ADEQUACY AND HAEMOGLOBIN STATUS OF ADOLESCENT GIRLS

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Background and objectives: Iron deficiency anaemia is a prominent unsolved problem in India. India has the world's highest prevalence of iron deficiency anaemia among women, with 60 to 70 percent of the adolescent girls being anaemic. Hence, the health of adolescent girls demands special attention. This study was conducted to assess the prevalence of anemia and to study the impact of nutrition education on nutritional and haemoglobin status of adolescent girls aged between 13 to 15 years.

Methods: Three thousand adolescent girls from 10 different locations of 10 states of India were screened out with haemoglobin level below WHO cut off of 12 gm/dl using cyanmethemoglobin method. The samples were further divided into equal sized control and experimental group to conduct the study. Nutrition education was provided for 3 months using various audio-visual aids. Haemoglobin levels at screening stage were considered as pre level and it was assessed again after imparting nutrition education. Food and nutritional adequacy was assessed before and after imparting nutrition education using 24 hour dietary recall and comparing with recommended allowances by Indian Council of Medical Research, India.

Results: Initial screening revealed that the prevalence of anaemia in the population studied was 66.84% with a mean haemoglobin level 10.1 ± 1.11 g/dl. Nutrition education significantly improved the haemoglobin level of experimental group from 10.01 ± 0.51 g/dl to 10.77 ± 0.60 g/dl. However the improvement had not reached the normal cut off level. There was improvement in percent distribution of population with an increase in normal category from 0.94% to 16.64%. Moderately anaemic category fell from 70.05% to 52.41% and also severely anaemic category from 5.99% to 1.49%. Intake of most of the food groups had increased significantly but not up to the recommended amounts. Similarly, mean nutrient adequacy was significantly increased in energy, protein, calcium, iron and folic acid in experimental group after nutrition education although not adequate.

Conclusions: There was increase in haemoglobin level, food and nutrient intake, but the increment did not meet normalcy and the recommended levels. This indicates that more intense nutrition education programme may be included probably through school curriculum.

Keywords: Anaemia, prevalence, adolescent, haemoglobin.

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IDENTIFICATION OF GEOGRAPHICAL CLUSTERS OF NUTRITION TRANSITION IN ARGENTINA AND ITS SOCIODEMOGRAPHIC CHARACTERIZATION

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Background and objectives: Nutritional Transition (NT) is a process that includes changes in populations' nutritional profile, determined by convergent socioeconomic, demographic, environmental, and sociocultural factors. The geographical context and its sociodemographic characteristics emerge as potential underlying factors of the populations' epidemiological and nutritional profile. This work proposes to identify the geographical clusters based on the contribution of NT indicators in Argentina (2005-2013) and distinguish the sociodemographic scenarios that characterize them.

Methods: Multi-group, ecological design (23 provinces and the Autonomous City of Buenos Aires). A cluster analysis was conducted to identify clusters by proximity among geographical units, based on similarities among NT indicators (nutritional state, physical activity, and food intake), obtained from official sources of information: Nationwide Nutrition and Health Surveys (2005), Risk Factors of Non-Transmissible Diseases (2005, 2009, 2013), and Population, Household, and Housing Census 2010. Summary measures of these indicators and of sociodemographic variables were calculated (based on the 2010 census), with the aim of characterizing each cluster identified. These were incorporated into a GIS (Geographical Information System) to draw up maps using the ArcGIS 10.2 software

Results: Three NT clusters were identified in Argentina: 1) provinces in the Pampas region, Cuyo and part of Patagonia; 2) the Autonomous City of Buenos Aires and the south of Patagonia; 3) the provinces in the northwest and northeast of Argentina. Cluster 2 displayed the highest levels of adult (19.99%) and child (11%) obesity, use of computers (71.3%), frequent salt consumption (23.63%) and consumption of at least 5 daily portions of fruit and vegetables (5.28%), while cluster 3 recorded the highest prevalence of low weight, low height and anemia in children (2.69%, 9.69%, 19.06%; respectively). Physical inactivity, alcohol intake and overweight in adults were similar in the clusters identified. Cluster 3 showed the worst relative situation concerning indicators of socio-economic level, health coverage, education, and degree of urbanization.

Conclusions: There are geographical clusters in Argentina with specific nutritional and sociodemographic characteristics. This might indicate different NT processes in the interior of the country.

Keywords: nutritional transition, sociodemography, spatial epidemiology, Argentina

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URINARY SODIUM EXCRETION AND RISK OF ISCHEMIC STROKE

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Background and objectives: Results: **Methods:** We studied 7,330 subjects free of cardiovascular events at baseline in the Prevention of Renal and Vascular End-stage Disease (PREVEND) study, a prospective, population-based cohort of Dutch men and women aged 28-75 years. UNaV was measured in two 24-hour urine specimens at baseline (1997-1998) and two specimens during follow-up (2001-2003).

Results: Baseline median UNaV was 137 mmol/24h (IQR: 106-171 mmol/24h). During a median follow-up of 12.5 years (IQR: 11.9-12.9 years), a total of 131 ischemic stroke events occurred. In primary analyses, we observed an inverse association between UNaV and risk of ischemic stroke (HR per 1 SD [51 mmol/24h] decrement, 1.53; 95% CI, 1.17-2.02) after adjustment for lifestyle and dietary variables. The association of UNaV with risk of ischemic stroke was modified by smoking status (Pinteraction=0.017), in such a way that the association was only observed among current smokers (HR per 1 SD decrement, 2.58; 95% CI, 1.60-4.15; n=53) and not among former/never smokers (HR per 1 SD decrement, 1.08; 95% CI, 0.77-1.52; n=78). In secondary analyses, we found that current smoking was associated with a higher hematocrit (st.β=0.11, P<0.001), particularly in subjects with low sodium intake (Pinteraction<0.001).

Conclusions: In this population-based study, lower UNaV is associated with an increased risk of ischemic stroke, particularly among current smokers. We found indications that – analogous to the increased risk of stroke observed on treatment with erythro-poietin-simulating agents – adverse rheological effects exaggerated by low sodium intake may play a role.

Keywords: sodium, stroke, risk, diet

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COMPARISON OF TWO PREGNANCY NUTRITIONAL EVALUATION STANDARDS USING NATIONAL DATA FROM URUGUAY

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Background and objectives: The USA Institute of Medicine (IOM) and the Rosso-Mardones maternal weight gain guidelines are widely used in Latin America. The purpose of this study was to compare some indicators of fetal growth related to the use of each chart at the beginning of pregnancy with national Uruguayan information.

Methods: Data of 23,832 healthy pregnant women and their term single newborns registered at the national level in the maternity hospitals between 2010 and 2012 were considered. Maternal nutritional status was classified at the beginning of pregnancy ac-

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cording to both guidelines. The diagnostic ability of both instruments regarding inadequate fetal growth was compared using sensitivity and specificity values. Inadequate fetal growth was defined as birth weight < 3000 g, birth weight > 4,000 g, and birth length < 50 cm.

Results: Proportions of BL < 50 cm and both BW < 3000 g and > 4000 g were similar at each nutritional category of both charts; absolute figures for at risk newborns were much higher in the RM underweight and obese women. The RM chart showed higher sensitivity values than the AEA chart at the beginning of the pregnancy.

Conclusions: The higher sensitivity of the RM chart would support its use for prevention purposes in countries such as Uruguay.

Keywords: Nutrition during pregnancy, maternal body mass index, birth length, birth weight.

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INNOVATIVE HOME GROWN SCHOOL FEEDING LINKED TO FAMILY FARMING: FAO SCHOOL FOOD AND NUTRITION APPROACH IN SUB-SAHARAN AFRICA

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Background and objectives: Home Grown School Feeding (HGSF) has been considered a simple win-win scenario for countries seeking to promote greater levels of school attendance, school performance economic integration of local family famers and increased access to a diversified school meals for improved nutrition and educational outcomes. However, the complex policy and programmatic design required in order to ensure efficient inter-ministerial as well as inter-sectoral collaboration (often between the ministries of Education, Social Protection, Agriculture and Health) in the implementation and in particular the procurement and delivery of home grown school meals, the constant challenges to ensure that local family farmers can cope with the production needs of a diversified nutritionally balanced school meals.

Methods: FAO in partnership with the Government of Brazil have been working in the implementation of comprehensive sustainable pilots HGSF in diverse Sub-Saharan African countries in order to identify the strategic needs as well the most common bottle-necks for effective implementation of HGSF programs.

Results: As a direct result of this partnership, two countries (Sao Tome and Principe and Malawi) have been provided with technical support in the areas of policy & legal frameworks, agricultural mapping assessments for identification and design and local school meals menus as well as tailor-made nutrition education

materials for the promotion of behavioural change and lifelong life skills for good nutrition.

Conclusions: Preliminary results support the conclusion that long-term investments for the organization of the family farming sector remains a fundamental bottleneck for the majority of countries. Findings have indicated the need for efforts to concentrate on ensuring greater participation of the Ministries of Agriculture and other stakeholders in the development, implementation and management of HGSF programs in Africa. The development of family farming specific support programs, the re-orientation of rural extension services for this purpose, and the facilitation of innovative procurement mechanisms to allow local purchases and sustainable and reliable supply of diversified food for school food and nutrition initiatives in Africa are critical parameters that should be combined with nutrition education at all levels.

Keywords: Home Grown School Feeding , Family farming, School Food and Nutrition, Agriculture, Social Protection

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THE ROLE OF THE NUTRITIONIST IN AN INTERDISCIPLINARY APPROACH OF COGNITIVE STIMULATION IN PEOPLE OVER THE AGE OF 60

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Background and objectives: People over the age of 60 can have several functional limitations. Depression, neurodegenerative diseases, arthritis and osteoporosis can increase obstacles to developing and maintaining daily activities. Environmental and psychological factors can reinforce or relieve this situation (Olazarán-Rodríguez, 2012). Therefore poor nutrition can lead to malnourishment.

The advancements of knowledge into neurological, vascular and degenerative diseases highlight the need for an integral approach through interdisciplinary work (Allegri, 2013) (Demey, 2010).

Using this model, PAMI has been offering a program of cognitive stimulation by using an holistic approach to the over 60's in the La Matanza district since 2011. By providing weekly activities such as music, games, art and physical exercise, we aim to improve the quality of life for this client group.

The multidisciplinary team includes a neurologist, psychologists, nutritionists, a physical education teacher, and a music therapist.

Nutritional objectives:

• Encouraging healthy nutrition.

• Promoting independence by adapting utensils, and food preparation

• Stimulating preserved cognitive functions.

• Encouraging satisfaction during meal times.

Methods: The program is aimed at people over 60 with physiological aging or initial to moderate stage of cognitive impairment; additionally we provide support groups for care givers.

Activities carried out in the Nutrition area:

• Cooking workshops with creative recipes of pureed foods, finger food.

• Healthy modifications of Argentine recipes

• Practice with adapted kitchen utensils.

• Specialist talks.

• Evoking an emotional value of food

• Identifying correct meals to eat at certain times in the day

• A memory recollection game with matched cards

Results: Using qualitative evaluation we observed:

• A decrease in caregiver's workloads.

• Feedback from family members of an increase in pleasure derived when eating.

• A need to quantify results, which will be used with the Mini Nutritional Assessment

• Attendance at the workshops has been maintained while the number of new attendees has increased.

Conclusions: Nutrition is not only the mechanical activity of incorporating substances into the body, but also involves emotions, evokes memories, and generates pleasure. Food is a useful vehicle when working with cognition and emotions, maintaining or improving people's independence.

Keywords: Elderly, Nutrition, Cognitive

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WEIGHT CONCERNS SCALE (WCS): VALIDATION OF THE ONLINE VERSION APPLIED TO NUTRITION STUDENTS

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Background and objectives: The body image is a multidimensional construct. One aspect of this construct is weight concerns. The Weight Concerns Scale (WCS) aims to evaluate the degree of concern with body weight. The aim of this study was estimate the reliability and validity of WCS's online version in female Nutrition students.

Methods: 102 students from a Brazilian private university completed the WCS in the online format. Information about the age, economic level, weight and height were also collected. The validity of the scale was measured by means of factorial and convergent validity. Confirmatory factor analysis of scale was carried by using goodness-of-fit indices: the chi-square by degrees of freedom ratio (c2/df), Comparative Fit Index (CFI), Normed Fit Index (NFI) and Root Mean Square Error of Approximation (RMSEA). Convergent validity was estimated by Average Variance Extracted (AVE) and Composite Reliability (CR) and the internal consistency by standardized Cronbach's alpha coefficient (α).

Results: The average age was 22.61±5.04 years, 4.90% were underweight, 66.67% eutrophic, 18.63% were overweight and 9.80% were obese. The WCS showed adequate factorial adjustment in the total sample (l=0.49-0.84; c^2/gl=1.832; CFI=0.969; NFI=0.936; RMSEA=0.091). The convergent validity (AVE=0.43; CR=0.78) was bellow recommendations and the internal consistency was adequate (α=0.77). The prevalence of eating disorder risk was 33.33%.

Conclusions: The online version of WCS showed satisfactory validity and adequate reliability. When it comes to the developing of eating disorders, the sample has presented a high prevalence of risk.

Keywords: Body image. College students. Validation.

144/1599

PLASMA VITAMIN C AND THE RISK OF GASTRIC CANCER RISK IN THE EURGAST STUDY

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Background and objectives: Vitamin C is an antioxidant and inhibitor of carcinogenic N-nitroso compound production in the stomach. Higher dietary vitamin C consumption is associated with decreased risk of gastric cancer (GC) in numerous case-control studies, but data from prospective studies are limited. Recently the WCRF have included citrus fruit as a protective factor with limited–suggestive evidence specifically for gastric cardia cancers. Our previous analysis based on 256 cases and using a fluorometric method has an inverse association between GC and serum vitamin C .The objective of this study was to re-assess the association of plasma vitamin C levels with the risk of GC in a case-control study nested within the European Prospective Investigation into Cancer and Nutrition (EPIC) including a larger sample size and a more accurate methodology.

Methods: Serum vitamin C was measured using liquid chromatography coupled to mass spectrometry in 456 GC cases and 456 matched controls (sex, age and blood collection) form teh nested case control study EURGAST . Conditional logistic regression models adjusted smoke, education, BMI, helicobacter pylori infection , red meat, processed meat, alcohol, and energys were used to estimate relative cancer risks .

Results: After adjusting by potential counfounders , No association with plasma vitamin C and gastric cancer risk was found (HR 20 microg/l: 0.947, 95 CI: 0.82-1.08). When results were analyzed by tumor localization, comparing highest vs. lowest tertiles of serum vitamin C results have shown a negative association for cardia cancer site (HR 0.482, 95 % CI: 0.235- 0.99). No association was found for non cardia site.

Conclusions: Plasma vitamin C levels may play a role decreasing the risk of cardia gastric cancer . More prospective studies, including a larger number of cardia cancers are needed to confirm these findings.

Keywords: Gastric cancer, biomarkers , vitamin C, risk, cohort study

COMPARISON OF DISORDERED EATING SCALES ON A HEALTHY POPULATION

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Background and objectives: Since their publication, the Three Factor Eating Questionnaire and the Eating Attitude Test 26 (EAT 26) have become the most widely used psychometric tools identifying individual differences in eating attitudes in studies of human eating behaviour. In this context the objective of this work was to examine the association between TFEQ and EAT 26 in adults.

Methods: In order to determine participants' eating behaviours, the eating attitude test 26 (EAT 26) and three factor eating questionnaire (TFEQ) were administered by intern dietitians. The TFEQ evaluates 3 dimensions of eating behavior: cognitive restriction (CR), uncontrolled eating (UE), and emotional eating (EE). The responses are measured on a Likert scale ranging from 1 (completely true) to 4 (completely false). Questions on socio-demographic characteristics were also included. The sample comprised 32 women and 14 men, ranged from 19 to 40 years. The questionnaires were analyzed with the statistical program SPSS.

Results: According to EAT 26, 8.9% participants had eating disorder. The mean TFEQ score of the participants was 40.59 ± 6.85. There was a significant difference between TFEQ total scores and TFEQ uncontrolled eating scores of participants with and without eating disorders ($p < 0.05$). When this difference was investigated by gender, there was a difference between TFEQ total scores, TFEQ emotional eating scores and TFEQ uncontrolled eating scores of women with and without eating disorder ($p < 0.05$), while no difference was found in men with and without eating disorder. Also there was a positive correlation between EAT 26 scores and TFEQ total scores and TFEQ cognitive restriction scores of women ($r=0.409$ $p=0.020$ and $r=0.493$ $p=0.004$, respectively).

Conclusions: This study showed a positive association between the TFEQ and EAT 26 in participants, especially in women. However, further studies are needed to explore the causes of this association. It would be interesting to investigate genetic and sociocultural causes that effect eating behavior in a larger sample.

Keywords: EAT 26, TFEQ, eating behaviour

PELLAGRA-A FORGOTTEN ENTITY

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Background and objectives: Pellagra is a niacin or tryptophan deficiency disorder.. Not long ago, the disease was endemic in several parts of the world; including India. The patients affected by the deficiency of Vit-B3 generally suffer from dermatitis. The symptoms begin as an acute eczematous rash distributed over the photo-exposed areas and in chronic situations, the skin becomes rough and chronic eczematous lesions are found. Pellagra is characterized by the three D s. i.e., Diarrhea, Dermatitis and Dementia. Over the past two decades, only a few pellagra cases have been reported. By the year 2011, Pellagra had almost disappeared due to Public Distribution System but, the clinical features still prevail in Indian subcontinent to some extent. This study clearly recommends that general ration should be regularly distributed.

Methods: The case records of patients with clinical diagnosis of pellagra attending the Nutrition Unit of Osmania General Hospital, Hyderabad were retrospectively reviewed between 1992 and 2012. The inclusion criteria were (a) clinical findings consistent with pellagra (photosensitive rash in sun-exposed areas). (b) resolution of symptoms with administration of niacin and (c) exclusion of other diseases. The medical records were reviewed for age, sex, seasonal variation, cutaneous examination findings and associated symptoms. Chronic energy deficiency was calculated based on $BMI < 18.5 kg/m2$.

Results: 335 patients were included in the study. Table 1 shows the corresponding descriptive data. Mean (SD) age of the study patients was 42.76 ± 11.6 years. CED was present in 63.8% of patients. Over-weight and obesity was uncommon in the study. The commonest age groups affected were middle aged patients and was highest in 30-40years age group followed by 40-50years of age group. Patients <20 years and >60years were uncommon in the study. Peripheral neuritis was present in 3.88% of patients, followed by Protein energy malnutrition, glossitis and tuberculosis in 1.49%, 1.49% and 1.19% of cases

Conclusions: Pellagra is a historically old disease, which is not completely eradicated. The decline in the proportion of pellagra patients over the past few decades may be attributed to the implementation of national nutritional programs, National product distribution system and improved nutritional status.

Keywords: Pellagra, Dermatitis, niacin, tryptophan deficiency

144/1611

THE IMPACT OF REPLACING COW'S MILK WITH GROWING UP MILK ON VITAMIN D AND IRON INTAKES AND ADEQUACY IN IRISH CHILDREN AGED 12 – 36 MONTHS

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Background and objectives: Growing up milks (GUM) are milk-based drinks with added vitamins and minerals intended for children aged 12 – 36 months. We have previously shown that intakes of vitamin D and iron are low in Irish children and that fortified milks (in particular GUM) are a key determinant of higher intakes. Studies in other countries have shown that replacing cow's milk (CM) with fortified milks can help to improve intakes, adequacy and status of vitamin D and iron in both chidren and adults.

The objective of this analysis was to investigate the impact of replacing CM with GUM on intakes, adequacy and risk of excessive intakes of vitamin D and iron in young Irish children.

Methods: Analyses were based on a sample of children (aged 12 – 36 months) from the Irish National Pre-School Nutrition Survey (www.iuna.net). The sample included children with a daily CM intake ≥300ml (n 146). Dazult software DaDiet© was used to simulate the replacement of 300ml of CM with an equivalent volume of GUM (composition per 100ml: vitamin D; 3.1μg, iron; 1.2mg). The composition of any milk intake >300ml was unchanged from that consumed. Usual intakes were calculated via the NCI-method and the proportion (%) of the population with intakes below the estimated average requirement (excluding energy under reporters) and above the tolerable upper intake limit were calculated.

Results: Replacing 300ml of CM with an equal volume of GUM would increase mean intakes of vitamin D (from 6.3 to 13.6μg/d) and iron (from 7.7 to 10.6mg/d). The proportion of the population with inadequate intakes would be significantly reduced from 82 to 17% for vitamin D and from 14 to 0% for iron with no risk (0%) of excessive intakes of either nutrient.

Conclusions: This study has shown that replacing 300ml of CM with GUM would result in a substantial reduction in the prevalence of inadequate intakes of vitamin D and completely eliminate inadequate intakes of iron in Irish children aged 12 – 36 months.

Keywords: Vitamin D, iron, growing-up-milk, adequate intakes

144/1619

PREVALENCE AND FACTORS ASSOCIATED WITH STUNTING IN PRIMARY SCHOOL CHILDREN AND ADOLESCENTS IN THE BURKINABE SAHEL

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Background and objectives: Stunting within students is a real public health and development issue.

However, there are few studies in pupils and adolescents in developing countries.

The objective of the study was to determine the prevalence and factors associated with stunting in primary school children and adolescents in the Burkinabe Sahel.

Methods: Descriptive and analytical cross-sectional study carried out in 13 public primary schools in Dori commune in June 2016. Sampling was random in two-stage clusters. The data were collected through anthropometric measurements, blood sampling and the administration of a questionnary to the students. Individual interviews were conducted at the household level. Prevalences were calculated using the 2007 WHO Growth Standards for Adolescents aged 5-19 years and the associated factors were studied using a multivariate logistic regression on STATA 14.

Results: A total of 568 pupils aged 5-15 years were involved. Nearly 50.62% of students were between 10 and 15 years of age. Girls accounted for 52% of students. The prevalence of stunting was 32.92% (95% CI). The coexistence of stunting and acute malnutrition accounted for 13.56% of students - and the cumulative chronic malnutrition and anemia was 29.40%.

Age (OR =1,20), sex (OR =1,53) and anemia (OR =0,61) were statistically associated with stunting (p <0.05). There was no difference between schools. The student's individual dietary diversity and level of household food insecurity were not statistically associated with significant growth retardation.

Conclusions: The study shows a high prevalence of stunting within elementary students in Dori.

Age, sex and anemia play major roles.

Keywords: Associated factors, stunting, pupils, prevalence, Burkina Faso

Further collaborators:

WORKING IN NUTRITION: HUMAN RESOURCE CONSTRAINTS THAT AFFECT ACHIEVEMENT OF NATIONAL NUTRITION PLAN GOALS

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Background and objectives: Though countries acknowledge the importance of strengthening human resources to deliver on national nutrition action plans (NNAPs), it is often hard to create sustainable improvements in the nutrition workforce. The USAID-funded Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) Project produced evidence on why this may be in two countries, Uganda and Nepal.

Methods: As part of SPRING's Pathways to Better Nutrition Case Studies, qualitative data were collected in Uganda and Nepal over two years (2013-2015 and 2014-2016, respectively). Six stakeholder groups, six nutrition-related sectors, and three levels of governance were studied through key informant interviews, direct observation, and news content analysis. These data were analyzed in NVivo to identify common themes, including nutrition workforce.

Results: Several nutrition workforce issues were mentioned as constraints to successful implementation of Uganda and Nepal's NNAPs. Stakeholders in both countries noted high turnover in key government, donor and UN nutrition positions; for instance approximately 50 percent of all NNAP sector focal positions turned over during the study, with several positions remaining vacant through the end of the study period. Turnover at every level was regularly cited as why planning and spending stalled for nutrition activities. Funding for nutrition coordination positions was also ad-hoc, which may have encouraged transience. Another nearly universal concern was lack of implementing staff trained in nutrition, especially in non-health sectors. The few available district and sub-district nutrition staff were often overwhelmed by responsibilities. Barriers to increasing implementation-level nutrition staff were lack of mentoring and recruitment for district nutritionists (Uganda) and difficulties recruiting for hard-to-reach areas (Nepal).

Conclusions: Our recommendations for overcoming these constraints include improving handover protocol for transitions of nutrition focal positions; securing funding for nutrition positions; including nutrition in civil service curricula; and innovating incentives to staff hard-to-reach areas. Recognizing the universality of this challenge, SPRING has developed several resources to help strengthen the nutrition workforce. Our workforce mapping toolkit is designed to identify gaps in training, recruitment, and planning for nutrition services. SPRING's community health worker advocacy toolkit can be also be used to advocate for increased nutrition workforce training and recruitment.

PLASMA METABOLOME ASSOCIATED WITH OBESITY IN COMMUNITY DWELLERS: TSURUOKA METABOLOMIC COHORT STUDY

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Background and objectives: There has been growing evidence of the importance of amino acids for obese metabolism change using metabolome analysis. The aim of this study is to examine the associations of amino acids and other polar metabolites with obese in the Japanese population.

Methods: Subjects are 35 to 74 years-old residents enrolled into our cohort study from April to July 2012, as a part of three-year baseline. Of the 11,002 participants, we had performed plasma global metabolomic profiling by capillary electrophoresis–mass spectrometry (CE/MS) in 8414 of the participants by the end of August 2016. We excluded 668 participants for the following reasons: missing information, previous history of cancer, the energy intake above 3,500 kcal or under 500 kcal. The remaining 7,726 participants (3,444 males, 4,282 females) were included in the analysis. 73 polar metabolites were identified and absolutely quantified using CE/MS; amino acids, amines, organic acids, purines and the others (detection rate >90%). Diet, including alcohol intake, was assessed with a semiquanitative food-frequency questionnaire (FFQ). Body mass index (BMI) was calculated with measured height and body weight at recruitment. According males and females, the participants were divided into four categories according to the quartile of the BMI, we compared the obese group (Q4) to the normal range group (Q2) by partial least squares discriminant analysis (PLS-DA) and pathway analysis using MetaboAnalyst 3.0.

Results: The PLS-DA model was fairly developed in both of males and females. The levels of six metabolites in plasma including glutamic acid were associated with obesity (VIP score>1.5), higher in the obese group. The results in the pathway analysis indicated that five pathways were associated with obesity; alanine, asparate and glutamate metabolism, arginine and proline metabolism, pyruvate metabolism, taurine and hypotaurine metabolism and citrate cycle.

Conclusions: We found six plasma metabolites and five pathways related to obesity among community-dwelling adults in the north of Japan, with applying metabolomics to a large population-based study. We continue our survey to clarify the causality between the found biomarkers and development of obesity related to diet intake and exercise, and contribute reducing the health risk due to the obesity in future.

Keywords: Cohort study, Metabolome, Obese metabolism change, Amino acids

Further collaborators:
Tsuruoka metabolomics cohort study team

144/1658

EVALUATION OF THE NATIONAL COMMUNITY-BASED FOOD DISTRIBUTION PROGRAM FOR CHILDREN ON ANTHROPOMETRIC INDICES OF MALNOURISHED OR GROWTH RETARDED CHILDREN IN IRAN: A MIXED METHOD APPROACH

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Background and objectives: In Iran, multidisciplinary program for improvement of nutritional status of children was initiated in 2005. In supportive section of this program, monthly food ration has been distributed for nourishment of growth retarded/malnourished children living in deprived family. This study aimed to evaluate the effectiveness of the supportive section of this program on nutritional status of children in two provinces of Iran (Qazvin and Semnan).

Methods: An effectiveness evaluation was conducted using mixed methods. Qualitative data gathered from twelve focus group discussions by mothers to determine factors that affect distributed foods consumption by the target child and their nutritional status. Quantitative data collected by quasi-experimental design.

362 children aged 6-72 months under coverage of the program selected as intervention group via multistage sampling. Comparison group included 409 children selected from children 6-72 months under coverage of Primary Health Care System using convenience sampling method. After 6 months, 332 in intervention and 324 in comparison group completed the study. Anthropometric indices of the children were measured at the baseline and 6 month thereafter. Data on child health and household demographic characteristics were collected by a questionnaire. Effectiveness was estimated using difference-in-difference (DiD) estimator.

Results: At the end of the study, mean of WAZ, HAZ, and WHZ was increased compared to the baseline in both groups (P<0.001). Differences in WAZ, HAZ and WHZ between two groups were not significantly differ at the end of the study (P=0.62, P=0.91, and P=0.94, respectively). The percentage of children who became normal in underweight, stunt, and wasting increased in both groups after 6 months (34.8% to 41.7%, 57.2% to 57.8%, and 40.1% to 49.6% respectively in intervention children; 58.2% to 66.3%, 65.8% to 69.4%, and 60.4% to 69.9% respectively in comparison children). Mothers reported low income, intra-household food sharing, irregular distribution, quantity and quality of distributed foods, and lack of training and education as the main factors affected distributed food consumption by the target child.

Conclusions: Providing foods for nourishment of malnourished children living in low income family could prevent the worse nutritional status. However, it is not effective in improvement of nutritional status without empowerment strategies.

Keywords: evaluation, children, malnutrition, food distribution, community based program

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144/1663

ANALYSIS OF THE PRESENCE OF FOOD ADDITIVES IN LABELS OF INDUSTRIALIZED FOOD PRODUCTS WITH HOMEMADE TERM COMMERCIALIZED IN BRAZIL

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Background and objectives: Contemporary food has been characterized by the increase in the consumption of industrialized food and the increase in the consumers' interest in traditional food products. Most food products contain additives, which are generally included to increase the shelf life of foods or make them attractive. Term such as homemade and others similars are present in labels of food products commercialized in Brazil. However, according to the Brazilian legislation, food labeling shouldn't have terms that cannot be demonstrated, since they may induce

the consumer to error in relation to its real nature or composition. The study aimed at investigating of the presence of food additives in the labels of packaged foods that contain the term homemade.

Methods: To reach such a goal, a cross-sectional, descriptive and analytical study of the type census was carried out (n=5506). All industrialized food products available for purchase in a supermarket from one of the ten largest supermarket chains in Brazil were analyzed. For this purpose, the lists of ingredients of 75 packaged foods (with term homemade) were analyzed. It was also observed the function of the additive and the number of these. Total frequency of the additives by food groups according to the Collegiate Directive Resolution was observed.

Results: From the sample, 80% (n = 60) of food analyzed had food additives. The most commonly found additives were flavorings, leavens and dyes, and the lowest were the humectant, acidity regulator and the sequestrant. The group of foods with the highest number of homemade terms was group I (baking, cereals and others) being also the group with the highest presence of additives (n= 23). The group that contained the highest average additives (9,25) was group VI (oils and fats). The food with the highest number of additives (n=14) was present in group VIII (sauces and prepared food). It has been found that most packaged foods with homemade term have food additives in their list of ingredients.

Conclusions: It should be noted that consumers do not expect these food segments to contain food additives or other ingredients that are not part of their cultural or historical context.

Keywords: Food labeling; Industrialized food product; List of ingredients; Food additive; Nutrition

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PREVALENCE OF THE DOUBLE BURDEN OF MALNUTRITION IN HOUSEHOLDS IN THE CITY OF LAMBARÉ, PARAGUAY, DURING THE PERIOD OF APRIL TO JUNE 2016

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Background and objectives: In Paraguay, it has been considered as the most important nutritional problem to malnutrition, preferably in children under 5 years of age. At the moment a problem is emerging, the increase of the overweight and the obesity. The WHO is drawing attention to the emergence of the nutritional phenomenon known as the Double Burden of Malnutrition (DBM), a situation in which both nutritional conditions coexist in the same household. The present study determines the prevalence of double burden of malnutrition in homes in the city of Lambaré through a survey conducted during the months of April to June 2016.

Methods: An observational, descriptive, analytical, cross-sectional study was performed. With probabilistic sampling, taking all the neighborhoods of Lambaré, then the blocks were selected by simple random draw and the households were chosen for convenience. In each household, parents and all children under 5 years of age were included in the study, where anthropometric and socioeconomic data were collected. We used a confidence level (Z) of 95% and an allowed margin of error (e) of 10%. 96 households comprising 617 individuals were included in the study.

Results: The results show a prevalence of obesity in adults of 36.3% and overweight of 15.2%, being higher in women. In the under-5 age group, 4.3% were obese, 6.9% overweight, 60.8% eutrophic, 23.1% at risk of malnutrition and 4.9% undernourished. In addition 9.2% with low stature. The prevalence of the DBM in the city of Lambaré during the months of April to June 2016 was determined to be 7.3%; in 28.6% of these households income was lower than the current minimum wage.

Conclusions: The prevalence of DBM in homes in the city of Lambaré during the months of April and June of 2016 is 7.3%. The socioeconomic status of households with DBM is largely the middle class. The nutritional status of the population studied has similarities with existing official data.

Keywords: Malnutrition - Overweight - Obesity – Households - Double burden

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SOCIOECONOMIC CHARACTERISTICS INFLUENCE ADHERENCE TO DIETARY PATTERNS DURING PREGNANCY

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Background and objectives: The assessment of food consumption by dietary patterns is a methodology not limited to traditional assessment of nutrient intake, enabling a global analysis of the diet and creation of more viable guidelines. Our objective was to investigate the food consumption during pregnancy determining dietary patterns and its association with socioeconomic characteristics of pregnant women.

Methods: We prospectively followed two groups of pregnant women (n = 353) and collected in each trimester two 24-hours food records: one face-to-face and another by phone, with one of them for weekend/holiday. The determination of patterns was performed by principal component analysis with all groups and gestational trimesters together. We investigated the association between adherence to patterns with the maternal characteristics in logistic regression model adjusted for potential confounders (group, tri-

mester and maternal characteristics with p<0.20 in crude analysis), considering p<0.05 as significance level. All analysis were performed in SPPS v. 20.0.

Results: We identified three patterns: Traditional Brazilian (P1); Predominantly Ultra-processed and beef (P2); Integral, fruits, legumes, low fat milk and derivatives (P3). Pregnant women who work outside home had 36% more likely to be in the tercil of greater adherence to P1 (OR 1.36; 95%CI: 1.01-1.82); chance similar to those non-white color (OR 1.35; 95%CI: 1.01-1.82). Not living with a partner increased in 71% the chances of greater adhesion to P2 (OR 1.71; 95%CI:1.20-2.44). On the other hand, pregnant women with intermediate schooling (8|-11 years of study), front those with 11 or more years, showed 41% less chances of greater adherence to P3 (OR 0.59; 95%CI: 0.42-0.84); when compared to the economic class B, pregnant women from class C and D/E showed, respectively, 40% and 50% less chances of greater adherence to this pattern (OR 0.60; 95%CI: 0.37-0.95 and OR 0.50; 95%CI: 0.28-0.90).

Conclusions: We found associations between work outside home, non-white skin color, not living with a partner, education and socioeconomic classification with adherence to different dietary patterns identified. This knowledge is of extreme importance to the formulation of dietary education interventions with potential for positive impact on maternal and child health.

Keywords: Pregnancy Nutrition, Maternal Diet, Pregnant Women, Factor Analysis, Dietary Patterns.

144/1679

MONITORING OF TELEVISION ADVERTISEMENTS FOR BREASTMILK SUBSTITUTES AND COMMERCIALLY PRODUCED COMPLEMENTARY FOODS IN PHNOM PENH, CAMBODIA AND DAKAR, SENEGAL

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Background and objectives: Promotion of breastmilk substitutes (BMS) can negatively affect breastfeeding and is prohibited by global minimum standards. Promotion of complementary foods is inappropriate if it encourages feeding to children <6 months of age. This study was undertaken to assess the prevalence and content of BMS and complementary food advertisements on selected television channels in Phnom Penh, Cambodia and Dakar, Senegal.

Methods: Sixteen television channels were monitored daily from 6:00 a.m. to midnight for 13 months in Phnom Penh, Cambodia, while 20 channels were monitored 24 hours a day for three months in Dakar, Senegal. The number, frequency and duration of advertisements for BMS and commercially produced complementary foods which aired during this time were reported, along with the proportion of advertisements with nutrition/health claims and instructions for age of use.

Results: Ten television channels in Phnom Penh and four in Dakar aired advertisements for BMS. Three and five channels, respectively, aired advertisements for complementary foods. All channels that aired advertisements in Phnom Penh were local, however only international cable channels aired advertisements in Dakar. All BMS products advertisements in Phnom Penh were for children over one year of age. Products for children over one year and 6+ months of age were advertised in Dakar.

BMS advertisements were shown on average 382 times per month in Phnom Penh and 95 times per month in Dakar. Average air time was 189.5 and 29.7 minutes per month, respectively. Advertisements for complementary foods were aired 11 times per month on average in Phnom Penh and 33 times in Dakar, and air time averaged 3.2 minutes per month and 13.6 minutes.

Fewer than half of BMS advertisements and only one-third of complementary food advertisements explicitly stated an age of use for products. Nutrient content, nutrient function, and/or health claims were common in BMS advertisements.

Conclusions: This study illustrates the need to adopt, monitor, regulate and enforce legislation prohibiting BMS promotion. Advertisements for complementary foods often fail to state that products should not be fed to infants less than six months of age; this should be done to protect optimal infant and young child feeding.

Keywords: nutrition, advertising, breast-milk substitutes, baby food, complementary foods

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144/1691

IS FISH CONSUMPTION RELATED TO LOWER RISK OF MORTALITY IN CHINA AND US? A JOINT CHNS-NHANES STUDY

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Background and objectives: Fish intake has been associated with a reduced risk of major chronic diseases, particularly cardiovascular disease. However, data linking fish consumption and mortality are lacking and conflicting. The aim of this study is to examine whether fish consumption is associated with lower risk of mortality in Chinese and US adults.

Methods: We investigated the proposed association separately for US and Chinese adults using data from the China Health

and Nutrition Survey (CHNS, n=14,113) and National Health and Nutrition Examination Survey (NHANES, n= 31,021), including NHANES III conducted in 1988-1994 and continuous NHANES 1999-2010 for this prospective cohort study. Participants with cardiovascular disease or cancer at baseline were excluded.

Results: During a median follow-up of 14 and 9.8 years for CHNS and NHANES, 1009 (CHNS) and 4205 (NHANES) deaths were documented. The fish consumption level was higher in China than in the United States. Among Chinese adults, increased fish intake was significantly associated with lower all-cause mortality. As compared with the lowest level of fish intake, the hazard ratios (HRs) across increasing intake levels were 0.44 (95% CI, 0.36-0.56), 0.66 (95% CI, 0.55-0.79), 0.76 (95% CI, 0.63-0.91; P<0.001 for trend), after adjusting for potential confounders. However, fish intake was not associated with total mortality among US adults. The multivariable-adjusted HRs across increasing intake levels were 1.04 (95% CI, 0.92-1.18), 0.91 (95% CI, 0.79-1.05), 0.96 (95% CI, 0.82-1.12; P=0.28 for trend), as compared with the lowest level. We only detected a borderline inverse association between fish intake and risk of death from stroke in NHANES (P=0.06 for trend). Moreover, a positive association with risk of death from diabetes was observed in certain category of fish intake in NHANES. Subgroup analysis showed that the inverse association of fish with all-cause mortality was stronger among participants living in rural compared with those in urban areas in CHNS.

Conclusions: In these two independent but similar national cohort studies, fish consumption is associated with a reduced risk of total mortality for Chinese rather than US adults. Future studies may clarify the heterogeneity across races.

Keywords: Fish consumption, Mortality, National cohort, CHNS, NHANES

144/1696

AGGREGATION OF CHRONIC DISEASES AND ASSOCIATED FACTORS IN THE MIDWEST REGION OF BRAZIL IN 2012

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Background and objectives: Noncommunicable diseases (NCDs) are recognized as a public health issue bringing great impact to the health system in Brazil. Individually, each disease contribute to increased mortality and when aggregated they can multiply this risk. The aim of the study was estimate the aggregation of self-reported chronic diseases and to identify the associated factors.

Methods: Cross-sectional study with data from 6,695 individuals aged ≥18 years-old, both sex, collected by Surveillance System

for Protective and Risk Factors for Chronic Diseases by Telephone Survey (Vigitel), at Midwest Region of Brazil in 2012. One resident of each household, with at least one fixed telephone line, was randomly selected from probability samples, subsequently answering the questionnaire. Hypertension, diabetes and obesity were used to create the aggregation of chronic diseases which was classified in zero - individuals with no disease, 1 - individuals with at least one disease and 2 - those with two or more diseases. Sociodemographic and economic data, lifestyle and self-assessment of health status were analyzed such as independente variables. Chi-square test was used in the bivariate analysis. Multinomial logistic regression models were used to evaluate the associated factors with aggregation levels. The complexity of the sample and the effect of the study design were considered in the estimates.

Results: The aggregation of two or more diseases was observed in 10.4%, higher among women compared to men (p=0.03) and it was positively associated with increased age (p<0.01). After adjustments, the factors that remained associated with the aggregation were age (p=0.03), formal work p<0.01, alcohol consumption (p=0.05), worsening of self-reported health status (p<0.01), and living at Cuiabá city (p=0.01) and Campo Grande city (p=0.02).

Conclusions: The aggregation of chronic diseases in the Midwest Region in Brazil was associated with lifestyle related behaviors, sociodemographic and economic characteristics.

Keywords: Chronic disease. Risk factors. Brazil.

144/1698

PREVALENCE OF METABOLIC SYNDROME IN A GHANAIAN POPULATION

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Background and objectives: Abdominal obesity assessed by waist circumference is one of the most important predictor for metabolic syndrome and obesity-related diseases mortality (1). Metabolic syndrome (MetS) prevalence has increased and affects 25% of populations in developed countries (2). However, there is paucity of data on rates in African populations (3,4). The present study aimed to determine the prevalence of the MetS and the associated risk factors among adults living in Ghana.

Methods: Adult males (n=354) and females (n=496) above 18 years were recruited using multistage cluster-randomized sampling method in urban and rural areas of Hohoe municipality in the Volta region of Ghana. All subjects had anthropometric variables (BMI, waist circumference, waist hip ratio) related with abdominal obesity measured, in addition to dietary intake, physical activity and blood pressure. Additionally, blood glucose was assessed from a blood sample after overnight fasting. WHO recommendations for body mass index (BMI), waist circumference

cut-off points for overweight and obesity, and factors associated with MetS risk were utilised for analysis.

Results: The mean age for the 850 participants was 47.26±16.13 years. Fasting blood glucose levels were higher in men (5.4±1.46 mmol/L) when compared with women (5.2±1.37mmol/L) (p>0.05). Mean waist circumference was 79.8 cm in men and 85.5 cm in women (p=0.00). BMI was significantly higher in women (26.10 kg/m2) when compared with men (22.46 kg/m2). The subjects' diastolic and systolic blood pressure levels were high in both genders (normal 26.6%, pre-hypertensive 37.4% and hypertensive 36%). The prevalence of MetS was 8.7 % and significantly higher (p<0.05) in women (13.5% versus 7.9% in men). Increased age, waist circumference, raised blood pressure, and BMI were all correlated with MetS (p<0.05).

Conclusions: This is among the few studies which highlights the prevalence of MetS in Ghana. Abdominal obesity predictors, in particular waist circumference, are the main causative factor for MetS. Dietary adjustments, regular physical activity and weight loss should be the main focus points for MetS management.

Keywords: Waist circumference, waist-hip ratio, hypertension, BMI

Further collaborators:

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144/1706
PANORAMA OF NUTRITION LANDSCAPE IN EAST AFRICAN COMMUNITY

Ouma, Cyprian.

WFP.

Background and objectives: The focus of nutritional challenges in the East African region has been on under nutrition measured through stunting, wasting and underweight levels in young children. There has been little correlational analysis on the emerging globalization and diet shifts, with the nutritional deficiencies the region faces. We explored the inter-relationships and trends of nutritional outcomes in children under 5 years.

Methods: We investigated the availability of food and nutrition data collected in DHS surveys for the last 20 years. The data was aggregated, standardized and harmonized. Assessment of the Quality of data and analysis was done in SPSS vs 24.

Results: Kenya registered an improvement in prevalence of wasting t from 7% to 4% over 6 years with Rwanda having the lowest levels .Highest proportions of mothers who practiced exclusive breastfeeding was in Rwanda while Kenya showed an improvement from 31.9% to 61.4% over 6 years. The levels of stunting in Burundi decreased from 63% in 2000 to 57.5% in 2010, wasting levels rose to 9% in 2005 but fell to 6.1% in 2010. In Kenya, Stunting levels decreased from 35% to 26%; and the proportion of underweight children dropped from 16% to 11%. In Rwanda, percentage of stunted children decreased from 57% to 38% from1992 to 2015 and wasting reduced from (8%) in 2000 to 2.2% in 2015 and prevalence of underweight children gradually decreased to 9% from 23.7%.

In Uganda over 10 years, stunting and underweight prevalence levels in children decreased to 33% from 45% in 2000. Tanzania's stunting levels in the last 5 years remained the same but alongside Rwanda reported a spike in the number of overweight cases while Kenya recorded a positive trend with the number of overweight cases reducing by 36,000.

Conclusions: Multiple forms of malnutrition coexist in EAC and vary across countries, regions and groups. Malnutrition is not decreasing at the required rate and is affecting the majority of the EAC population. The changing burden of disease should be tracked and included in development plans.

Keywords: EAC, Malnutrition

144/1708
NUTRITION INEQUALITIES IN EAST AFRICA

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World Food Programme (WFP). Kenya.

Background and objectives: Food and nutrition inequalities in the East Africa Community region are characterized by high prevalence rates of malnutrition. Although the region is characterized by high rates of undernutrition, the nutrition dynamics are rapidly shifting into obesity, making th region to face a double burden of malnutrition.

Methods: Country profiles data sources, indicators and dimension of inequality data were sourced from publicly available demographic and health Surveys (DHS), localized SMART assessments, NGO and UN reports, multiple indicator cluster surveys (MICS) and institutional websites WHO, EAC, AU. The use of large-scale, nationally representative household surveys that collect data through standardized, face-to-face interviews in low- and middle-income countries was applied. Inequality Nutrition data was disaggregated into three dimensions, economic status, sex and place of residence. The wealth index was used to calculate the economic status at household level by using country specific indices to show the ownership of certain assets and access to certain services, after which quantiles were created.

Results: Disaggregation by place of residence shows that high levels of stunting in all the EAC countries are found in rural areas than in urban dwellings. Low levels of stunting are seen among wealthy families and high prevalence's are reported among the poor households. Rural living children are more likely to be underweight in comparison to urban children. Overall these shows that

more nutrition inequality if found among poor rural households who have low access to essential health services, suffer chronic food insecurity and have low purchasing power that leads to inadequate food consumption and insufficient dietary diversity .

Conclusions: Nutrition inequalities exists in the region and because of the harmful effects of malnutrition over the life cycle, inequalities exemplify other household and communal disadvantages creating a circular relationship. Identifying the data gaps that hinder action on equity and inequalities and ttargeting expansions in services specifically towards the most disadvantaged may be more successful and cost effective than using limited resources to create across-the-board increases in services.

Keywords: Nutrition, Inequality, EAC

144/1712

DEVELOPING THE NEXT GENERATION OF PACK-AGED FOODS: A FRAMEWORK TO ADDRESS MULTI-STAKEHOLDER REQUIREMENTS

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Background and objectives: The demand for foods and beverages with improved nutritional composition has increased in the past decade. Governments, academics, and consumers have different expectations of what is a 'healthy' product. Here we present the development of a 'nutrition innovation framework' which could be used as a guidance to improve the nutritional composition of a product category and its application in two case studies: breakfast drinks and sweet biscuits.

Methods: The framework is divided in three steps: 1. Definition of product positioning, i.e. the targeted food category or eating occasion. 2. Definition of nutritional targets/requirements based on the latest dietary recommendations and regulated definitions of 'healthy' (e.g. front-of-pack labeling). 3. Testing the extended to which the proposed targets identify best-in-class nutritional composition using the Mintel Global New Product Database branded food composition data.

Results: The framework was applied to two product categories, breakfast drinks and sweet biscuits, falling respectively under the 'breakfast' and 'snacks' eating occasions. In both cases, food based dietary guidelines and regulatory definitions of 'healthy' focused on low sugar content (added and total), no addition of salt, low saturated fat content and a high nutrient density. Wholegrain, protein, complex carbohydrates and fruit and vegetable content were clearly prioritized. For breakfast drinks a Mintel extract showed that only 10% (n=9/95) of the existing products would meet external definitions of 'healthy'. In the case of biscuits, no products would meet all external definitions and there was a need for interim nutritional targets to successfully stimulate innovation.

Proposed interim targets were achieved by 7 products out of 2072 products analyzed.

Conclusions: This novel framework uses the latest available evidence and data to guide the food industry towards more nutritious products while addressing the requirements of public health officials and regulators. Further research is needed to assess the applicability/ feasibility of this framework across companies' portfolios. In particular, there is a need to clearly define the product categories in which such (re)formulation guidelines could operate and to develop a comprehensive scoring algorithm to track improvements in nutrient composition and compare between products.

Keywords: Food reformulation, breakfast, snacks, packaged foods

Conflict of Interest Disclosure: All authors are employed by Nestec Ltd

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144/1717

PLASMA MAGNESIUM AND RISK OF DIABETES. THE PREVENTION OF RENAL AND VASCULAR END-STAGE DISEASE STUDY

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Background and objectives: Low circulating magnesium has been found to be associated with prevalence of diabetes in cross-sectional studies. Such associations can be due to reverse causation. We therefore aimed to investigate the association of plasma magnesium with risk of developing diabetes.

Methods: We examined 5673 subjects aged 28-75 years without diabetes at baseline in the Prevention of Renal and Vascular End-Stage Disease (PREVEND) study, a prospective population-based cohort study. Diabetes was defined as fasting glucose level ≥7.0 mmol/l, non-fasting glucose level ≥11.1 mmol/l or anti-diabetic drug use. The association of plasma magnesium with risk of diabetes was studied using Cox models. We adjusted multivariable models for age, sex, race, body mass index, educational level, smoking, alcohol consumption, cholesterol, hypertension, history of stroke and coronary heart disease, family history of diabetes, kidney function (eGFR CKD-EPI), plasma levels of potassium, calcium, sodium and albumin, and use of diuretics and proton pump inhibitors.

Results: During a median follow-up of 11.2 (IQR: 7.1-11.8) years, 448 (7.9%) subjects developed diabetes. Mean age was 49.1±12.1 years, 48.1% were male. Mean plasma magnesium was 0.81±0.05 mmol/L, and plasma magnesium was inversely associated with risk of diabetes after multivariable adjustment (HR 0.79; 95% CI 0.63-0.99 per 0.1 mmol/L). We observed a significant interaction by age (Pinteraction<0.01). In age-stratified analyses (based on equal number of events in both groups), we observed no association of plasma magnesium with risk of diabetes in subjects

aged <55 years (HR 0.94; 95% CI 0.67-1.32 per 0.1 mmol/L). In contrast, we observed an inverse association of plasma magnesium with risk of diabetes in subjects aged ≥55 years (HR 0.65; 95% CI 0.52-0.83 per 0.1 mmol/L). Adjustment for potential confounders did not materially alter the association (HR 0.66; 95% CI 0.48-0.90 per 0.1 mmol/L).

Conclusions: Plasma magnesium is inversely associated with risk of diabetes. This association appears particularly present in subjects aged ≥55 years. Magnesium might therefore play a role in the prevention of diabetes, in particular in the older population.

Keywords: magnesium, diabetes, epidemiology

144/1722

A CARBON TAX ON FOOD MUST BE ETHICALLY NUANCED

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Background and objectives: With global food production accounting for 19-29% of total global carbon emissions, it is reasonable to ask whether we could eat more sustainably than we currently do. A carbon tax on food is estimated to reduce greenhouse gas emissions by 8.6-9.3% and has been proposed as a way to encourage consumers to adopt a more sustainable diet. However, the details of such a proposal are morally significant.

Methods: We used an ethics framework to assess the moral risks of a carbon tax on food commodities, and particularly on red meat. We completed a policy analysis to develop carbon tax scenarios that could ethically mitigate carbon emissions from foods.

Results: A carbon tax on foods does not meet a justice requirement. It exacerbates the burden on those who have contributed the least to the problem and who would be most negatively affected from the perspectives of nutrition, socioeconomics and vulnerability to climate change. Additionally, insufficient attention has been placed on evaluating meat alternatives, the amounts of those alternatives that would be needed to account for energy and nutrient loss associated with not eating meat, and the production requirements and environmental impacts of those alternatives. However, there are ways that a carbon tax could be implemented in an ethically just way. It could be implemented in wealthy countries with strong social protections and in countries that have disproportionately high levels of red meat consumption. A carbon tax on food could also be ethically applied to specific foods (e.g. red meat), instead of all foods or all animal-sourced foods. This would allow for alternatives with a lower environmental footprint to remain available and affordable to certain populations to meet their dietary needs.

Conclusions: The discussion moving forward should focus on how to make environmental gains from altering consumption habits without exacerbating existing vulnerabilities. A food tax must be carefully constructed so as to not benefit the privileged at the expense of the vulnerable. We cannot permissibly tackle the injustices of climate change by creating and exacerbating injustices elsewhere.

Keywords: climate, ethics, justice, food, carbon

144/1724

GENDER DIFFERENTIALS IN ADULT EXCESS WEIGHT IN THE ARAB WORLD: A REVIEW

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Background and objectives: Some of the highest prevalences of overweight and obesity have been reported in the Arab region; a consequence of the global nutrition transition, and ensuing alterations in diet and lifestyles. Globally, increases in weight have been shown to be greater among women, and it is likely that cultural factors exacerbate these gender differentials in the Arab region. We therefore aimed to review evidence for the female excess in weight among adults in countries of the Arab world.

Methods: We searched MEDLINE and Social Sciences Citation Index (SSCI) databases for articles published between January 2000 and October 2016, and hand-searched bibliographies of retrieved articles. We included studies that reported adult overweight or obesity prevalence; were conducted among residents of Arab League countries; described study design and methods and specified sample size. Data on prevalence of overweight, obesity and central obesity were extracted by gender. Male- to-female ratios (M/F) of each excess weight indicator were computed. Qualitative data on cultural factors that contribute to excess weight were also extracted.

Results: Out of 1,734 articles retrieved, 339 articles met inclusion criteria and 213 provided data. Data from nationally representative studies showed high overall prevalence of overweight (ranging between 28.2% to 37.9%) and obesity (ranging between 14.5% and 43.7%). A clear gender difference in overweight was observed, with 41/56 studies having M/F ratio exceeding 1. However, females were more likely to be obese and centrally obese with M/F ratios of less than 1 in 72/77 studies and 35/37 studies respectively. Explanations for these gender differences included higher levels of physical inactivity among females due to cultural barriers, reduced efforts from women to take care of their body shape after getting married and having children, and preference for plumpness as a sign of feminine beauty among traditional societies.

Conclusions: In a region where overall levels of obesity are among the highest globally, we find that prevalence of overweight is higher among men, whereas obesity and abdominal obesity are more prevalent among women. It is likely that gender norms specific to the region amplify these differentials.

Keywords: Excess weight, obesity, overweight, gender, Arab region

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144/1727

TEMPORAL TRENDS IN FOOD GROUP AVAILABILITY AND CANCER INCIDENCE IN AFRICA: AN ECOLOGICAL ANALYSIS

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Background and objectives: Many African countries are experiencing an unprecedented epidemiological transition characterized by an increase in incidence of non-communicable diseases including various cancers, and fueled by the uptake of a Western-type diet and increased sedentary behavior. Nevertheless, data linking specific changes in diet and lifestyle with cancer incidence in Africa are extremely limited and there are few population-based cancer studies available. We aimed to evaluate at the country level the relation between food group availability as a proxy for individual level consumption and trends in cancer incidence across Africa.

Methods: Recent age-standardized rates for breast, prostate, colorectal, oesophageal, thyroid and pancreatic cancer were obtained from the African Cancer Registry Network, for 18 countries. National availability data for red meat, animal fats, cereals, starchy roots, vegetables/fruits, alcoholic beverages in kg/capita/year, and energy in Kcal/capita/day were retrieved from the Food and Agriculture Organization of the United Nations (FAO) databases. Food availability values were considered for four hypothetical times of exposure: time of collection of cancer incidence data (T0) and 5, 10, 15 and 20 preceding years (T-5, T-10, T-15, T-20). Ecological partial correlation coefficients with adjustment for potential confounders were calculated for the relation between cancer incidence and food availability.

Results: There was a significant increase in the availability of energy and all the major food groups for over the 20 years considered in this analysis (T-20 vs. T0, $p<0.05$). In multivariate analyses, red meat (r-5=0.495, $p=0.002$) and animal fats (r-10=0.450, $p=0.007$) availability were significantly positively correlated with colorectal cancer incidence in both men and women.. In contrast, starchy roots were negatively correlated with colorectal cancer (r-10=-0.359, $p=0.034$) and thyroid cancer (r-20=-0.331, $p=0.052$). Alcoholic beverages were also positively correlated with colorectal cancer (r-20=0.314, $p=0.066$) and oesophageal cancer (r-15=0.624, $p=0.001$).

Conclusions: This analysis provides ecological support for an impact of Westernization, marked by higher consumption of animal products and lower consumption of starchy roots, on the development of certain cancers in Africa over the past decades. Further research on the impact of diet and lifestyle with cancer development in Africa through high-quality epidemiological studies are urgently needed.

Keywords: Cancer. Food availability. Nutrition transition. Africa. Ecological analysis

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144/1730

ENVIRONMENTAL SUSTAINABILITY IN FOOD AND NUTRITION UNITS - ROLE OF NUTRITIONIST?

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Background and objectives: Studies indicate that only few undergraduate courses in nutrition include disciplines focused on environmental issues in their curricular matrices, in despite of the fact that food production be responsible for the considerable generation of solid waste and consumption of water, energy and raw materials. The objective was to know the opinion of responsible technical nutritionists (RT) of food and nutrition units (UANs) about the role of the nutritionist in implementation of the sustainability practices focused on the production of meals.

Methods: This is a qualitative study, with intentional sampling. Online questionnaires sent to RT of different UANs. There were interviewee nutritionists from hospital cooking, school meals, both representatives of the municipal public service, federal educational institutions and private companies. Professionals should answer the questions: "Have you received any training on sustainability practice at UAN?" and "Is the nutritionist the most appropriate practitioners working in environmental sustainability at UAN?".

Results: 11 nutritionists answered the questions. Regarding their participation in training aimed at sustainability practice at UAN, 63.6% of nutritionists denied, 18.2% confirmed and two (18.2%) professionals reported their participation in generalized content training. Regarding their opinion on nutritionists as the most appropriate practitioners working in this issue, 36.4% disagreed and 63.6% favored it. Disagreement was justified by the large number of attributions of the RT nutritionist and the lack of training / capacity building for this responsibility, suggesting

the partnership with a trained professional. Those agree said that nutritionist knows and keep up with the whole routine of the unit, establishes procedures, plans menus and supervises the execution process. They must to be trained in this area.

Conclusions: Among the researched nutritionists, most of them reported that they did not have the training to work for sustainability at UAN and acknowledged that the nutritionist was the most suitable professional for this task, showing the need for changes in the training of this professional.

Keywords: Sustainability; Nutritionist; Nutrition and Sustainability; Food and Nutrition Security

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144/1732

ASSOCIATION BETWEEN TIME PERSPECTIVE AND ORGANIC FOOD CONSUMPTION IN A LARGE SAMPLE OF ADULTS

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Background and objectives: Organic food intake has risen in many countries during the past decades. Even though motivations associated with such choice have been studied, psychological traits preceding these motivations have rarely been explored. Consideration of future consequences (CFC) represents the extent to which individuals consider future versus immediate consequences of their current behaviors. Consequently, a future oriented personality may be an important characteristic of organic food consumers. The objective was to analyze the association between CFC and organic food consumption in a large sample of the adult general population.

Methods: In 2014, a sample of 27,789 participants from the NutriNet-Santé cohort study completed the CFC questionnaire and an Organic-Food Frequency questionnaire. For each food group (17 groups), non-organic food consumers were compared to organic food consumers across quartiles of the CFC using multiple logistic regressions. Moreover, adjusted means of proportions of organic food intakes out of total food intakes were compared between quartiles of the CFC. Analyses were adjusted for socio-demographic, lifestyle and dietary characteristics.

Results: Participants with higher CFC were more likely to consume organic food (OR quartile 4 (Q4) vs. Q1 = 1.84, 95% CI: 1.58, 2.15). Overall, future oriented participants were more likely to consume 15 food groups. The strongest associations were observed for starchy refined foods (OR = 1.75, 95% CI: 1.60, 1.91), fruits and vegetables (OR = 1.71, 95% CI: 1.55, 1.88), and non-alcoholic beverages (OR = 1.70, 95% CI: 1.58, 1.84). The contribution of organic food intake out of total food intake was 33% higher in the Q4 compared to Q1. More precisely, there was a significant increase of the contribution of organic food consumed for 16 food groups. The highest relative differences between Q4 and Q1 were observed for starchy refined foods (22%), non-alcoholic beverages (21%), and dairy products (20%). Seafood was the only food group without a significant difference.

Conclusions: This study provides information on the personality of organic food consumers in a large sample of adult participants. Consideration of future consequences could represent a significant psychological determinant of organic food consumption.

Keywords: Organic Food Consumption. Nutrition. Consideration of Future Consequences. Psychology

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144/1736

PHYSICAL ACTIVITY IN THE CLASSROOM TO PREVENT CHILDHOOD OBESITY: A PILOT STUDY IN SANTIAGO, CHILE

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Background and objectives: Chile is in an advanced stage of the nutritional transition, which means that there is an increased prevalence of obesity, notably in children. A 4-month pilot study tested the suitability of a physical activity intervention for first graders (children ages 6 and 7) in a public school in Santiago, Chile.

Methods: This intervention was done in the classroom twice a day. Teachers were trained to deliver the program in the classroom during the school day. Teachers were surveyed to determine if this intervention fit within their curriculum and classroom routines

and they reported in a focus group that it was suitable for them. All children actively participated in the program and positive changes in their attitudes towards physical activity were observed by their teachers. Anthropometrics, blood pressure, and hand grip strength were measured in the students.

Results: Of the 89 students studied, 54 were male and 35 were female, with an average age of 6.44 years (SD±0.39, 5.82- 8.00 years). A significant reduction was observed in children with high waist circumference ≥90th percentile, and in mean systolic blood pressure. However, statistical power values for those comparisons were rather low. Anthropometry and hand grip strength were not modified.

Conclusions: The latter calculations and the lack of a control group are showing the weaknesses of this pilot study and that further research with a larger sample size and an experimental design are strongly needed.

Keywords: children, physical activity, blood pressure, waist circumference

Conflict of Interest Disclosure: This study was funded by the International Life Sciences Institute (ILSI Sur Andino). which had no influence in the presented results.

144/1737

ARE NUTRIENTS INTAKE ASSOCIATED WITH COPD?: A CROSS SECTIONAL SURVEY IN MOROCCO

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Background and objectives: Diet represents an important source of micro and macronutrients. Several studies demonstrated the existing evidence that they have a series of antioxidant, anti-allergic and anti-inflammatory properties, which can have a protective effect against COPD risk in the population.

Objective: to investigate the dietary intake of micro and macronutrient with the COPD prevalence in a representative sample of adults Moroccan in Fez City.

Methods: A cross-sectional study carried out in Fez as part of the BOLD study. The relationships between dietary intake and spirometrically defined chronic obstructive pulmonary disease (COPD) were investigated in 767 adults. Post-bronchodilator spirometry was performed for all participants using a Micro Spirometer. The dietary information was obtained by food frequency questionnaire(FFQ). From the food diary results, nutrients and energy intake were calculated using Food composition table analysis. Comparison of micro and macro nutrient intake between two subgroups with an without COPD was performed using Mann-Whitney and kruskal-wallis non parametric test.

Results: From 767 subjects. 56.7% were female. Mean age was 55.6±10.9 years old. The prevalence of COPD was 12.6%. 38.1% of the participants were overweight, and 31.2% were obese. Among all subjects, 25% were current or ex-smokers. Intakes of Vitamin C, Vitamin A, Carbohydrate, Calcium, Protein and total Energy Intake were low in person with COPD (P=0.03; P=0.04 ; P=0.02; P=0.02 ; P=0.05; P=0.05 ; P=0.02 respectively)

Conclusions: This study has shown the lower intake in several macro and micronutrients as a potential risk factor of COPD. Appropriate trials are needed to establish the real impact of nutrient intake on COPD in Morocco

Keywords: Micronutrient, macronutrients, COPD, Morocco

144/1745

BODY MASS INDEX TRAJECTORIES OF INDIGENOUS INDIAN ADULT POPULATION AND IN RELATION TO DIET, PHYSICAL ACTIVITY AND SOCIOECONOMIC FACTORS

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Background and objectives: Indigenous population in India constitutes 8.6% of the total population. Limited cross sectional studies indicate increase in the prevalence of overweight and obesity even in Indian indigenous population, which were known for high physical activity and low body mass index (BMI) levels. The objective of the study is to quantify BMI trajectories among indigenous Indian adult population 20 years and above and also to identify factors associated with increase of overweight and obesity in this population.

Methods: It was a periodical longitudinal National study on 'diet and nutritional status of indigenous population', carried out by the National Nutrition Monitoring Bureau (NNMB) during the years

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1985-87, 1998-99, and 2008-09 by covering 9,753, 21,334, 28,730 adults in the respective years. The BMI trajectories among adult indigenous population was assessed by mixed models and according to BMI categories for both men and women and multiple Logistic regression analysis was computed to identify associated factors.

Results: The prevalence of overweight and obesity among Indian indigenous adult population at baseline was 1.2% and 1.6% among men and women, respectively in 1985-87 and it was increased to 3.6% and 3.8% in 1998-99 and 7% and 8% in 2008-09. The trajectories of BMI was 0.52kg/m2 (CI: 0.47 - 0.56) in men and 0.47 (CI: 0.43 – 0.51) in women. The trajectories were more in normal BMI categories than CED and overweight and obesity categories. The results were consistent with less rapid increased rates of BMI for adults who had lower intakes of sugar and sugar sweetened beverages, oils and fats and those engaged in moderate and severe physical activities and it was more rapidly increased in adults who belonged to high socioeconomic and high per capita monthly income.

Conclusions: The overweight and obesity is a significant problem even among indigenous tribal population and there is an urgent need educate the population on the rapid increase and consequences of overweight and obesity on health of the individuals.

Keywords: Indigenous population, Body mass index, adults, trajectories, National study

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INFLUENCE OF FOOD CONSUMPTION IN GLYCEMIC CONTROL AND THE CARDIOMETABOLIC RISK OF CHILDREN AND ADOLESCENTS WITH DIABETES MELLITUS TYPE 1

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Background and objectives: Type 1 diabetes mellitus (DM1) is a disease characterized by the destruction of the beta cells, which can lead to an insulin deficiency. Through a balanced diet, one can obtain better glycemic control. Objective: To investigate the influence of dietary intake patterns on glycemic control and cardiometabolic risk in children and adolescents.

Methods: Descriptive cross-sectional study with children and adolescents between 9 and 17 years of age, with DM1. Anthropometric parameters (body weight, height (h), waist circumference (WC), body mass index (BMI), score z (h/age) and (BMI/age), blood pressure measurement and biochemical tests (lipid profile, fasting glycemia and glycated hemoglobin). A questionnaire was used to evaluate the level of physical activity and food consumption was estimated by a 3-day food diary. Patients were classified as having metabolic syndrome (MS) or not, when more than 3 risk factors were identified.

Results: The sample consisted of 31 individuals (55% female). Inadequate food intake was identified, regardless of gender, age or disease duration. Only 14% of the population reached the daily energy requirement and only 10% of the children had adequate intakes

of protein, carbohydrate and lipid. The population consumed in excess carbohydrate and cholesterol and presented low consumption of monounsaturated fats. The mean value of glycated hemoglobin was high (Hb1Ac 9.49%) and there was a better glycemic control in the population that presented higher energy expenditure and lower lipid consumption. Of the total sample, 25% of children and adolescents had MS. However, this was not related to food quality and physical activity level. The most prevalent factors were fasting glycemia; high triglycerides and low HDL levels, and large abdominal circumference than expected. Both the MS and non-MS groups presented inadequate diet and sedentary lifestyle.

Conclusions: The present study showed an inadequate dietary intake of the sample and that these DM1 individuals tend to present an elevated cardiovascular risk. The findings suggest that strategies should be created to promote healthy eating and continuous follow-up, favoring the link between health professionals and patients and increasing adherence to prescribed treatments.

Keywords: diabetes mellitus, cardiometabolic risk, metabolic syndrome, glycemic control, food consumption.

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ESTIMATING GESTATIONAL AGE USING LAST MENSTRUAL PERIOD (LMP) AND SYMPHYSIS FUNDAL HEIGHT (SFH) MEASURES RATHER THAN ULTRASOUND EXAMINATION: A TEST OF METHODS FOR USE IN LOW INCOME SETTINGS

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Background and objectives: Dating gestational age (GA) of pregnant women is essential for assessing age of pregnancy and intra-uterine fetal growth. Obstetric ultrasound (USG), the gold standard for establishing GA, is not available in most low -income countries. Dating last menstrual period (LMP) and measuring symphysis pubis-fundal height (SFH) offer potential as cheaper alternatives.

The objective is to compare the accuracy of gestational age (GA) estimated by reported last menstrual period (LMP) and measured symphysis-pubis fundal height (SFH), with the ultrasound estimates (USG) as a reference, in a cohort of pregnant women in rural Nepal.

Methods: Data derive from pregnant women and their newborn infants from a USAID-supported birth cohort study in Banke district of Nepal. GA was assessed using three separate methods between 18 to 26 weeks of pregnancy. A total of 717 women were assessed using USG, 712 with reported LMP, and 614 women with SFH. Paired t-tests were used to assess differences in GA estimated by LMP or SFH compared to USG. A concordance correlation coefficient (CCC) was calculated to quantify agreement among the three methods.

Results: The median GA using USG was 275 days, 278 days by LMP (p<0.0003 compared to USG) and 268 days by SFH (p<0.0000 compared to USG). The concordance correlation coefficient for GA estimates for LMP and US was 0.35, and between SFH and USG was 0.40. Percent women with GA estimates at delivery within +/- 7 days comparing LMP to USG were 18%, and 77% within +/- 14 days. In contrast, the percent women with GA estimates within +/- 7 days at delivery comparing SFH and USG were 19%, but only 62% within +/- 14 days.

Conclusions: There were small but significant differences in the median GA estimates obtained by the three methods. The degree of agreement between LMP and SFH were poorly concordant. No significant differences in accuracy between the measures were observed. However, GA estimates were found to be more accurate than SPH in LMP compared to USG (within +/-14 days). This finding suggests that LMP should be used instead of SFH in the absence of USG.

Keywords: gestational age estimates, pregnant women

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FACTORS ASSOCIATED WITH LOW BIRTH WEIGHT IN RURAL MALI USING BIRTH WEIGHT RECALLED FROM MOTHER'S MEMORY OR BIRTH WEIGHT REPORTED FROM A HEALTH CARD. (2013)

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Background and objectives: It is widely known that low birth weight (LBW) is associated with increased risk of neonatal death and impaired cognitive development. However, in developing countries, estimating LBW can be challenging due to the absence of official documents. Moreover, causes of LBW are multifactorial. The objectives of the present work are: (1) to compare the profiles of mothers reporting birth weight from memory vs.

mothers who provide a document indicating birth weight in rural West Mali; (2) to identify the determinants of LBW depending on the method birth weight is reported.

Methods: In 2013, we conducted a cross-sectional survey among randomly selected mothers of 12-42 months old children (n = 1254) in the district of Kayes, Mali. We collected birth weights during the survey from either an official health card (HC) or from mother's memory (MM), as well as potential determinants of LBW such as socioeconomic characteristics, pregnancy details, mother's anthropometry and household food insecurity. Definition of LBW was a weight under 2500g. Relationships between LBW and potential determinants were assessed using logistic regressions.

Results: The prevalence of HC-LBW was significantly lower than the MM-LBW prevalence (11% vs. 16%, p = 0.04). Mothers reporting birth weight from memory were less educated (p < 0.01), poorer (p = 0.03) and attended fewer prenatal visits (p < 0.01) than mothers who reported birth weight from HC.

Factors associated with MM-LBW included mother's profession, skilled person who attended delivery and household food insecurity (respectively: p <0.01, p <0.01, p = 0.03). Factors associated with HC-LBW were mother's education, antenatal care and place of delivery (p < 0.01). House occupancy status was associated with both HC-LBW and MM-LBW (p < 0.01), while mother's anthropometry was not, neither with HC-LBW nor MM-LBW.

Conclusions: LBW prevalence estimates and determinants depend on the method used to report birth weight data (HC vs. MM); the method of reporting is itself highly influenced by socioeconomic characteristics of mothers.

Keywords: Memory reported birth weight, documented birth weight, low birth weight, Rural Mali.

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EFFECTIVENESS OF A CULTURALLY APPROPRIATE LIFESTYLE MODIFICATION PROGRAMME IN IMPROVING BODY COMPOSITION IN URBAN SRI LANKAN WOMEN WITH PREDIABETES

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Background and objectives: Lifestyle interventions are the keystone of prevention and treatment for non-communicable diseases. Effectiveness of interventions rests on cultural relevance. Increased fat mass (FM) and abdominal obesity has been suggested as a possible cause for increased cardiometabolic risk

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and improvement of body composition status may have a positive effect on dysglycemic status. This abstract presents data on the effectiveness of a lifestyle modification programme in improving body composition among newly diagnosed prediabetic Sri Lankan women.

Methods: Urban women (n=1500) aged 30-45 years from Colombo Municipal Council area were screened for prediabetes and 130 newly diagnosed prediabetics were recruited randomly to intervention and control groups. Using a participatory approach an intervention progaramme was developed and implemented for 4 months in the intervention group (goal: 5% weight loss and 150 minutes of physical activity/week). Control group received regular advice and print material only. Weight, waist, glycosylated haemoglobin (HbA1c), body composition (bioelectrical impedance analysis using a population specific equation) were assessed. Independent sample t- test and paired t- test were used.

Results: The final sample was 101 women (intervention n=51, control n=50) with no significant difference in baseline parameters between responders and non-responders or between groups. Following intervention, 52.9% of the intervention group achieved the weight loss goal compared to the control group (2%) and a significant (P < 0.001) reduction in mean waist circumference (0.88 ± 1.2 cm) was observed in the intervention group. In the intervention group, there was a reduction in both FM and fat free mass (FFM) post intervention compared to baseline (P < 0.05) and also a reduction in weight (2.6 ± 2.0 kg) (P < 0.001). Hence a concurrent reduction in FM% and an increase in FFM% were observed. In the intervention group, there was a reduction (P < 0.05) in HbA1c (0.2±0.24%) and FPG (20.6±11.6 mg/dl) and 37.3% became normoglycaemic, with none among controls. In the control group no changes were seen in any parameter post intervention.

Conclusions: Improvement in body composition and reversal of dysglycaemia were achieved through a goal- based, culturally sensitive intervention programme of four months duration.

Keywords: Lifestyle modification, Prediabetes, body composition

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COMPLEMENTARY FEEDING INTERVENTIONS AND ITS EFFECT ON MORBIDITY OF CHILDREN UNDER 5 YEARS

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Background and objectives: Complementary feeding using fortified blended food supplements in poor households is one of the intervention for improving nutrients intakes and reducing the incidence of diseases in children under 5 years. We assessed the impact of this vital child survival programme in Rutsiro and Nyamagabe districts.

Methods: A cross-sectional study was conducted to collect data on the targeted population in the two districts between August and September 2016. Two stage sample stratification by district and wealth category was done. Final sample size was 3700 aged 6-59 months. Morbidity was assessed based on two weeks recall questionnaire. The child caretaker was the main respond. Key indicator symptoms assessed were cough, fever and diarrhoea.

Results: Children enrolled in the complementary feeding receiving fortified food supplement were slightly less likely to be affected by combination of 2-3 symptoms (46.5%) as compared to those not enrolled in the programme (48.4%).

Conclusions: The complementary feeding using fortified blended food supplement reduces the prevalence of morbidity and reinforces the impact of the nutrition infection cycle on child malnutrition. Undertaking appropriate food supplementation is encouraged for future nutrition programmes.

Keywords: complementary feeding, fortified blended food, Morbidity

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144/1772

MAPPING OF SCHOOL MEAL NUTRITION GUIDELINES AND STANDARDS IN LOW AND MIDDLE-INCOME COUNTRIES

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Background and objectives: Poverty eradication, health, education, food security and nutrition continue to be the pillars of sustainable development. Schools can make a sizeable, lasting impact on these determinants through various access points. One such access point is the provision of meals through globally widespread school-based programmes. Key actors have proposed that many of these programmes can benefit from a stronger emphasis on the quality, adequacy and nutritional composition of the meals provided, primarily through the enforcement of nutrition guidelines and standards (NGS). The objective of this study was to conduct a mapping of school meal NGS in low and middle-income countries, and to identify implications from school food programmes (SFP).

Methods: This study used a triangulation of methods for data collection and analysis including survey administration, complemented with official laws, regulations and policies, scientific articles, and through direct follow-up with key respondents. The inclusion criteria to select countries, encompassed being classified as a low or middle-income country, and having a government-owned or transitioning SFP targeting primary schools.

Results: Survey responses were received from 33 countries (59% response rate). A further 10 countries, which did not re-

spond to the survey, were then included, using information from the above-mentioned sources. Overall, identified SPF nutrition objectives, beneficiaries, food procurement and preparation modalities, varied widely between countries as they obey to different nutrition priorities, possibilities and contexts. Out of the 43 sample countries, 17 were found to have some general recommendations to guide the composition of the SFP meals, while 13 (mostly from Latin America) had official NGS for school meals and 10 were in the process of development. The majority of the identified NGS included both nutrient (great emphasis on energy and protein) and food-based standards, determined by using different nutrition requirements. Food-based standards were not always explicitly aligned with national food-based dietary guidelines. Many tend to be complex and change according to SPF modality.

Conclusions: These preliminary results underscore that SFP characteristics have important implications which should be considered for the development and feasibility of NGS. More attention is needed to the development process, context, easiness and flexibility of application, and training for end implementers.

Keywords: nutrition guidelines and standards; school meals; school food programmes

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THE ADOLESCENTS IN THE SOURTHERN CONE WITH LESS CONSUMPTION OF FRUITS AND VEGETABLES ARE LESS ACTIVE?

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Background and objectives: During the adolescence, they acquire and consolidate stylelife habits. Physical inactivity and low fruit and vegetables consumption are frequent habits in all age. These represent health risk factors and for NCDs.

The objetive was evaluate the association between fruits and vegetables consumption with being physically active in adolescents in the Southern Cone, based on of the Global School Based Student Health Survey (GSHS) of Uruguay and Argentina (2012) and Chile (2013).

Methods: Cross-sectional descriptive study with an analytical component in adolescents between 13 and 17 years of age based (GSHS). The association between being physically active and consumption of five fruits and vegetables was studied. Control variables were age, sex, alcohol consumption, smoking habit, sedentary lifestyle, and condom use. Relative frequencies and means with 95% CI were used. The comparison of categorical and dichotomous variables was performed using the Pearson Chi square hypothesis test (2 א). The risk of being physical inactive was estimated with a multivariate analysis that was expressed in Odd Ratios with a 95% CI. An alpha (α) was considered of 0.05.

Results: Only 29.4% (28.9 - 29.9) of the adolescents were active. Males in the Southern Cone were more active than females 37.6 (36.8 - 38.4) and 22.4 (21.8-23.1), respectively. (P <0.001) The consumption of 5 servings or more of fruits and vegetables was low (18.7%); only 13.5% consumed more than 3 vegetables and about one third (38%) 2 or more fruits daily. Consumption of less than 2 fruits, less than 3 times vegetables and less 5 or more servings of fruits and vegetables was significantly associated with being less active. (P<0.001) The risk of being less active was 1.50 times higher in those who did not consume the 5 or more servings of vegetables and fruits per day. The condition of being a woman also double this risk OR: 2.06 (1.96 -2.17).

Conclusions: The low fruits and vegetables consumption, and increased risk of being physical inactivity that have these adolescents; it reveals need to consider strategies that to address both issues together to achieve synergies to improve health in the short and long term

Keywords: Physical activity. Fruits. Vegetables. Adolescence.

144/1784

ASSOCIATION OF MONOUNSATURATED FATTY ACIDS INTAKE WITH MORTALITY IN CHINA AND UNITED STATES

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Background and objectives: Recent dietary guidelines for Americans recommended replacing saturated fats with plant-derived monounsaturated fats as evidence showed the preventive effect of monounsaturated fatty acids (MUFA) on cardiovascular diseases. However, studies investigating the association of MUFA intake with mortality are limited. We aim to assess and compare the association between dietary intake of MUFA and mortality between Chinese and US adults.

Methods: We used data from the China Health and Nutrition Survey (CHNS, n=14,113) and National Health and Nutrition Examination Survey [NHANES, 1988-1994 (III), continuous 1999-2010 (n=36,032)]. Dietary intake of MUFA was assessed using a 24-h dietary recall in NHANES and 3-day 24-h dietary recalls in CHNS.

Results: A total of 4826 deaths occurred during 378,359 person-years of follow-up in NHANES and 1009 deaths accrued during 199,091 person-years in CHNS. Total MUFA intake was significantly associated with lower risk of overall mortality in CHNS. After adjustment for confounders, the hazard ratios (HRs) across increasing quartiles of MUFA intake were 0.85 (95% confidence interval [CI], 0.70-1.02), 0.69 (95% CI, 0.55-0.87), 0.83 (95% CI, 0.60-1.15); P=0.02 for trend), as compared with the first quartile.

Total MUFA intake was also inversely but weakly associated with mortality in NHANES. As compared with the first quartile, the HRs across increasing quartiles of MUFA intake were 1.00 (95% CI, 0.90-1.11), 0.89 (95% CI, 0.77-1.04), 0.83 (95% CI, 0.67-1.02; P=0.06 for trend). Importantly, increased MUFA intake was related to lower risk of death from stroke [fourth quartile versus first quartile: 0.25 (95% CI, 0.12-0.52); p=0.02 for trend] in NHANES. Analyses of specific MUFA showed that the association of palmitoleic acid with mortality was inverse in CHNS (P=0.002 for trend) but null in NHANES. As the main type of MUFA, oleic acid intake was also weakly associated with mortality in NHANES (P=0.06 for trend) whereas the association seemed U-shape in CHNS.

Conclusions: Total MUFA intake was associated with reduced risk of mortality for both Chinese and US adults, though the association was strong in CHNS but weak in NHANES. Our findings provide epidemiological evidence for formulating the recommended nutritional intake of MUFA for Chinese and American people.

Keywords: Monounsaturated fatty acids, Palmitoleic acid, Mortality, CHNS, NHANES.

144/1792

ACTUALIZATION OF THE CONTENT OF ADDED FOOD SUGARS IN THE SPANISH FOOD COMPOSITION DATABASE (BEDCA).

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Background and objectives: Food composition databases (FCDB) are important tools for food and nutrition professionals (Pennington, 2007). Food composition data can be obtained from various sources. Different proposals to evaluate the quality of these data (Martínez-Victoria, et al., 2015).

The necessity of distinguish from added sugar (AS) and naturally occurring sugars (NS) in foods has been growing since there are a lot of scientific information that shows the connection between AS and metabolic syndrome, as well as other related diseases. Because of that, the FDA has implemented the new Nutrition Facts label for packaged foods. Due to changes in some recipes provided by food companies, the sugar data added in the USDA database have been withdrawn.

This situation generates a growing interest in information on the content of sugars in food, in the consumer and in health pro-

fessionals. The content in sugars will serve for the new nutritional labeling, mandatory in accordance with European Union legislational ready, so it is important to have this data in the Spanish FCDB (BEDCA) (www.bedca.net).

Methods: We were implemented the method proposed by JCY Louie et al. (2015) in order to establish a differentiation of sugar content of most of food that make up BEDCA and has searched analytical data from primary sources like scientific papers and laboratories associated with intent to add it up to the nutrients list of foods that do not have sugar content previously.

Results: The foods in BEDCA have been divided in two groups: "100% AN" or "100% NS" and added sugar data that our group found in their search for foods that does not have any sugar data.

The next step (already started) is to compile a recipe list of all food that have a mix of AS and NS to obtain the real sugar content of that to include in our database.

BEDCA is currently the only FCDB developed in Spain with compiled and documented date, according to EuroFIR (www.eurofir.org).

Conclusions: BEDCA (950 foods, 48 components, 310 methods and associated references) will allow users and professionals of Nutrition and Public Health to use online quality food composition data.

Keywords: Sugar; added sugars; food composition; nutrition label; food composition database.

Conflict of Interest Disclosure: None of the authors have any conflicts of interest to declare.

144/1796

SETTING OF CUT-OFF SCORE FOR ASSESSING THE COUNSELING COMPETENCY OF FILIPINO VILLAGE NUTRITION WORKERS ON INFANT AND YOUNG CHILD FEEDING (IYCF) BASED ON SENSITIVITY AND SPECIFICITY

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Background and objectives: Five instruments for assessing the counselling competency of Filipino village nutrition workers on infant and young child feeding (IYCF) were developed and

validated. These included: (1) 28-item knowledge test(KNO); (2) 10-item attitude test(ATT); (3) 18-item worker's skills self-assessment(CSW); (4) 18-item supervisor's instrument for assessing worker's skills(CSS); and (5) 17-item activity checklist for IYCF counselling client(CSM). These were combined into competency assessment instruments KAS-COM(1,2,3,4,5); KAS-WOR(1,2,3); KAS-SUP(1,2,4) and KAS-MOM(1,2,5). To establish the composite distribution for knowledge(KNO), attitude(ATT), and skills(CSW, CSS, CSM) in the competency score calculation and to set the cut-off score based on sensitivity and specificity, this study was undertaken.

Methods: Using the receiver operating characteristic(ROC) analyses, 28 possible combinations of composite distributions (30-30-40; 25-25-50; 20-20-60; 15-15-70; 25-15-60; 25-10-65; 20-10-70) for knowledge, attitude and skills, with corresponding passing score of 60%, 65%, 70%, 75% were tested.

Results: The best area under curve (KNO=0.86; ATT=0.81; CSW=0.77; CSS=0.94; CSM=0.81) was the 20-10-70 percent distribution for knowledge, attitude and skills, respectively with 75% cut-off score. Among the constructs, CSS had the highest area under curve (0.94) and using 51% as cut-off score, it was a good test (0.92) to identify the skilled workers on IYCF counselling. The tests for knowledge, attitude, CSW, and CSM with 63%, 79%, 80%. and 89%, respectively as cut-off scores were fair enough in identifying the knowledgeable workers, those with better attitude; and were skilled to do the IYCF counselling. The setting of cut-off score for each assessment instrument (KAS_WOR, KAS_SUP, KAS_MOM and KAS_COM) resulted to areas under curve ranging from 0.83 (good) to 0.92 (excellent). Using 50% and 80% as cut-off values, the sensitivity for the instruments with supervisor and client as assessors of skills was excellent (1.0 and 0.96) while specificity was fair (0.78 and 0.76). The cut-off score for self-assessment instrument KAS_WOR (75%) was fairly sensitive and specific. The cut-off score for the combined instrument (KAS_COM) is 65%.

Conclusions: The use of ROC curve in identifying the cut-off score and the composite distribution for knowledge, attitude and skills provided a sound basis for identifying competent BNS in terms of IYCF counselling.

Keywords: composite distribution of competency score, setting of cut-off score, ROC curve, sensitivity and specificity, IYCF counselling

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ASSESSING THE RELATIONSHIP BETWEEN HOUSEHOLD WATER QUALITY AND ENVIRONMENTAL ENTERIC DYSFUNCTION (EED) IN YOUNG CHILDREN LIVING IN SOUTHWESTERN UGANDA

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Background and objectives: Environmental enteric dysfunction is defined by abnormal intestinal morphology resulting in reduced absorptive capacity, inflammation, and poor growth. While the causes of EED warrant further investigation, it has been linked to unsanitary environmental conditions, especially repeated exposure to enteric pathogens. The main objective of this study is to determine if household water quality is a risk factor for EED in children living in southwestern Uganda.

Methods: This cross-sectional assessment was a sub-study of the Uganda Birth Cohort study, undertaken from 2014-2015. 385 children who met the inclusion criteria were randomly selected for participation. Data on water quality and sex of the household head, mother's education level, and mother's age were extracted from the 6 month infant age time point. Water quality was assessed using the Aquagenx CBT for detecting and quantifying E.coli bacteria. EED was assessed at 12-16 months using a lactulose: mannitol (L:M) test. For the L:M test, children consumed 20 ml. of solution containing 5 grams of lactulose and 1 gram of mannitol. All urine was collected for a minimum of four hours, and 1.5 ml. aliquots were stored at a minimum of -20°C. Levels of the two sugars were analyzed using validated LC-MS methods. Funding was provided by USAID (grant AID-OAA-L-1-00006).

Results: Of the 385 children, 49.4% were male and 50.7% were female, and the median age was 15.0 months [14.1, 15.7]. Among the households, 43.8% had "safe" water, 13.5% had "probably safe" water, 12.2% had "probably unsafe" water, and 30.5% had "unsafe" water. The median L: M score was 0.27 [0.16, 0.41], with 20.26% having no EED (L:M <0.15), 57.4% having moderate EED (0.15 <= L: M <= 0.45), and 22.34% having severe EED (L:M > 0.45). The association between water quality and EED was assessed using linear regression. The L:M scores of children consuming water deemed "unsafe" were 0.08 points higher (99% confidence interval [CI]: 0.02, 0.15) compared to water deemed "safe".

Conclusions: Household water contamination may be an important risk factor for EED, which is consistent with previous findings but requires further study.

Keywords: environmental enteric dysfunction, malabsorption, water quality, child health

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144/1812

ENVIRONMENTAL IMPACTS OF NATIONAL DIETS: COMPARISON OF LAND USE AND WATER DEPRIVATION IMPACTS IN FRANCE AND TUNISIA

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Background and objectives: Environmental impacts of national diets are often analyzed through Carbon emissions. Nevertheless, with a life cycle vision, other impacts are to be considered and new methods and data are now available to compute water deprivation and land use impacts (Pfister et al., 2016; Vidal-Legaz et al., 2016). The objective of this study was to use an hybrid method combining economical statistics data to production ones and compute environmental potential impacts due to water deprivation and land use for the French and Tunisian diets.

Methods: National nutritional enquiries were merged with the international custom data base UNComtrade and the FAOstat one. For animal products, feed composition and origin were also considered. Characterization factors for the water deprivation were the WSI factors from Pfister et al. (2009). Land use impacts were computed from the occupied surface including land occupied by animal feed crops. Then LANCA characterization factors (Beck et al., 2011; Bos et al., 2016) were applied to compute land use potential impacts. Biodiversity impacts from land use were obtained from Chaudhary et al. (2015).

Results: Potential impacts were computed for the total equivalent amount of food of one person during one year in France and Tunisia. Impacts are generally one order higher (roundly 5 to 15 times) for the Tunisia diet than for the French one but food production in Tunisia has positive impacts on erosion and biotic production. Comparing food groups show the prevailing importance of the group "meat/fish/eggs".

Conclusions: The hybrid approach allowed to consider the origin of each product in the French and Tunisian diets and to differentiate environmental potential impacts due to water deprivation and land use for each country and for each food family.

Keywords: national diet, life cycle assessment, land use, water deprivation

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144/1818

EPIDEMIOLOGY OF TYPE II DIABETES MELLITUS IN URBAN POPULATION

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Background and objectives: Diabetes Mellitus proves to be major cause of morbidity and mortality around the world and contribute largely to healthcare costs. Deshpande (2008) points that the risk of death of patients with DM is twice that of the population of the same age without DM . Seema et al (2010) opine that DM poses significant healthcare burdens on both families and society. Adiseshiah (2005) suggests that multidisciplinary interventions help in management of DM patients and delay the onset of complications which are usually life threatening and affect the quality of life.

Objective: To understand and trace out the critical factors haunting the DM patients selected from an urban population.

Methods: The study of 51 hospitalised DM patients was undertaken in Visakhapatnam city in the Andhra Pradesh state of India. The secondary data in the form of patients' case history was collected and primary data of family, socio-economic status, anthropometry, diet and physical activity were obtained. BMI was calculated.

Results: The hospitalised DM patients were aged from 41 to 90 years, that is late middle age to old age. The males and females were equally affected by the disease and its complications. The maximum affected were in the age group 61-70 years. The disease had a toll on people of all walks of life and with active lifestyle. The diet followed by the affected over a period of time was analysed. However no concrete diet pattern could be arrived at as causative factor. The diet counselling was undertaken.

Conclusions: The study revealed very pathetic situation as the people affected with DM were in productive age. The burden of the disease the quality of life and the economic condition of the patients.

Conflict of Interest Disclosure: The co-author was my Grad student and the work is a dissertation undertaken in my supervision.

144/1821

DIETARY PATTERNS IDENTIFIED BY LATENT PROFILE ANALYSIS (LPA) AMONG BRAZILIAN SCHOOLCHILDREN: USING DATA FROM THE WEB-CAAFE SURVEYS

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Background and objectives: Although the identification of dietary patterns is important to support dietary interventions, there are few studies in Brazilian children, none of them using Latent Profile Analysis (LPA). The aim of this study is to apply LPA to identify dietary patterns in pupils of public schools participating in the Web-CAAFE 2013-2015 surveys, in Florianopolis, Brazil.

Methods: The Web-CAAFE Survey is an annual cross-sectional school-based survey designed to help public health and education professionals to evaluate schoolchildren from 2nd to 5th grade regarding nutritional status, food consumption and physical activity. Data for the present study were collected in the years 2013, 2014 and 2015 and included 6,379 schoolchildren from Florianopolis (southern Brazil). Data was obtained using the questionnaire Web-CAAFE (Food Intake and Physical Activity of Schoolchildren), a web-based self-administered questionnaire that examines food consumption and physical activity during the previous day. Latent profile indicators were the frequency of consumption of 32 food/beverages items, in number of times per day. LPA was used to assign the children to the most likely latent profiles based on their food consumption.

Results: Three latent profiles were identified: 1) Traditional pattern (39.7% of the children), with a significantly elevated probability of consuming rice, vegetables, green leaves, beans, manioc flour, meat, fruits, bread and biscuits and dairy products; 2) Monotonous pattern (39.3% of the children), with a significant probability of consuming pasta, instant noodles and pizza/hamburger/hot-dog, and 3) High diversity pattern (21% of the children), with a significantly higher probability of eating a variety of foods, healthy or not, such as corn and potatoes, French fries, breakfast cereals, soda, sweets, chips snacks, vegetables, green leaves, milk, yoghurt and fruits. A higher proportion of boys presented a Monotonous dietary pattern (43.6% CI 95% 41.9-45.3 vs 35.0% CI 95% 33.3-36.6) and a higher proportion of girls presented a Traditional pattern (45.0% CI 95% 43.2-46.7 vs 34.5% CI 95% 32.9-36.2).

Conclusions: The present study offered insights about the use of LPA for describing the eating patterns of Brazilian schoolchildren. Three patterns were identified: Traditional, Monotonous and High diversity.

Keywords: dietary patterns, Latent Profile Analysis, schoolchildren.

144/1824

DIET QUALITY INDEX AND FAMILY MEALS IN OVERWEIGHT AND OBESE ADOLESCENTS DURING 6 MONTHS OF MULTIDISCIPLINARY OBESITY TREATMENT: EVASYON STUDY

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Background and objectives: Overweight and obesity have achieved high rates in children and adolescents across the world. A diet quality index (DQI) is a useful tool that provides an overall

score of an individual´s dietary intake when assessing compliance with food-based dietary guidelines. Moreover, family life plays an important role in developing eating behaviors and dietary intake in children and adolescents. This study was aimed to assess the associations between DQI and family meals in adolescents included in a comprehensive therapy for obesity.

Methods: Multi-intervention approach (diet, physical activity and psychological support in a family-group-based treatment-EVASYON) was implemented within a one-year intervention in 13-to-16-year-old overweight or obese Spanish adolescents. A total of 67 adolescents, 31 females, were included in the present study, whose energy intake and BMI had been measured at baseline. In the EVASYON study, diet quality index was calculated from food frequency questionnaire at baseline, 6 and 13 months of follow-up. Family meal was assessed from dietary history reported from parents at baseline, 2, 6 and 13 months of treatment. In the present study, we evaluate the diet quality index and family meals after 6 months of intervention. Data are shown as means and SD for continuous variables and frequency and percentages for categorical variables). U-Mann Whitney and Chi-squared tests were performed. Signification level was established at p<0.05. All statistical analyses were performed by using SPSS STATISTICS v.20 (IBM Corp., New York, NY, USA, 2010).

Results: 67.2% adolescents had family meals and showed DQI score of 71.16±8.94 after 6 months. Males had lower DQI values than females, meanwhile similar percentage of family meals was observed (69.4% vs 64.5%). However, there was only a significant relationship between DQI and family meal in females (p=0.036).

Conclusions: It is important to create a comfortable atmosphere in order to reach a better diet quality index in adolescents with obesity. Males need to be instructed in food and health related issues. The efforts in obese adolescents should be directed to really achieve healthier behavioral changes, including family, in order to improve their DQI.

Keywords: Adolescents, family-involvement, family-group-based, multi-intervention approach, diet quality index

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144/1827

INCENTIVE VALUE OF CASH IN A CONDITIONAL CASH TRANSFER PROGRAM FOR MATERNAL AND CHILD HEALTH AND NUTRITION IN MALI

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Background and objectives: The "Cash for Nutrition Awareness" (CNA) component of the community-based intervention "Santé Nutritionnelle à Assise Communautaire à Kayes" (SNACK) was implemented in Mali by the World Food Program (WFP-Mali) in 2013 for a duration of 3 years. The conditional cash transfer program aimed at improving child nutrition outcomes by increasing maternal and child attendance at community health centers (CHCs) through the distribution of a small amount of cash (~$3.00-$12.00 USD), during antenatal visits, delivery, vaccination and monthly growth monitoring visits starting at 6 months, covering the "1000 days" period (i.e. from pregnancy to 23 months of age of the child). The objective of this study was to explore the incentive value of the cash for beneficiaries to attend CHCs.

Methods: We conducted a process evaluation two years after the start of the program, using a purposive sample of 12 CHCs and their catchment area. We collected data using semi-structured interviews with frontline workers (n=76) and mothers (n=24), semi-structured observations of cash distributions and services delivered in 11 CHCs (twice for each CHC, n=22), and free listing with groups of up to 10 mothers gathered outside the CHCs (n=24 groups). Data were analyzed using thematic analysis along the program impact pathway (from service delivery to beneficiaries' receipt and use of cash).

Results: We identified various implementation issues, including difficulties for program workers to supply the cash to the CHCs due to a challenging implementation environment (namely long travel distances to deliver cash to the CHCs and high workloads). In addition, some mothers returned home empty-handed, as the total amount of cash available was often insufficient to pay all women attending the CHC in the same day. In some CHCs, cash was also delivered on different days than the days they provided services. Beneficiaries identified maternal and child health

as their main motivation to attend activities at the CHCs and cash only as a benefit, mainly used to buy food.

Conclusions: Implementation issues and a potentially insufficient amount of cash may have decreased the incentive value of the cash to increase attendance at CHCs. The research was funded by UNICEF, EC (IFAD) and CGIAR (A4NH).

Keywords: implementation research; conditional cash transfer; health attendance; children; nutrition

144/1828

A GLOBAL FOOD FORTIFICATION DATA REPOSITORY: ENSURING THE AVAILABILITY OF DATA FOR PROGRAM MONITORING, ACCOUNTABILITY, ADVOCACY, AND STRATEGIC DECISION MAKING

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Background and objectives: While multiple agencies maintain databases with a variety of programmatic data, there is a need for greater alignment and harmonization to achieve more uniform global monitoring of the state of, and progress in fortification; programmatic decision making and accountability; and advocacy. A global repository of key program-related indicators for multiple food vehicles (maize flour, oil, rice, salt, wheat flour) will help fill this niche and will provide a resource for governments, donors, and implementing agencies to make data-driven decisions about fortification policies and programs.

Methods: We implemented a process that entailed reviewing existing databases, developing a core set of indicators, and outlining a process for continuous collection and aggregation of updated data. These processes and outcomes were reviewed at each stage through a consultative process implemented in a food fortification community of practice comprising over thirty organizations/actors operating at national and global levels [the Global Fortification Technical Advisory Group (GF-TAG)].

Results: A set of core indicators covering aspects related to demand, supply, and the enabling environment for fortified staple foods were defined based on data available within existing databases. Examples include the status of fortification legislation, regulations, monitoring, compliance, and coverage. Proxy indicators were also crafted where the ideal indicator is not available across all countries and fortified food vehicles. Data stewards were identified for each food vehicle to serve as gatekeepers to ensure optimal data inclusion and quality. A repository prototype was developed with assistance from Camber Collective and TenPoint7

that includes existing data from the core indicators within an interactive data visualization platform and was publically launched in June 2017. Data stewards streamlined data collection processes with countries and technical partners to ensure timely data updates and inclusion of additional indicators over time to address user needs.

Conclusions: As food fortification programs are scaled up in countries, it is imperative to track progress and establish standard indicators to assess performance, impact and sustainability. This effort has underscored the need for broader improvements in fortification data, including improvements in data collection that require continued collaboration across all GF-TAG member organizations.

Keywords: Food Fortification, Data Collection, Data Repository, Evidence-Based Decision Making, Data Visualization

144/1845

SUPERMARKET SHOPPING AND NUTRITIONAL OUTCOMES: A PANEL DATA ANALYSIS FOR URBAN KENYA

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Background and objectives: Overweight and obesity are growing health problems in many developing countries. Rising obesity rates are the result of changes in people's diets and lifestyles. Income growth and urbanization are factors that contribute to these changes. Modernizing food retail environments may also play a certain role. For instance, the rapid spread of supermarkets in many developing countries could affect consumer food choices and thus nutritional outcomes. However, concrete evidence about the effects of supermarkets on consumer diets and nutrition is thin. A few existing studies have analyzed related linkages with cross-sectional survey data. To our knowledge, we are the first to use panel data in this setting.

Methods: Panel data from households and a total of 1,199 adult individuals was collected in urban Kenya in the years 2012 and 2015. Panel regression models with individual fixed effects plus other controlling factors were employed.

Results: Our results show that shopping in supermarkets significantly increases adults' body mass index (BMI). Regarding impact pathways we did not find that supermarkets contribute to net increases in total calorie consumption. However, our panel data models revealed significant shifts in dietary composition. Supermarket shopping contributes to a sizeable decrease in energy consumption from unprocessed staples and from fresh fruits and vegetables. We found significant increases of supermarket shopping on energy consumption from dairy, vegetable oil, processed meat products (sausages etc.), and highly processed foods (bread, pasta,

snacks, soft drinks etc.). These shifts towards processed and highly processed foods lead to less healthy diets, with higher sugar, fat, and salt contents, and probably lower amounts of micronutrients and dietary fibers.

Conclusions: The observed changes in dietary composition could explain the increasing effect on BMI, even without a rise in total calorie consumption. These results confirm that the retail environment affects people's food choices and nutrition. However, the effects depend on the types of foods offered. Rather than thwarting modernization in the retail sector, policies that incentivize the sale of more healthy foods – such as fruits and vegetables – in supermarkets may be more promising to promote desirable nutritional outcomes.

Keywords: Dietary choices, overweight, supermarkets, panel data, developing countries

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144/1851
THE ROLE OF THE NUTRITIONIST IN THE PUBLIC HEALTH SYSTEM OF SPAIN

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Background and objectives: The figure of the nutritionist is well recognized around the world. The nutritionist's intervention not only improves the health of the patient but also reduces the associated health cost. Even though there is accumulated evidence of the role of the nutritionist in the prognosis of a person's health status, in Spain, its inclusion in health systems has not been achieved. For this reason the main objective is introduce the role of nutritionist in the public health system of Spain and the strategies to give visibility to these health professionals.

Methods: It is now known that for every euro spend on dietary counseling from Nutritionists, society gets a net 63€ in return: 56€ in terms of improved health, 3€ net savings in total health care costs and 4€ in terms of productivity gains. However in the Spanish Health System, the nutritionist is not considered. Taking into account the importance of the incorporation of nutritionists in the

health system, the Autonomous University of Madrid through the Clinical Nutrition Education and Research the Chair of the Teaching Sponsorship (UAM-VEGENAT) have set in motion measures to spread the importance of nutritionists in health institutes.

Results: As a result of this necessity, the first congress of Dietitians-Nutritionists, an absent health professional, has been done. This congress has been supported by the Nutrition Department of La Paz University Hospital, in order to give more visibility to this group of professionals. Topics of special interest as the current situation of this collective and its functions within a hospital have been presented. Nutritionists from Spain and other countries put in evidence the urgent need to carry out national policies that promote the incorporation of the nutritionist in the Public Health Systems of Spain. There was an exploration through the different areas, besides the sanitary one, where the role of the nutritionist takes on special importance as in research centers, universities, companies, etc.

Conclusions: The lack of nutritionists in the Spanish Public Health System should be resolved. Events of diffusion such as this Congress serve to give visibility of these health professionals.

Keywords: Nutritionist, Spanish Public Health System

144/1869
DRIVERS AND BARRIERS OF SCHOOL FEEDING PROGRAMS IN THE PHILIPPINES

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Background and objectives: School feeding programs (SFP) are an important strategy to prevent and tackle malnutrition in low and middle income countries. The SFP intervention studied was implemented in ten public elementary schools in the Victorias City, in the province of Negros Occidental (Philippines), an area with an estimated 40% of children (5-10 years) being underweight. The objective of the study was to identify drivers and barriers of the SFP.

Methods: A qualitative research approach was applied to gain insights into participants' experiences with the SFP. The participant groups consisted of school authorities, teachers, and mothers or caregivers. Six focus group discussions, two for each participant group, were conducted with question guides and analyzed with a QDA-Software. Additional data were collected through informal conversations and observations while visiting the schools.

Results: Drivers as well as facilitators of the SFP were the motivation of the participants, awareness, promotion for parents and caregivers, good management, including monitoring activities, adequate targeting, and the implementation of hygiene education as part of the school curriculum. Awareness promotion through the SFP activities enhanced hygiene and nutrition practices of parents and children, however this was limited to environments with

supportive infrastructure. Further, school vegetable gardens were important drivers for a successful SFP. Identified barriers were lack of parental involvement and of linkages between SFP and national policies and related activities. Another aspect that hindered the effectiveness of the SFP was the lack of complementary nutrition sensitive activities aligned to the SFP as well as insufficient infrastructure and equipment.

Conclusions: Participant motivation and active participation of community members, parents, and school staff members played a key role in the success and sustainability of the SFP. School vegetable gardens displayed an important part of the SFP, but they cannot sustain stable food production for the SFP throughout the whole school year. Improvement in management skills, funding, and investments in adequate infrastructure and necessary conditions such as kitchen equipment, handwashing and toilet facilities, and separate dining spaces, are required to enhance the effectiveness of the SFP in the study area.

Keywords: school feeding, focus-groups, school health, motivation, participation

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144/1874

OBJECTIVELY MEASURED LEVELS OF PHYSICAL ACTIVITY IN FIRST GRADE CHILDREN OF BUENOS AIRES. DATA FROM MINISALTEN STUDY

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Background and objectives: Global Recommendations on Physical Activity for 5-17 years old, of the World Health Organization (WHO), are to invest at least 60 minutes a day in moderate to vigorous physical activity (MVPA). The study aim was to objectively assess levels of physical activity (PA) in a sample of first grade children of Buenos Aires and to examine differences according to gender.

Methods: This data correspond to the baseline assessment (June to November 2015) of MiniSALTEN Study (obesity prevention program targeting first grade children at public primary schools). All children of first grade attending to the 12 public primary schools from the city of Buenos Aires participating in MiniSALTEN were invited to participate. The levels of PA were measured using ActiGraph wGT3X-BT accelerometers for 7 consecutive days (24 hours). Outcomes were: time in light, moderate and vigorous PA and sedentary time (minutes/day) determined by Evenson et al.'s cut points. Time in MVPA (minutes/day) was also

determined. Accelerometer data were analyzed using the ActiLife 6.11.8 software. Descriptive statistical analyzes of the variables measured for the total and by sex were made. Data were processed using IBM SPSS Statistic 18.

Results: 185 children (mean age = 6.7 years, 94 girls and 91 boys) wore accelerometers. The total sample spent 354.4 minutes/day in PA light, 47.9 minutes/day in PA moderate, 17.8 minutes/day in PA vigorous and 937.7 minutes/day in sedentary time. Children spent 65.7 minutes of the day in MVPA. 55.7% of the total sample don´t meet the PA guidelines of the WHO. According to gender, boys invest significantly more time in MVPA than girls (74.7 vs. 57.1 minutes/day) (p = 0.000). 60.6% of the girls don´t meet the recommendation while 72.5% of the boys exceed the recommendation.

Conclusions: This is the first Argentine study that objectively describes the PA levels in a sample of children starting primary school from Buenos Aires. Considering it shows that the majority of children don´t meet the PA recommendation, nor for active time neither for sedentary time, lots of preventive efforts should be considered when planning public health policies.

Keywords: Physical activity, Sedentary time, Accelerometer, Children.

Conflict of Interest Disclosure: The source of funding for the research is the Coca-Cola Foundation. The authors declare that they have no competing interests. The funding source had no role in study design, data collection and analysis, decision to publish, or preparation of manuscripts.

Further collaborators: On behalf of the MiniSALTEN Study Group.

144/1881

NEW MULTISECTORAL TOOLS TO ADDRESS ANEMIA AT THE NATIONAL AND DISTRICT LEVELS

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Background and objectives: Anemia is caused by multiple factors, and it can be difficult for decision-makers to prioritize anemia actions for their context. Collaborating with country implementers, the SPRING Project developed two tools for use at the national and district level, to encourage stakeholders to gather and interpret data related to anemia and anemia programs. We cover the theoretical rationale, design, and testing of the tools.

Methods: The "Guidance for Conducting a Landscape Analysis for Anemia" was designed to help provide stakeholders a broad understanding of the national anemia situation, and the "District

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Assessment Tool for Anemia (DATA)" to enable districts to understand anemia and prioritize actions. The anemia landscape tool was developed based on experiences assessing the anemia situation in Ghana, Uganda, and Sierra Leone and validated by receiving input from 34 content-specific experts. The DATA tool was also developed with input from multiple stakeholders and field tested in a district in Ghana. A revised tool was piloted in a district in Nepal and Uganda.

Results: The landscape analysis tool guides the user through a four-step process to assess the anemia situation: characterize anemia prevalence, establish causes of anemia, and review and assess existing anemia policies and interventions. An accompanying Excel-based tool allows users to aggregate and present data. Using similar content as the national tool, the DATA tool is an Excel-based tool that guides a two-day facilitated workshop. During the workshop district-level stakeholders from multiple sectors discuss and complete questionnaires and the data generated is automatically translated into output dashboards. The DATA tool underlines the importance of local contextual factors, identifies enablers and barriers to address these factors, and assists district stakeholders to prioritize anemia actions.

Conclusions: An effective multisectoral effort to combat anemia requires insights from multiple data sources and an understanding of data gaps and their implications for implementation. These resources guide stakeholders through the collection and use of such information. The extent to which the findings generated from using these tools will be used to inform planning and program design remains to be seen. An important next step will be to scale-up and evaluate these tools.

Keywords: anemia multisectoral tools decison-making planning

144/1883

ASSOCIATION BETWEEN HOUSEHOLD CULTIVATION OF NUTRIENT-DENSE CROPS AND MATERNAL AND CHILD DIETARY DIVERSITY IN SELECTED RURAL COMMUNITIES IN THE UPPER MANYA KROBO DISTRICT OF GHANA

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Background and objectives: Households with restricted income may sell nutrient-dense produce they cultivate at the expense of their own nutrition. We assessed whether household cultivation of nutrient-dense vegetables was associated with mothers and children's dietary diversity indicators.

Methods: This analysis used data from cross-sectional baseline survey of 184 mothers with children (6 to 36 mo) participating in Nutrition Links, a 5-y project to improve rural health and economic well-being in the Upper Manya Krobo district of Ghana. The survey included questions regarding socio-demographic characteristics, agriculture production (including dark green leafy vegetables, orange-flesh sweet potatoes and fruits), and maternal and child dietary intake. Dietary diversity score (DDS), computed as consumption of up to eight food groups for mothers (7-day recall) and up to seven food groups for children (24-hour recall), were dichotomized as "good" (met recommendation of ≥5 for women and ≥4 for children) or as "poor" (did not meet recommendation). Bivariate analyses and linear regression were used to determine associations and predictors, respectively of child dietary diversity.

Results: The mean ages of mothers and their children were 27.2 ± 7.2 y and 12.4 ± 6.3 mo, respectively. Approximately 60% of households cultivated at least one type of nutrient-dense vegetable or fruit on their farms. The mothers' mean DDS was 4.5 ± 1.2 and children's mean DDS was 3.2 ± 1.9, with a significant positive correlation (r=0.36, P<0.01) between the two DDS. Younger children (6-12 mo) were more likely than older children (12-36 mo) to have a "poor" DDS (70.5% vs. 29.5%; P<0.001). Children from households cultivating at least one nutrient dense crop were more likely to have "good" DDS compared to those from households not cultivating these crops (57.7% vs. 42.3%: P=0.03) but no association was noted with mothers' DDS. Mothers' DDS (P=.002), household nutrient dense crop cultivation (P=0.025) and child age (P<0.001) independently predicted child DDS.

Conclusions: Mothers need support to improve their children's diet diversity during early complementary feeding. The positive association between household crop cultivation and child DDS supports use of agricultural interventions focused on nutrient rich crops to improve child nutrition.

Keywords: dietary diversity, children, maternal, agriculture, dietary intake

FOOD-BASED DIETARY PATTERNS AND NUTRITIONAL QUALITY OF MEALS IN BRAZIL (2008-2009)

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Background and objectives: It has been observed the declining in the consumption of traditional meals based on freshly prepared dishes, and its replacement by the ultra-processed food and drink products. However, evidence on the composition and nutritional profile of each main meal from low and middle-income countries is still scarce. This study aimed to identify food-based dietary patterns at lunch and dinner and assess the nutritional quality of these patterns in Brazil.

Methods: Cross-sectional analysis based on individual-level dietary data from 32,898 individuals aged ≥10 years in Brazil, collected as part of the 2008–2009 National Household Budget Survey. Food consumption was evaluated by two 24-hour food records. Lunch and dinner were identified as the most caloric meals in the periods between 11 a.m. and 5:59 p.m. and between 6 p.m. and 11:59 p.m., respectively. Food items were classified into three food groups and subsequent subgroups according to the extent and purpose of the processing they undergo. Exploratory factor analysis was applied to identify food-based meals patterns. We used linear regression analyses to evaluate the association between quintiles of the foods patterns' scores and nutritional indicators of the meals.

Results: We identified three food-based meals patterns for lunch and dinner. The first pattern, labeled 'ready meal', was positively associated with bakery products, ready meals and other processed and ultra-processed products, and negatively associated with unprocessed and minimally processed food such as rice, beans and meats. The second pattern, labeled 'snack', included butter, milk, coffee and tea, processed breads and margarine. The third pattern, labeled 'traditional meal', was positive for unprocessed or minimally processed foods (like fruits/fruit juices, roots/tubers and fish), and negative for meats and soda. For lunch and dinner, the nutritional indicators of unhealthy diet increase significantly across quintiles of the ready meal and snack patterns, while nutritional indicators for healthy diet increase significantly across quintiles of the traditional meal pattern.

Conclusions: This study suggests that the adherence of traditional meals and the avoidance of ready meals and snacks patterns may be an effective way to improve the nutritional quality of Brazilian diets.

Keywords: Dietary pattern. Diet quality. Meals. Food processing. Household Budget Survey.

OBESITY, INSULIN RESISTANCE AND TYPE 2 DIABETES MELLITUS IN FEMALE ADOLESCENTS, LIMA – PERÚ

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Background and objectives: The prevalence of obesity in adolescents at the national level was 3,2% in 2010 and this figure was more than double for the year 2014 (7,5%). This increase is alarming because of the complications obesity causes, including type 2 diabetes mellitus (DM2), dyslipidemia and hypertension. The objective was to determine the prevalence of IR in an obese adolescent population and to identify the presence of DM2.

Methods: In 1206 female adolescents were evaluated with BMI for age. Obesity at BMI/A ≥ 95p was defined using the WHO standards. In the obese patients, insulin, glucose, and lipid profile were determined using the Matthew equation (Insulin uUI/mL * glycemia mmol/dL/22.5). HOMA-I was calculated using a value ≥ 3,16 , to define insulin resistance (RI). To identify dyslipidemia the cut-off points were: hypercholesterolemia ≥ 200 mg/dL, low HDL-C ≤40 mg/dL, high LDL-C ≥ 130 mg/dL and hypertriglyceridemia ≥ 150 mg/dL. Obese women with IR were given a glucose tolerance test (PTG) by choosing the criteria of the American Diabetes Association, between 140 and 199 mg/dL intolerant to glucose and 200 mg/dL and more as diabetics.

Results: Obesity was present in 25.1% of the study population. In this group of obese adolescents, 28.1% had IR. When comparing the group of obese with RI with obese without RI, it was observed that the difference of the means of the biochemical variables presented statistical significance, except the HDL-C.

In the same way the differences between the prevalences of the dyslipidemias were significant with the exception of HDL-C. RI had an OR of 16.2 (6.3-41.9), 12.1 (4.9-30.1), and 7.6 (3-19.5) with hypertriglyceridemia, hypercholesterolemia, and C -LDL, respectively. PTG showed 3.3% intolerant and none diabetic.

Conclusions: Obese adolescents were identified with a high risk of becoming diabetic over time and presenting with cardiovascular problems and that this is exacerbated by the presence of them at a young age.

Keywords: Obesity; Insulin resistance; glucose tolerance; adolescent

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144/1891

THE LATIN AMERICA AND THE CARIBBEAN INTERVENTIONS THAT FOSTERING NUTRITIONAL WELL-BEING: OPPORTUNITIES TO STRENGTHEN NUTRITION PUBLIC POLICIES

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Background and objectives: Latin America and the Caribbean Region is currently in a transition between two key periods in its development. In the last 20 years, the region has made progress in hunger and undernutrition control and prevention. However, overweight and obesity as well as non-communicable chronic diseases are rapidly increased affecting across the entire region. The present study aimed to identify and analyze national experiences to support nutritional well-being in Latin America and the Caribbean.

Methods: The Information was obtained from primary and secondary sources in the 33 participating countries, from February through August 2016.

Results: Two hundred and four interventions were identified in the three sub-regions covered by the study. Most interventions seek to prevent or reduce malnutrition due to deficiencies, or promote healthy lifestyles among vulnerable groups. Seventeen interventions were selected to conduct in-deep interviews in Chile, Colombia, Costa Rica, Dominican Republic, Guatemala, Jamaica, Mexico, Paraguay, Trinidad and Tobago, and Uruguay. According to the results, the main success factors for the interventions were: political endorsement; targeting actions for the identification of beneficiaries and coverage at the national level; adequate and timely budget; sufficient, trained and committed staff; monitoring and evaluation; work in partnerships with the public and private sector as well as international cooperation; community participation and empowerment of beneficiaries.

Conclusions: There is significant potential for the strengthening of nutrition public policies to promote comprehensive interventions that foster nutritional well-being in LAC that is currently facing the double burden of malnutrition and the NCD epidemic. Implementation of a regional nutrition public policies framework could complement the UN Decade of Actions on Nutrition ongoing commitment to fight against the double burden of malnutrition in LAC.

Keywords: nutrition, malnutrition, food security, nutrition policy, Latin America and the Caribbean.

Further collaborators:

Israel Rios have further collaboration with other academic institutions

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144/1909

METABOLIC SYNDROME AND RISK FACTORS ASSOCIATED WITH LIFESTYLE

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Background and objectives: Metabolic syndrome (MS) is a term that has been used to define a group of risk factors that include: visceral obesity, hypertension, hyperglycemia and atherogenic dyslipidemia, which predispose the individual to develop cardiovascular disease and type 2 diabetes mellitus, becoming one of the main problems of public health in the 21st century. The objective of this study was to determine the prevalence of metabolic syndrome in the adult population and its relationship with some risk factors related to lifestyle.

Methods: Case - control study nested in a cross - sectional study of a representative sample of adults (175) from households of Salta city, Argentina. Weight, height, waist circumference, blood pressure measurement, food consumption, physical activity (IPAQ) and laboratory tests were performed. Metabolic syndrome was diagnosed according to the criteria of Adult Treatment Panel III (ATP-III). Excel, WHO software Antro v.1.0.4 Plus, EPI 7 programs were used.

Results: MS prevalence was 21.1%, significantly higher in males (28%) than in females (17.8%); OR = 1.95; 95% CI: 1.15 to 3.3. MS risk is higher in the overweight population (OR = 179; 95% CI: 11.1 to 2884); it is 2.6 times higher when the energy adequacy is excessive compared to normal caloric intake (95% CI: 1.58 to 4.43); Is 5.5 times higher with daily intake of sugary beverages (95% CI: 3.1 to 9.7) and 65 times higher when fiber adequacy in the diet is deficient (95% CI: 16.1 To 262.7). The consumption of saturated fatty acids was higher in the population with MS (21.5 ± 20.7 vs 17.6 ± 13.9) but without statistical significance. High cho-

lesterol intake (> 200 mg / day, according to ATPII) triples the risk of MS (95% CI: 1.87 to 4.8) and low levels of physical activity increase 1.5 times the risk of developing it .

Conclusions: The composition of the diet: high in calories, saturated fat, cholesterol and reduced in fiber added to low levels of physical activity, are predisposing risk factors of MS.

Keywords: metabolic syndrome, diet, physical activity

144/1912

EXPLORING THE FOOD AND NUTRITION SECURITY IMPACT OF THE SOCIAL PROTECTION POLICY "PROSOLI" AMONG ELDERLY BENEFICIARIES IN DOMINICAN REPUBLIC

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Background and objectives: Food security and nutritional well-being are important elements for elderly people living in social and economic vulnerable situations in the Dominican Republic. The present study aimed to compare food security and nutritional outcomes at household and individual level of elderly beneficiaries and non-beneficiaries of the Dominican Republic social protection policy "Progresando con Solidaridad (PROSOLI)".

Methods: A cross-sectional study of 335 elderly people (50% beneficiaries) was conducted to compare food security and nutritional outcomes in beneficiary and non-beneficiary groups. Data was collected from June-December 2016 in ten geographically-dispersed regions at national level in the Dominican Republic. The Latin America and the Caribbean Food Security Scale (ELCSA) and the food diversity index at household level were conducted. Data analysis included anthropometric, dietary intake and socio-demographic data and rand univariate parametric or non-par-

ametric statistical analyses using Wilcoxon Mann-Whitney, t tests and proportional test.

Results: Median age and interquartile range (iqr) of participants was 74.1(13.0) years; 51% were women. Sixty percent reported moderate or severe household food insecurity, however, the prevalence was significantly higher in non-beneficiaries (65%) compare to beneficiaries (55%) (Proportional test, p<0.05). A significantly higher prevalence of wasting (BMI<23kg/m2) was also found in non-beneficiaries (44%) compare to beneficiaries (34%) (Proportional test, p<0.05). For dietary intake, geometrical mean and standard deviation of dietary calcium intake was 396 mg (125-1255) in beneficiaries and 292 mg (74-1146) in non-beneficiaries (ttest, p=0.0280); and saturated fatty acids were 8.5mg (2.7-27.0) in beneficiaries and 6.2mg (1.6-23.9) in non-beneficiaries (ttest, p=0,0241); no such difference was observed with other macro or micronutrient intake.

Conclusions: Results suggest that nutrition-sensitive social protection policies such as PROSOLI may significantly influence the food security situation and nutritional status of their elderly beneficiaries. This underscores the need of capitalizing on the strengths of nutrition sensitive social protection policy and program measures to support in an integrated manner efforts that aim to promote healthy eating habits and better nutrition among elderly.

Keywords: malnutrition, elderly, dietary assessment, Social Protection, Food Insecurity

Conflict of Interest Disclosure: the authors declare no conflicts of interest. Mr. Medina and Ms. Suriel are employees of the Vice presidency of the Dominican Republic, Social Protection "PROSOLI"

Further collaborators: Israel Rios-Castillo will submit others collaborations

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144/1914

SIMULATIONS OF THE IMPACTS OF BIOFORTIFIED CROPS ON VITAMIN A INTAKE OF YOUNG CHILDREN AND IRON INTAKE OF WOMEN OF REPRODUCTIVE AGE IN CAMEROON

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Background and objectives: Biofortification to increase the micronutrient content of staple crops may reduce the burden of micronutrient deficiencies, but effectiveness relies on food con-

sumption patterns, which may vary spatially. Dietary intake data can be used to estimate the potential impacts of biofortification.

Methods: We completed 24-hour dietary recalls among women (n = 912) and children 12 - 59 month of age (n = 883) during a national survey in Cameroon, with representative sampling for three geographic strata (North, South, and Yaoundé/Douala). We simulated the impacts of pro-vitamin A biofortified sweet potato, maize, and cassava on the adequacy of vitamin A intake of children, and the impacts of iron-biofortified rice, beans, millet, and sorghum on adequacy of iron intake of women, under optimistic assumptions of full replacement of the non-biofortified varieties. We calculated "reach" as the proportion of the population that consumed a biofortified food on the previous day, and "effective coverage" as the proportion of the population with inadequate micronutrient intake that achieves dietary adequacy following biofortification.

Results: The baseline prevalence of inadequate vitamin A intake among children varied by region (South: 33%; North: 71%; Yaoundé/Douala: 48%). Effective coverage was the highest for maize (~20%), which had the greatest reach in the North region, and the lowest for sweet potato (~8%), because of infrequent consumption of sweet potato. Inadequate iron intake was common among women (South: 88%; North: 63%; Yaoundé/Douala: 82%; adjusted for absorption). Millet and sorghum were only consumed in the North (~45% and ~8% reach, respectively); hence, effective coverage was only 17% and 2%, respectively, in the North and near zero elsewhere. Beans and rice were consistently consumed in all regions (~15% and ~30% reach, respectively). However, amounts consumed and estimated iron absorption were low, so the effective coverage was less than 5% for both.

Conclusions: Among children, maize was consumed more commonly in regions with the highest prevalence of vitamin A inadequacy, so biofortified maize may be more effective than other crops for increasing dietary adequacy. Among women, several iron-biofortified crops would increase iron intake, but the prevalence of inadequacy is likely to remain high.

Keywords: biofortification, dietary modeling, vitamin A, iron

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HOUSEHOLD FOOD INSECURITY AND DIETARY DIVERSITY INDEX AMONG MOTHERS OF CHILDREN UNDER TWO YEARS OLD IN PANAMA

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Background and objectives: Food security exists when all people in all social and economic contexts have capacity to get enough and of high quality nutrient foods to cover their nutritional needs. There are clear evidences about the relation of food security and dietary diversity with a better nutritional status. The present study aimed to evaluate household food insecurity and dietary diversity index (HDDI) among mothers of children under two years old in Panama.

Methods: A cross-sectional study of 273 household was conducted in four geographically dispersed health regions (San Miguelito, Panama Centro, Cocle and Veraguas). This study was part of a national project aimed to develop Food Based Dietary Guidelines for children under two years in Panama. Household food insecurity was assessed using the Latin America and the Caribbean Food Security Scale (ELCSA) considering the previous three months, and dietary diversity index, which included twelve food groups in the last 24 hours. The statistical data description comprehend frequency and percentage, mean and standard deviation (SD), and median and interquartile range (iqr).

Results: Mean age and SD for mother was 27.3 ± 7.4 years, for children was 9.1 ± 5.7 months (51% female). Nineteen percent of households reported moderate or severe food insecurity; the median HDDI and iqr was 8 (7 – 10) points. The less-consumed food groups were fish (19%), eggs (56%), vegetables (56%), fruits (64%) and pulses (66%).

Conclusions: Moderate and severe food insecurity is mainly present in families with children under two years at risk of poverty and social exclusion, which remains as concern for public health and agricultural sectors in Panama; HDDI shows lowest consumption of high quality nutrients foods such as fish, vegetables and fruits. Comprehensive nutritional interventions should be put in place to fight against malnutrition, especially in early stage of life.

Keywords: food security, malnutrition, dietary diversity, Panama

144/1934

EVALUATION OF A SCHOOL FEEDING PROGRAM IN A REAL SETTING

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Background and objectives: School age is an opportunity to build lasting healthy habits. In Argentina, overweight and multiple deficiencies of essential nutrients, affects 34.5% and 38%, respectively.

The objective of the study was to characterize the nutritional quality of school feeding in six jurisdictions of Argentina and the contribution of the school cafeteria and kiosk in it.

Methods: A team of nutritionists made 24-hour food records in a sample of 1108 scholars and registered two days of food service in 61 schools and the sale in 24 school kiosks. Intake of Kcal and critical nutrients was compared to FAO/WHO 2004 requirements and WHO 2003 recommendations. Adequacy indicators, main dietary sources and quality nutritional of school feeding program were analyzed.

Results: The median energy intake was 1958 kcal; 31% comes from the school meals, 10% from the kiosk and 59% from home. The 97% of children exceed the recommendation of discretionary calories and 79% of added sugars; 99% of school breakfasts are high in sugars and 24% of lunches in saturated fats. Almost half of the discretionary calories and sugars are provided by school. Home diet is monotonous and the school meal reinforces this monotony. Breakfast is the more inadequate school offer; only 15% of them contain at least one portion of dairy. Home diet and breakfasts are the most responsible of the observed inadequacies.

Conclusions: The nutritional redesign of school feeding programs is urgently needed, prioritizing breakfast and the provision of food nutritional quality.

Keywords: evaluation, nutritional quality, school feeding.

144/1935

A NEW INSTRUMENT TO MONITOR GLOBAL DIET QUALITY

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Background and objectives: Dietary risks have been identified as the most significant contributor to the global burden of disease. However, there is no global mechanism for monitoring dietary quality in a standardized way across countries. This paper defines the need for monitoring dietary quality on a global basis, and outlines steps needed for the design and testing of a survey module suitable for global implementation.

Methods: A review commissioned by Gallup, Inc. was carried out to identify, characterize, compare and contrast widely-used definitions of diet quality (DQ) and dietary recommendations at global and national levels. An expert consultation was held to discuss results and identify possible mechanisms for data collection at global level, with the aim of defining what should be measured and how.

Results: Based on assessments of international and national dietary recommendations/food based dietary guidelines and epidemiological meta-analyses, there are several operational definitions of DQ. The technical advisory group (TAG) came to a consensus that in all contexts, a healthy diet (a) achieves sufficient nutrient adequacy and (b) reduces the risk of diet-related NCDs such as cardiovascular disease and type II diabetes. Key elements of a universal definition and set of metrics linked to these positive health outcomes across countries and regions are (a) adequate dietary diversity, (b) abundant consumption of diverse plant foods, such as fruits, vegetables, legumes, nuts, seeds and whole grains; and (c) low consumption of ultra-processed foods (UPFs), such as sugar-sweetened beverages and processed meat products. In order to operationalize the nutrient adequacy and health-protective diet components into a concise questionnaire module, the TAG recommended modifying the questionnaire for the minimum dietary diversity for women (MDD-W) to include 23 items. The TAG affirmed that Gallup World Poll (GWP), which implements a nationally representative survey in 160 countries annually, would be an appropriate mechanism for implementing a diet quality survey.

Conclusions: Diet quality is a critically important health and nutrition policy issue that should be measured globally. There is concordance on the key elements of diet quality that could feasibly be monitored on a regular basis, and survey modules are under preparation for piloting within the context of GWP.

Keywords: Diet quality, dietary assessment, diet-related non-communicable diseases (NCDs), MDD-W

144/1937

NUTRIENT PROFILE, GAPS AND DIFFERENTIAL PRICING OF PROCESSED FOODS IN ARGENTINA

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Background and objectives: In a context of high prevalence of overweight and obesity the discussion about the incidence of food in the high intake of critical nutrients has gained relevance. The purpose of this study is to analyze the nutritional profile of processed food which have significant contribution in saturated fat, free sugar and sodium intake to know their quality gaps and the difference in the price between different nutritional qualities.

Methods: A sample of 1179 products grouped in 11 categories of foods which represent around 42% and 47% of the total intake of nutrients to limit was analyze. The nutrient content of each category was compared with a corresponding standard which was were determined according to the critical nutrient density value of the category adjusted to total calories of a healthy diet with preponderance of high nutrient density foods

It was calculated a nutritional score with the NRFI method to compare the price per kcal according to nutritional quality. The price of the products were registered from the website "Precios Claros".

Results: The 15% of the products of the sample have a higher content than the standard for saturated fat, 27% for free sugar and 29% for sodium. Processed meats, Sausages, salty cookies and dressings are the categories with the greatest inadequacy in sodium. Sodas and sweet snacks have the most inadequacy in free sugar.

The price per calories is 47% higher in products of the two quintiles with better nutritional quality in relation to the two of lower quality.

Conclusions: The excesses in the consumption of critical nutrients are concentrated in eight categories of products. Nevertheless there are a lot of processed products which their content in critical nutrition does not have an incidences in the excesses intake. It is necessary to design an appropriate nutrient profile system at the local level.

Keywords: Nutritional profiles; Critical nutrients; Nutritional quality; Price of food; Processed food.

144/1939

CHARACTERIZATION OF STREET FOOD CONSUMPTION AND HYGIENIC-SANITARY PERCEPTION OF STREET FOOD STALLS IN PARAGUAY

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Background and objectives: The sale of food on the street is a common practice around the world. The nutritional quality of food and hygienic-sanitary conditions of street food stalls varies between countries, and may have implications for certain health-related events. The objective of this study was to characterize the consumption of street food and the perception of the hygienic-sanitary conditions of the street food stalls in Paraguay.

Methods: As part of a multicenter study conducted in 11 Iberoamerican countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Guatemala, Panama, Paraguay, Peru, Uruguay and Portugal), we applied a structured online survey with 12 questions related to sociodemographic characteristics, the street food consumption frequency, perception of hygiene of the street food stalls and episodes of vomiting or diarrhea following after the consumption of these foods.

Results: 525 people were surveyed, 51.8% (n = 272) reported consumption od street food in the last 3 months. We found that 79% were women, 61,8% were between 18 and 30 years old, 49,3% had university studies and 36,8% were postgraduates, also 66.5% worked or studied in the health or food area. During the last 3 months 33.8% consumed some type of food on the street every week. The most frequently consumed foods were: chipa (cassava flour bread) (40.6%), meat patties (40%), brochets (36.8%), sandwich (36.7%) and fruits (40%). The availability of these foods (38.6%), lack of time to prepare meals (25%) and the fact that they are tasty foods (23.5%) are the main reasons for consumption. Only 11.4% of people had the perception that the food street stalls were clean or hygienic and 14.7% reported having diarrhea or vomiting after consuming some food at these stalls.

Conclusions: Despite the high educational level of the population surveyed and the perception of poor hygienic-sanitary condi-

tions in the street food stalls, the consumption of unhealthy food on public places is highly frequent. Given that availability is a key conditioning factor of consumption, promotion of fruit consumption could be a valid strategy.

Keywords: Street food. Consumption. Public Health Policies. Hygienic-sanitary conditions

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144/1945

PHYSICAL ACTIVITY, NUTRITIONAL STATUS AND METABOLIC SYNDROME IN ADULTS

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Background and objectives: Physical inactivity is the fourth most important risk factor for mortality in the world according to the World Health Organization and its prevalence is increasing in many countries, which has a significant influence on the increase of chronic nontransferable diseases and on health of the world's population. The objective of this study was estimate levels of physical activity and its association with metabolic syndrome and nutritional status in the adult population.

Methods: Cross-sectional study, descriptive of a representative sample of households in the capital of the province of Salta, Argentina. The short version of the International Physical Activity Questionnaire (IPAQ) was used as a valid measure to estimate the categories of physical activity. Nutritional status was assessed through Body Mass Index and Metabolic Syndrome classification was performed according to ATP-III. Excel, WHO software Antro v.1.0.4 Plus, EPI 7 programs were used.

Results: The sample was 175 people. The mean age of the studied population was 44.4 ± 13.6 years. 21.1% of adults had metabolic syndrome. Regarding the categories of physical activity: 27.4% were low, 40.6% moderate and 32% intense. In the evaluation of nutritional status, only 23.4% of the population were anthropometrically normal, 4.6% presented underweight, 29.7% were

overweight and 42.3% were obese. This high prevalence of altered nutritional status allows us to assume that the intensity of physical activity declared is only of the last time, so no association was observed between levels of physical activity, nutritional status and metabolic syndrome.

Conclusions: In the linear correlation there is no statistically significant finding, among the levels of self-reported physical activity, with anthropometric and biochemical variables.

Keywords: Physical activity. Metabolic Syndrome. Nutritional status

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144/1950

A GLOBAL OVERVIEW OF FOOD-BASED DIETARY GUIDELINES

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Background and objectives: Food-based dietary guidelines (FBDG) are an attempt to translate the evidence base regarding relationships between foods, diet patterns, and health into specific and culturally appropriate recommendations. This objective of this study is to assess similarities in FBDG across countries in order to identify whether there are commonalities that could serve as the basis for global dietary guidelines.

Methods: Recently, FAO completed a major update of their online repository of FBDG and associated resources. All FBDG available in this repository as of 2016 were reviewed. Organization of messages into themes involved an iterative and primarily inductive process. Key messages were organized by major food group/type, and analyzed for their relationship to existing WHO dietary recommendations. The main graphics were organized into a typology, globally and by region.

Results: FBDG were available for 82 countries (Africa: 5; Asia and the Pacific: 15; Near East: 3; Europe: 32; Latin America and the Caribbean: 25; North America: 2). Graphics showed that most countries divide foods into 3-5 food groups (starchy staples; fruits, vegetables; dairy, and other "protein foods"). Few countries specified recommended amounts or types of "protein foods." Messages about fats were mixed, some countries advocating less fat consumption in general, and others specifying healthy vs. unhealthy fats. The single most common type of message (95% of countries in key messages; 100% of countries in graphic images) was encouragement of consumption of fruits and vegetables. A majority of countries also had messages on limiting salt (70%), various fats/fatty foods (63%), and sugars (51%).

Conclusions: While countries vary in their groupings of foods and the specific foods included in food groups, there is widespread

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concordance on encouraging consumption of fruits and vegetables, and limiting foods high in salt, sugar, and certain fats. Multiple ways are recommended across countries to meet protein needs in accordance with food culture. These points are aligned with existing WHO global guidance (including the lack of guidance about optimal ways to achieve protein intake), as well as other epidemiological evidence about diet patterns that reduce risk of diet-related diseases. This review underscores international agreement about some universal components of a healthy diet.

Keywords: food-based dietary guidelines (FBDG), global dietary guidelines, diet quality, dietary recommendations

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144/1951

PREVALENCE OF OVERWEIGHT, OBESITY AND PHYSICAL ACTIVITY IN CHILDREN FROM ASUNCIÓN, CENTRAL AND CAAGUAZÚ AND FLUID INTAKE PATTERNS

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Background and objectives: Introduction: Obesity is a multifactorial disorder. According to the survey of cardiovascular risk factors in 2011, the percentage of physical inactivity in the population is 74.5%. There are no previous studies in Paraguay about the pattern of consumption of these beverages in children.

Objective: To estimate the prevalence of overweight obesity and physical inactivity and to evaluate the pattern of consumption of energetic beverages in children and adolescents from Asuncion, Central and Caaguazú in 2015.

Methods: We used a probabilistic cohort stratified by age (7-19 years) and by conglomerates (schools in Asunción, Central and Caaguazú). Size sample: 2.300 subjects. A 24 hours reminder used for repeat samples. Cluster (schools). INTA Questionnaire was applied for measuring physical activity. Overweight and obesity was calculated with BMI Z score (WHO). Analysis by ANOVA and T Test. Significance: $p < 0,05$.

Results: Entered the study 2300 children and adolescents, average age was 11 years (2,89 years SD). The prevalence of overweight was 26.81% and obesity was 18.60% in Asuncion, Central and Caaguazú. The 50% of the study population said to spend 60 min daily sitting in front of the TV, with a rank from 0 to 120 minutes, 50% performed physical activities. The pattern of beverages consumption was: Volume. Median 1950 ml (RQI 1450-2600): Water 766 ml (RQI 491-1191); Milk and derivatives: 362 (RQI 255-471), Infusions 200 (RQI 141-450), Natural juices: 425 (RQI 300-600), Artificial juices 300 (RQI 200-500), Nectar 200 (RQI 200-350), Carbonate beverages 416 (RQI 300-616). %

Conclusions: The prevalence of malnutrition by excess is high. Half the population stated to performed physical activities outdoors for 30 minutes per day. The consumption pattern of these beverages

in children and adolescents is characterized by a less consumption of dairy products and more consumption of sugared beverages.

Keywords: obesity, physical activity, fluids intake, children

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144/1963

CREATING HEALTHY FOOD ENVIRONMENTS THROUGH THE BENCHMARKING OF NUTRITION-RELATED GOVERNMENT POLICIES IN SOUTH AFRICA: LOCAL EXPERT RECOMMENDATIONS FOR IMPROVED PRACTICE

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Background and objectives: Worldwide, rates of non-communicable diseases (NCDs) are on the rise. Dietary risk factors increasingly contribute to this surging global burden. This is also more and more the case in low- and middle-income countries, including South Africa. Since unhealthy diets are predominantly driven by unhealthy food environments, comprehensive actions by governments are crucial. Although a detailed plan currently exists for achieving specific NCD-related targets in South Africa, this has yet to be translated into concrete actions and/or policies.

The aim of this study is to benchmark public sector policies impacting food environments in South Africa by assessing government policies on food environments against achievable, well-defined benchmarks.

Methods: 1. Collection of relevant policy documents and policy scan to gather evidence

2. Validation of evidence document with government officials

3. Expert rating workshops: rating the extent of government policy implementation, identify gaps in these policies, and proposing concrete actions

4. Prioritization of proposed policy actions by experts

5. Feedback of results to experts, government officials, and the public

Results: An evidence report that was validated by a low number of government officials was generated. Workshops with experts were convened during which the evidence was rated and actionable steps identified. Ratings were generally low, with the lowest ratings being given to policies in the areas of 'food trade & investment' (1.00/5) and 'food retail' (1.03/5). Gaps in these areas included the absence of regulation of trade and investment in unhealthy foods, and the lack of consideration of informal vendors, respectively; with proposed actionable steps including policies to support investment in healthier food options, and the relaxation of zoning restrictions and provision of subsidies for the provision of healthy foods for informal vendors. The highest ratings were given in the areas of 'leadership' (2.71/5), 'food consumption' (2.26/5), and 'governance' (2.11/5).

Conclusions: Although South Africa is making great strides towards improving the nutritional intake of its citizens, and seems to providing the leadership and governance to this end, there is still a great deal more that the government can do as far as policy development and, especially implementation goes.

Keywords: non-communicable disease, food environments, nutrition policy

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144/1967

FOOD BEHAVIORS OF RISK AND NUTRITIONAL STATUS IN PRETEENS

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Background and objectives: Documenting the development of altered eating behaviors and attitudes at an early age can help identify at-risk cases and improve intervention strategies. Therefore, the objective of this research was to analyze risky dietary behaviors in preadolescents of public and private school institutions, according to gender and nutritional status.

Methods: Descriptive, cross-sectional study of a sample of students aged 10 to 13 years of both sexes belonging to public and private establishments in the capital of Salta. The nutritional status was evaluated anthropometrically through the body mass index and the EAT 26 test (Maloney 1988) was used to measure dietary risk behaviors, which evaluates diet, bulimia and oral control.). Excel, WHO software Antro v.1.0.4 Plus, EPI 7 programs were used.

Results: 288 students belonging to public schools (51.7%) and private schools (48.3%) were evaluated with a even distribution by sex. In public schools, 50.4% presented risky dietary behaviors while in private schools only 17.8%, a highly significant difference (p 0.0000001). The percentage of overweight and obese pupils is high in the total sample (52.5%), predominantly in males, both in private establishments (47%) and in public schools (66.2%). It's worrisome the low percentage of children in normal situations, corresponding to 24.6% and 37.7% of women and men respectively in public schools. These figures increase in private establishments, reaching 48.2% in women and 47.6% in men.

Conclusions: We found a statistical association between risky dietary behaviors, type of school establishment (public and private) and overweight and obesity.

Keywords: Dietary behaviors. Nutritional status. Schoolchildren

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144/1977

MOBILE TECHNOLOGY TO IMPROVE TREATMENT, REPORTING, AND MONITORING FOR ACUTE MALNUTRITION

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Background and objectives: Community-based Management of Acute Malnutrition (CMAM) is a proven approach for treating acute malnutrition. Its effectiveness is undermined by poor adherence to clinical protocols, inaccurate record keeping and weak supervision systems. A mobile application (app) for CMAM was developed to provide health workers (HWs) with case management tools and job aids, including response-triggered decision tree algorithms, automated referral initiating and tracking, integrated media for counselling, and automated reporting. The app was contextualized and deployed in Afghanistan, Mali, Chad, Niger, and Kenya in 2014 to determine the effectiveness and impact of the technology.

Methods: Evaluations were conducted in 2016 to assess the effect of the app on protocol adherence, monitoring, reporting, user acceptability and competency. Data was collected from a sampling of one third of implementation health centers and was matched with health centers using the traditional paper-based system for comparison. Evaluation tools included: Observational Checklist, Focus Group Discussions with HWs and beneficiaries, and Key Informant Interviews with project staff, Health District officials and Community health committee members. Monitoring tools administered quarterly, provided information on user acceptability and competency.

Results: Data completeness, protocol adherence, and treatment outcomes were improved across all 5 countries and HW acceptability was high if they were given enough time, training and support. The main challenges to HW uptake were battery life, screen size, network speed/coverage, and requirement to complete dual reporting (electronic and paper-based). The app prevented skipping steps in treatment protocol, resulting in longer case management times.

Conclusions: The app has demonstrated the potential to transform the delivery of CMAM, improving the ability to more efficiently and effectively treat acute malnutrition in humanitarian settings. However, developing 'global specifications' was not feasible given the differences between national protocols; country contextualization was complex and time consuming; field testing with users was vital; working with a technology partner who can accommodate timeline flexibility and works in fragile contexts would be beneficial; weak CMAM services in some countries affected uptake of the app. The app has also highlighted the need to better understand what is feasible in terms of capacity and time for HWs in low resource settings, with high patient caseloads.

Keywords: Acute Malnutrition; Technology; Nutrition; Child

144/1979

NUTRITIONAL RISK FACTORS AMONG ADOLESCENTS FROM A CITY IN THE NORTHEAST REGION OF BRAZIL

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Background and objectives: To describe the prevalence of nutritional risk in adolescents from a city in the Northeast Region of Brazil.

Methods: This is a school-based cross-sectional epidemiological study. Nine hundred and twenty adolescents aged 12 to 17 years old were randomly selected from six schools in different six geographic regions, in the city of Fortaleza, Ceará, Brazil. All eligible students in the selected classes were surveyed. Nutritional status, gender, economic level, body perception, diet and physical activity were included as variables.

Results: The evaluated group consisted of 49.2% boys and 50.8% girls. Twenty-one percent of students (n = 193) were underweight; 57.4% (n = 528) presented eutrophy; 15.5% (n = 143) were overweight, and 6.1% (n = 56) presented obesity (p<0.001). The majority of the students (51.7%, n = 476) presented intermediate economic level and 39.5% (n = 363), low economic level (p<0.001). Body perception presented discrepant results comparing to nutritional status: 34.5% (n = 317) of students wanted to lose weight and 24.1% (n = 222) wanted to gain weight (p<0.002). The frequency of the consumption of milk (62.8%; n=578), fruit (73.2%; n=673), fruit juices (65.1%, n = 599), vegetables (45.2%, N = 416), green salads (38.9%, n = 358), Potatoes (49.5%, n = 455) and soft drinks (79.3%, n = 730) demonstrated inadequate eating habits. Regarding the practice of physical activity, 44.3% (n = 408) of students did not practice any physical activity (60 minutes/day) in the last week evaluated. It was also observed that 15.3% (n = 141) used video game or computer for more than 5 hours a day and 15.5% (n = 143) watched television for more than 5 hours daily.

Conclusions: It is possible to verify the existence of nutritional risk among the evaluated adolescents, evidencing the need to implement education and health actions with this age group.

Keywords: Adolescent, risk factors, nutrition, epidemiological surveys

144/1984

PALM OIL: WHAT ARE WE TALKING ABOUT?

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Background and objectives: The lack of distinction in fatty acid (FA) composition in palm oil (PO) and its fractions may induce misleading conclusions regarding the effect on lipid metabolism. We aimed to analyze the FA concentrations in percentage for PO, palm kernel oil (PKO) and their fractions.

Methods: Data were extracted from CODEX-2015 for PO, PKO, palm olein (POL), palm kernel olein (PKOL), palm stearin (PS), palm super olein (SO) and palm kernel stearin (PKS). Saturated fatty acid (SFA) percentage was calculated for lauric (C12:0), myristic (C14:0), palmitic (C16:0), and stearic acids (C18:0). Unsaturated fatty acid (USFA) percentage was calculated for palmitoleic (C16:1), oleic (C18:1) and linoleic (C18:2) acids.

Results: Ratio (SFA/USFA) was lower for PO (1:1.2), POL (1:1.3), PSO (1:1.5), and higher for PS (2.1:1), PKOL (3:1), PKO (4.3:1) and PKS (10.3:1). Palmitic acid concentration was highest in PS (60.46%) followed by PO (38.84%), POL (38.41%) and PSO (34.62%), being lower in PKS, PKO and PKOL (8.08%, 7.84% and 8.22%, respectively). Palm kernel oils showed higher values for lauric (42-54%) and myristic (21-13%) acids. Stearic acid was about 4% in PO and its fractions while 2% in PKO and its fractions. Oleic acid was higher in PSO (46.41%), POL (40.43%) and PO (35.79%) when compared to PS (25.52%). It was lower in PKOL (19.08%), PKO (14.73%) and PKS (5.86%). Palmitoleic acid concentration was 4.25%, 4.01%, 2.30%, 1.90% and 1.93% in PO, POL, PKOL, PKO and PKS, respectively. It was barely detected in PSO (0.25%) and PS (0.10%). Linoleic acid concentration was two-folded in PO (14.77%), PSO (12.79%) and POL (11.07%) when compared to PS (6.44%), yet lower in PKOL (3.28%), PKO (2.14%) and PKS (0.97%).

Conclusions: Our study highlighted the large variation in FA composition for different palm oils and their fractions, which may explain different effects on lipid metabolism. Recently, a new fraction rich in oleic acid (48-60%) has been considered to be included in the CODEX. An adaptation of labelling is needed in order to clarify the FA composition of palm oil used by the food industry.

Keywords: Palm oil, Palmitic acid, Food labelling, Cardiovascular risk

HEALTH RELATED QUALITY OF LIFE IN OBESE, OVERWEIGHT AND NO OVERWEIGHT CHILDREN FROM PUBLIC SCHOOLS OF CORDOBA CITY (ARGENTINA)

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Background and objectives: The prevalence of childhood obesity have steadily increased since more than four decades. Measures of health related quality of life (HRQoL) may contribute to know the impact of overweight on physical, social, and emotional well-being. Objective: to know the HRQoL in children according to their condition of excess weight.

Methods: Cross-sectional study conducted in a representative sample of 1577 children attending Municipal primary schools in the city of Cordoba, Argentina, in 2011. Children completed the KIDSCREEN-52 questionnaire measuring 10 dimensions of HQRoL. Body weight and height were measured to calculate BMI and to categorize excess weight according to IOTF and WHO definitions. Associations between variables were assessed using ANOVA, adopted 5% as the significance level. Between-group differences were assessed using Cohen's "d" as a measure of effect size (ES). ES of 0.2–0.5 were considered small, those between 0.51 and 0.8 moderate, and those over 0.8 were considered large.

Results: The prevalence of obesity was 11.1% using the IOTF definition and 16.5% using the WHO definition. The prevalence of overweight resulted in 20.7% and 22.7%, respectively. Obese children scored lower than no overweight children in dimension of Physical well-being, both girls (mean=49.2 versus 52.1; p<0.05; ES=0.31) and boys (50.6 vs 55.3; ES=0.47). As well, obese girls (means=49.4 versus 52.2; p<0.05; ES=0.27) and boys (means=51.3.4 versus 54.1; p<0.05; ES=0.27) scored worse than no overweight children in Self-perception. Nevertheless, score of School environment were higher in obese girls (mean=60.0) compared with no overweight (mean=56.6; p<0,05; ES=-0.31). No differences were found in the other dimensions of HRQoL. No differences in HRQoL were observed between overweight and no overweight children These analyses were carried out with IOTF definitions, but similar results were obtained when WHO definition was used as reference.

Conclusions: Obesity was associated to a worse Physical well-being and Self-perception, both in girls and boys, when comparing with no overweight children. HRQoL should be an outcome to be measured in overweight preventive interventions.

Keywords: Children. Obesity. Health related quality of life.

THE COMMUNITY FOOD ENVIRONMENT IN COSTA RICA FAVORS HIGH INTAKES OF SODIUM

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Background and objectives: The availability of foods within the environment greatly influences nutrient intake. Understanding access to foods lower in sodium is essential to prevent and control non-communicable diseases (NCD) associated with excessive sodium consumption, such as hypertension, cardiovascular and renal diseases.

To characterize the community food environment in Costa Rica by (i) assessing the sodium content declared on the nutritional label of 7570 processed and ultra-processed products and from company websites for 311 commercial fast foods, and (ii) describing the types of fast foods available within key communities.

Methods: Nutrition information on packaged and restaurant foods was collected through a systematic scan of packaged foods sold on supermarkets and online information, respectively. Sodium content of packaged foods was evaluated using the nutritional criteria from 3 systems: a. PAHO Nutrient Profile Model, b. UK Traffic Light, and c. US FDA criteria for "nutritional" claims. In the qualitative study, social ecological, health beliefs and trans-theoretical change models were used. Data were collected from 2013 to 2016.

Results: 79% of processed and ultra-processed products (n=6005) declared nutritional information on the label, and of these, 77% (n=4642) provided the sodium content. Processed, ultra-processed and fast foods reported varying amounts of sodium, even within a single food category. However, in most categories, regardless of the system used, there were classified as medium to high sodium sources. In rural areas, there was less variety of ultra-processed foods and less expensive compared to urban areas. Those with low socioeconomic status had less access to a healthier food supply, except for fresh items. Likewise, cultural diversity and stage of life influenced preferences and use of processed and

ultra-processed foods. A wide and varied supply of foods high in sodium, was observed in all the places visited (supermarkets, parks, markets, macrobiotics, "pulperías", fairs, outside educational centers), conditioned by socioeconomic, cultural and geographical factors. With globalization, urbanization and the use of mass media, the availability, variety and marketing of affordable foods high in sodium increases.

Conclusions: The community food environment in Costa Rica favors a high intake of sodium, which increases risk of NCDs associated with excess sodium consumption.

Keywords: Salt, sodium, food environment, community food environment, Costa Rica.

144/1991

ANALYSIS OF THE PRESENCE OF GENETICALLY MODIFIED ORGANISMS' INFORMATION ON FOOD LABELS

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Background and objectives: Transgenic organisms, also called genetically modified organisms (GMOs), have its genetic material modified by the inclusion of genes through molecular biology, to promote improvement of the product's quality and higher productivity. In Brazil, GMOs came clandestinely in 1997. Nowadays, Brazil is the second biggest producer of GMOs in the world, having as transgenic food 94.2% of its soy and 84.6% of its corn cultivated in its land. In 2003, a decree was published stipulating that all foods containing GMOs have to present in its label a "T" black symbol in a yellow triangle, with a sentence and the scientific name of the donor species of the responsible gene for the GMO modification. Still, many companies do not identify the presence of GMOs in their products. The aim of this study was to evaluate the presence of GMOs' information on food labels.

Methods: Products, collected in four supermarkets, that contained soy or corn as one of the first five items from the ingredient list were included. We analyzed the labels of 83 products. Soy products were considered: soy oil, soy protein, isolated soy protein, texturized soy protein, hydrolyzed soy protein, vegetal soy protein, soybean extract, and soy lecithin emulsifier. Corn products were considered: corn flour, corn groats, corn starch, corn meal, and corn oil. Food labels were classified as "adequate" or "inadequate". Those that did not present information about the presence or lack of GMOs were classified as "questionable".

Results: From the 83 food labels that were analyzed, 24.1% were classified as "adequate", 8.5% as "inadequate", and 67.5% as "questionable". Among the 20 food labels considered "adequate", we verified that 60% were from products with corn, while 40% were from products with soy. We cannot confirm if the food labels without information were adequate or inadequate, because of the current lack of legislation compliance from food industries.

Conclusions: Most of the food labels did not present any kind of information regarding the presence of GMO's. Therefore, it is necessary to prioritize monitoring and punishment actions for the companies that do not ensure essential information for the consumers to make conscious choices.

Keywords: Genetically modified organisms, label, soy, corn, consumer's rights.

144/1994

REPRODUCIBILITY OF A MINI FOOD CONSUMPTION QUALITY ASSESSMENT (MINI-ECCA) IN MEXICAN ADULTS

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Background and objectives: The assessment of population's food consumption quality allows the development of food aid programs, public policies for fortification or for food labelling and the elaboration of nutritional recommendations. However, in Mexico, there are not reproducible and validated short/quick screening tools to evaluate this characteristic. For this reason, our aim is to develop a Mini Food Consumption Quality Assessment (Mini-ECCA) in Mexican adults and determine its reproducibility.

Methods: A longitudinal study was carried out from March to December 2016 in a sample of apparently healthy workers from the Intermunicipal System of Water Services (SIAPA for its initials in Spanish), who voluntarily agreed to participate and signed informed consent form. The Mini-ECCA is conformed by 12 items

with visual support. It was built upon national and international recommendations and reviewed by experts. Its application lasts 5 minutes. Each question scores 0 or 1; the higher the score, the better the food consumption quality. Besides, it allows a classification of four categories of food consumption quality according to final score (10-12: very good; 7-9: good; 4-6: low; 1-3: very low). It was applied twice with a 15-days interval between them. Spearman correlation (reproducibility) and intraclass correlation coefficient (concordance) were calculated from the total scores, and for the concordance between categories (SPSS v.20 for Windows, p<0.05 significant).

Results: One hundred fifty five subjects were included; the average age was 40.2 (standard deviation (SD) 7.4) years. The average of Mini-ECCA´s total score was: first application 6.0 (SD 2.2), and second application: 6.3 (SD 2.3). Spearman correlation between the total scores of the first and second applications was ρ=0.713 (p<0.001) and intraclass correlation coefficient (ICC) was 0.841 (95% CI 0.779, 0.885).

Conclusions: Mini-ECCA's reproducibility was good (ρ=0.713) and its concordance was excellent (ICC of 0.841). Therefore, Mini-ECCA is a tool that, once validated, could be used in public health, to carry out focused food consumption assessments and orientation.

Keywords: Diet quality index, food consumption quality, reproducibility.

144/1998

PUBLIC POLICY IN MEXICO FOR THE FIGHT AGAINST OVERWEIGHT AND OBESITY IN SCHOOL CHILDREN

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Background and objectives: The excess weight in school-children in Mexico is a serious health problem that has increased at an alarming rate. In 2010, the government established General Guidelines for the Dispensing or Distribution of Foods and Beverages at School Food Establishments (SFE) in Elementary Schools whose objective is to stop the epidemic of overweight and obesity.

Objective: To evaluate the compliance with the Guidelines during two scholar periods (2011-2012 and 2012-2013), that correspond to stages II and III of their implementation, with regard to the availability and compliance with the established criteria for the sale of foods and beverages at SFE of public elementary schools.

Methods: Cross-sectional study carried out in 39 schools that were randomly selected, from the national census of schools in Mexico. The foods and beverages available at schools were recorded in two school years, and their nutritional characteristics were compared to those established in the Guidelines. Linear, logistic or Poisson regression models were developed, according to the type of variable of interest, to make comparisons between the stages, within each food category.

Results: A broad availability of energy dense foods that are not allowed in the SFE such as cookies, desserts and sweetened beverages, was found at the schools in both stages of the study. Less than 7% of the foods and drinks were vegetables, fruits and plain water.

The food categories that met fewer of the nutritional criteria established in the Guidelines were prepared foods (fried and non-fried), as well as snacks.

Conclusions: No changes were observed between stages in the compliance with the Guidelines for the availability of foods in schools. These results suggest that Guidelines must be promoted and provided with legal basis, to make its accomplishment mandatory.

Keywords: Public policy, schools, obesity, food and beverages, Mexico

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144/2000

PREVALENCE OF CARDIOVASCULAR RISK FACTORS AMONG ECUADORIAN WORKERS AT A PRIVATE ENTERPRISE

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Background and objectives: Cardiovascular diseases (CVDs) are the leading cause of morbidity and mortality worldwide. Cardiovascular diseases are among the main causes of mortality in Ecuador. However, the prevalence of Cardiovascular Risk Factors (CVRF) is unknown in Ecuadorian workers. This study aimed to determine the prevalence of obesity, overweight, physical inactivity, hypertension, central obesity, dyslipisdemia history, tobacco use, alcohol and low fruit and vegetable intake among Ecuadorian workers at a private enterprise.

Methods: A cross sectional study was conducted on 917 Ecuadorian private workers (663 men and 254 women). Surveys were conducted to obtain life style information, hypertension and dyslipidemia stories, tobacco and alcohol use; anthropometric data (waist circumference, waist/hip ratio and Body Mass Index), fruit and

vegetable intake and physical activity levels (International Physical Activity Questionnaire). Statically, descriptive statistics, chi-squared test and multiple correspondence factorial analysis were used.

Results: The prevalence of CVRF are: 87,9% low fruit and vegetable intake, 65.3% physical inactivity, 50% excess of weight (40.8% overweight and 9.4% obesity); 36.4% alcohol, 25.6% central obesity, 14.8% tobacco use, 14% hypertension and 6.9% dyslipidemia history. Hypertension coexisted with obesity (38.4%), overweight (15%) and central obesity (p=0,000). Overweight and central obesity increases with age (p=0,000). Being obese and lack of time are the most common barriers to practice physical activity.

Conclusions: There is a high prevalence of cardiovascular risk factors in apparently healthy workers at a private enterprise in Ecuador. This exposes the need of preventive strategies against cardiovascular disease at workplace by making lifestyle modifications. The preventive strategies against CVDs would help in decreasing employee absenteeism, as well as hospital and drug costs which burden the health care system.

Keywords: Cardiovascular risk factors, physical inactivity

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144/2009

EVALUATION OF LEFTOVERS OF PREPARATIONS WHICH MAKE UP THE MENU OF A FOOD AND NUTRITION UNIT IN THE CITY OF SÃO PAULO

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Background and objectives: The Food and Nutrition Unit (UAN) consists of an area dedicated to the preparation and distribution of meals, with the objective of guaranteeing the provision of balanced meals according to hygienic-sanitary and dietary standards, guaranteeing food safety since the preparation and production until distribution to the final consumer. The waste of food in a UAN occurs both in the transformation of food into ready-to-eat meals, leftovers, which are all ready-to-eat foods that have not been distributed, as in the distribution stage, interpreted as food remains. Waste reduction can bring a number of benefits to a UAN, such as reducing production costs by using less inputs and energy. The main objective of this study was to Identify the amount of leftovers from the preparations that make up a menu in a food and nutrition unit.

Methods: Cross-sectional, observational descriptive study with primary data collection, developed at a UAN of a financial institution located in the southern region of the city of São Paulo, administered by a service provider in the food and nutrition segment. All items belonging to the menu were weighed in the five days of collection, between May and June 2016. For the data collection, the quantities of food produced were considered, from the gender requisition of the stock, calculating if the correction factor and cooking index, besides weighing the leftovers of the days of

collection for later calculation of percentage of leftovers and grams per capita. The analysis was made according to parameters stipulated by Lanzillotti, 10% as the maximum acceptable limit, and Vaz, 7 to 25 g per capita, respectively.

Results: The mean total food preparation during the five days of weighing was 105.5 kg, with 26.77 kg were of leftover food, totaling a percentage of 25.37% and a mean per capita of 33g .

Conclusions: The average total percentage of leftovers as per capita leftovers are high when compared to those proposed in the literature.

Keywords: Food Waste; Food Service; Food Leftovers; Food and Collectivity.

144/2024

NUTRITIONAL QUALITY OF A SELECTED SAMPLE OF PACKAGED FOODS IN ARGENTINA

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Background and objectives: One of the major causes of the global increase in the prevalence of obesity, and other diet-related chronic diseases has been the increased intake of foods high in sugar, salt, and fats. This study analyzed the nutritional quality of packaged foods highly consumed or targeted to children in Argentina.

Methods: Data for breakfast cereals, cookies and milk desserts were collected at a major supermarket chain in Argentina in June 2016. Pictures were taken of the Nutrition Information Panel (NIP) of all products.

NIP of all products was analyzed using the PAHO and the WHO Europe Nutrient Profile (NP) Models.

Results: A total of 301 products were collected, 42 (14%) breakfast cereals, 209 (69%) cookies and 50 (17%) milk desserts. According to the PAHO NP model, most products (87%, n=262) showed high critical nutrient levels in at least one nutrient: 27% (n=82) were "excessive" in one nutrient, 25% (n=74) in two nutrients, 22% (n=65) in three nutrients, and 14% (n=41) in four nutrients. From the total sample, 58.8% (n=177) had excessive levels of sodium, 56.4% of saturated fats (n= 170), 53% of free sugars (n=159), 49.8% of total fats (n=150), and 2.3% (n=7) had other sweeteners. For each food category, 94% (n=196) of cookies, 92%(n=46) of milk desserts and 47% (n=20) of breakfast cereals contain elevated levels of at least one critical nutrient. For the WHO Europe NP model, most products (91%, n=292) exceeded the nutritional thresholds.

Conclusions: Most of the products analysed have high levels of sugars, fats and/or sodium. Policy considerations need to be

made regarding marketing regulation directed to children, the use of nutrient and health claims and front of package warning labels, according to the nutrient profile of products in order to inform adequately to consumers empowering them to make healthy choices

Keywords: Nutritional quality, Food Labelling, Childhood obesity, Argentina

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144/2025

IS INEQUALITY AFFECTING THE NUTRITIONAL STATUS OF ADULT CHILEAN POPULATION? NUTRITIONAL STATUS IN ADULT CHILEAN POPULATION: INEQUALITIES IN A POST-TRANSITIONAL COUNTRY

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Background and objectives: Previous research in Latin America shows that socioeconomic status (SES) influences dietary patterns and obesity distribution. However, it is unclear how SES impacts overall nutrition status, in a post-transitional country such as Chile. The objective of this study was to assess the relationship between nutritional status (overweight, short stature and anemia), and two key aspects of SES-income and educational level in adult Chilean population.

Methods: Nationally representative data of 1,413 women (20-49y) and 819 men (>49y) from the 2003 and the 2009-2010 Chilean National Health Surveys were included in these secondary analyses. Body mass index (BMI) was categorized as underweight, overweight and obesity according to WHO criteria. Overnutrition was defined as BMI ≥ 25 kg/m2. Short stature (height <1.49m) and anemia (hemoglobin concentration <12 mg/L) data were assessed only for women. Descriptive statistical analysis and Chi square tests were used to compare prevalence (%; 95% CI) by educational level (low=0-7 y, middle=8-12y, and high>12y) and income tertiles.

Results: Overweight [(34.0% (30.1%-38.2%) in women] and [47.8% (41.5-54.1) in men] and, as well as, obesity [(27.1% (23.5%-30.9) in women] and [28.9 (23.7-34.8) in men], were high while underweight was negligible. Less educated women had higher prevalence of overnutrition (80.2%; 68.8%-88.1%) and short stature (14.9%; 8.5%-13.7%) than higher educated women (49.2%; 40.9%-57.5% and 3.7%; 2.0%-6.9%, respectively) (P<0.05 for both). Poorer women had higher prevalence of short stature (10.1%, 7.4%-13.8%) than richer women (2.2%, 1.0%-5.0%) (P<0.05). Anemia did not differ by SES. In men, nutritional status did not vary by income or educational level (all p>0.05).

Conclusions: In a post-transitional country such as Chile we observed SES and gender inequalities in adult nutritional status; this poses important challenges for future nutrition policies.

Keywords: Chile, Malnutrition, Inequalities, Obesity, Anemia

144/2026

APPLYING A FEASIBILITY LENS TO AN INTEGRATED NUTRITION PROGRAM IN PERI-URBAN AND URBAN SENEGAL

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Background and objectives: The PROMIS program, implemented by HKI, integrated a package of preventive services with monthly screening and referral for acute malnutrition (AM). A one-month supply of small-quantity lipid-based nutrient supplements (SQ-LNS) for children 6-23 months of age served as an incentive to attend screening and behavior change communication (BCC) on nutrition, health, and hygiene. In peri-urban and urban Senegal, we assessed the feasibility of using neighborhood nutrition sites run by community volunteers as the program platform. Feasibility evaluation provides insights to improve implementation and increase potential for impact.

Methods: We evaluated feasibility within Bowen's (2009) seven "key areas of focus" along the program's theory of change with individual semi-structured qualitative interviews with purposively selected beneficiary mothers (n=40), volunteers (n=37), and program staff (n=12); and group free listing with 40 opportunistic groups of 5-15 beneficiary mothers.

Results: Results across feasibility domains showed that PROMIS was perceived as acceptable by beneficiaries and volunteers. SQ-LNS added value to the program for mothers and demand for program services was also increased by proximity of sites and effective communication on timing of services. Implementation of screening, BCC, and SQ-LNS was overall successful, however, barriers to program utilization included limited motivation, lack of interest in BCC topics, and time constraints. In an effort to reach more beneficiaries with SQ-LNS, some volunteers conducted home visits and/or dropped the requirement of screening and BCC. These modifications limited program practicality. PROMIS' design was inadequately adapted to the time constraints faced by mothers. Sites were affiliated with a health center and integration was ensured through referral of children with AM, health agent supervision and SQ-LNS management. Mothers' recollection of BCC messages revealed that child feeding and hygiene were the most salient, 75% of what they recalled was consistent with recommendations (limited efficacy).

Conclusions: We conclude that providing SQ-LNS without the conditionality of screening and BCC indicated a lack of understanding of the program theory of change among volunteers. However, program modifications made by volunteers to reach beneficiaries also

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indicated that the program delivery platform requires further adaptation to a peri-urban and urban setting. Feasibility evaluation provided valuable insights not easily obtained through other methods.

Keywords: feasibility study, small-quantity lipid nutrient supplement, prevention of malnutrition, Senegal

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144/2029

FRONT-OF-PACK SYMBOLS AS INDICATOR OF NUTRIENTS LEVEL IN ULTRA-PROCESSED FOODS: A BRAZILIAN PROPOSE

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Background and objectives: Ultra-processed foods contribute excessively to the energy, fat, sugar and sodium intakes. Nutrition information included in ultra-processed packaged foods may be confusing. Nutrition labels and front-of-pack (FOP) food labelling are proposed to provide more accessible and comprehensible nutrition information to consumers and may help consumers to make more healthy food choices. The objective of this study was to create a symbol to identify nutrients level in Brazilian ultra-processed foods and to verify consumer understanding of this information.

Methods: Cross-sectional study from Jun 2016 to Dec 2016 with the development of FOP food labelling, and verification of the consumer understanding of it and influence on food choice. The FOP labelling contained nutrition information for total fats, saturated fats, addition sugars, sodium and fiber in packaged beverages and foods. Heathy and unhealthy levels of each particular nutrient were based in United Kingdom and Brazilian legislation for packaged foods. A questionnaire to verify the consumer understanding of nutritional information in the symbol in FOP food labelling and the food choice was applied in a Retail Lab to participants aged >18 years recruited from an university in south of Brazil. Data was shown how means, standard deviation and frequencies.

Results: The FOP symbol for identification was a single stamp. The stamp was based in Multiple Traffic Light system: red, yellow and green. The text in each FOP symbol indicated the relative health value of each nutrient in the front-of-pack label: red – Be careful with your heath; yellow – Pay attention with your health; and green – Heathy choice. The questionnaire was answered by 54 individuals, 30.42 ± 13.12 years, 57.41% (n = 31) were women. All participants identified the FOP single stamp and answered that were easier to understand the ultra-processed packaged foods nutritional information with the FOP single stamp. The FOP stamp may influence 88.9% (n=48) of the participants in their food choices.

Conclusions: FOP single stamp was create to identify nutrients level in Brazilian ultra-processed foods and was based in Multiple Traffic Light system, and facilitate consumer understanding of nutritional information. However, FOP stamp does not assurance totally change in food choices.

Keywords: Ultra-processed foods. Nutritional Labelling. Front-of-pack labelling. Consumer survey.

144/2033

NUTRITION OF WOMEN IN CHILE

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Background and objectives: The advanced stage of Chile's nutritional transition implies the increase of obesity prevalence, coexisting with problems caused by underweight, especially in pregnancy. The objective was to diagnose the nutritional and health status of Chilean women of reproductive age and contrasting findings with current nutritional programs.

Methods: A comprehensive literature review from the last 15 years, including articles published in peer-reviewed journals and official reports, produced a final list of 85 references.

Results: Ultra-processed foods intakes are rising. Changes in food intake play a role in obesity epidemic. Overweight and obesity prevalence are growing in pregnant women population accounting for 29% in early pregnancy, increasing the risk of perinatal complications and metabolic syndrome later in child's life. Furthermore, the beginning of obesity epidemic in the population under 6 years is well documented.

Several micronutrients and omega-3 fatty acids are cited as deficient. Pregnancy complications including anemia, diabetes, hypertension, cesarean section and inadequate fetal growth are frequently found in malnourished women. Implementation of recent national policies might be important to address the situation. Those policies include micronutrient fortified food supplement distribution to pregnant women, food labeling changes, sugar sweetened beverages taxes, and a secondary prevention program for overweight non-pregnant girls and women.

Conclusions: The current study proposes to implement policies that use a more accurate weight gain chart during pregnancy, improves in the current fortified food supplements and include a secondary prevention program for overweight pregnant and nursing women.

144/2038

THIAMINE-FORTIFIED FISH SAUCE IN RURAL CAMBODIA: VITAMIN STABILITY AND ORGANO-LEPTIC PERCEPTIONS

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Background and objectives: Background: In Cambodia and throughout Southeast Asia, potentially fatal infantile beriberi occurs because thiamine-deficient mothers produce thiamine-poor breast milk. To prevent this thiamine deficiency in breastfed infants, we developed a novel thiamine-fortified fish sauce with the aim of improving maternal thiamine intake during pregnancy and lactation. We formulated two thiamine-fortified fish sauces: low concentration (low; 2 g thiamine hydrochloride (THCl)/L) and high concentration (high; 8 g/L).

Objective: To test the stability of thiamine in fish sauce during typical storage and use in rural Cambodian households, and after exposure to sunlight, oxygen, and heat in the laboratory. Also, to examine consumer acceptability through sensory evaluation of thiamine-fortified fish sauces compared to a control sauce containing no thiamine.

Methods: Thiamine-fortified fish sauce was exposed to sunlight, oxygen, and sunlight + oxygen for up to 21 days, and heat (100°C) for up to 35 minutes. Sensory evaluation was conducted among 90 women (18-45 y) in Prey Veng, Cambodia using the Triangle Test, Paired Preference Test, and a Nine Point Hedonic Scale.

Results: Mean ± SD THCl in low and high fish sauce household samples was 2.3 ± 0.4 and 9.7 ± 1.0 g/L (n=53 each), respectively. Sunlight, oxygen, sunlight + oxygen, and heat exposure caused ≤10% degradation in samples. Women enjoyed the taste of all fish sauces, and only 30 (33%) correctly identified the different sample in the Triangle Test, suggesting that the fish sauces were not discernible. More than 65% of women liked the sauces (scores ≥6 on a Nine-Point Hedonic Scale).

Conclusions: Thiamine is stable in a fish sauce matrix, and thiamine-fortified fish sauce is acceptable to rural Cambodian consumers, highlighting the potential of fish sauce as an ideal thiamin fortification vehicle to increase maternal thiamine intake to combat infantile beriberi.

144/2041

THE ECONOMIC BURDEN OF NOT MEETING FOOD RECOMMENDATIONS IN CANADA

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Background and objectives: Healthy lifestyles (e.g., healthy eating, smoking cessation, physical activity) can often prevent chronic diseases (CD) (e.g., type 2 diabetes, cardiovascular diseases, cancers). Public health professionals have difficult choices to make when deciding on resource allocation for CD prevention programs. Estimates of the economic burden of CD due to lifestyle factors are insightful for these professionals and exist for smoking, obesity and physical activity; however, only a few estimates exist for healthy eating. The purpose of this study was to estimate the economic burden of CD attributable to not meeting food recommendations in Canada.

Methods: Foods identified by the Global Burden of Disease Study (GBD) as being either protective (1. vegetables; 2. fruit; 3. whole grains; 4. milk; 5. nuts and seeds) or detrimental (6. processed meat; 7. red meat; 8. sugar-sweetened beverages) in terms of CD risk were included. Risk estimates were obtained from the GBD. Usual intake distributions for these foods were obtained from the 2004 Canadian Community Health Survey 24-hour dietary recalls (n=33,932 respondents). Canada's Food Guide (or other relevant) recommendations were used. Population attributable fractions (PAF) that accounted for both independent risk factor contributions and multiple exposure levels were calculated. Annual direct health care (hospital, drug, physician) and indirect (human capital approach) costs in 2014 for relevant CDs were obtained from the National Health Expenditure Trends and Economic Burden of Illness. PAF outcomes were multiplied by these costs to estimate those attributable to diet.

Results: Not meeting recommendations for the eight foods is responsible for ~CAD$17.4 billion/year (direct health care costs:

~CAD$6.5 billion; indirect costs: ~CAD$11.0 billion). Males were responsible for ~2/3 of these costs. The top contributors to these costs were inadequate nuts and seeds, inadequate whole grains, excess processed meat, and inadequate fruit.

Conclusions: In Canada, the costs of not meeting food recommendations are similar to smoking and higher than physical activity. These findings also suggest prioritization to dietary factors such as nuts and seeds and whole grains is potentially warranted. This research will ultimately help public health professionals make better-informed decisions to improve population health, reduce health care costs and protect workforce productivity.

Keywords: chronic disease, burden of disease, economics, population attributable fraction

144/2042

THE RELATIONSHIP OF FOOD INSECURITY AND THE NUTRITIONAL STATUS OF MEXICAN MOTHER-CHILD PAIRS

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Background and objectives: Previous studies have suggested a link between obesity and HFI (Household food insecurity); especially among adult women [8-10]. Specifically, it has been documented that women who experience food insecurity are more likely to be obese when compared with those from households with food security. HFI has been associated with overweight mothers and underweight children living in the same households. Adult obesity has been linked to both obesity and undernutrition in children.

The objective was to examine the association between HFI and child stunting risk and to determine if maternal-child overweight/obesity modifies the relationship between HFI and stunting risk.

Methods: We assessed the association of HFI with the nutritional status of mothers and their <11-year-old children based on data from the Mexican National Health and Nutrition Survey (ENSANUT 2012). The study included 5,087 mother-preschool child pairs and 7,181 mother school aged child pairs. HFI was measured with the Latin American and Caribbean Food Security Scale (ELCSA). We calculated the prevalence (95% CI) of each HFI category by socioeconomic characteristic and maternal-child nutritional status. Multiple logistic regressions were used to examine the associations of interest adjusting by pertinent covariates.

Results: There was a higher prevalence of stunting among preschool children with moderate HFI (16.2%) or severe (16.8%) (p=0.036 and p=0.007, respectively), compared with mild or no HFI (13.2 and 10.7%). A significant interaction was found between maternal obesity status and HFI on stunting among pre-

school children (p<0.05). HFI severity increased the risk of school aged children stunting among non-obese mothers but not among obese mothers.

Conclusions: An intriguing finding from our study is that among preschoolers HFI severity increased their risk of stunting if their mothers were not obese. However this was not the case if their mothers were obese. The double burden of malnutrition in Mexico occurs most notably among mother child pairs living with HFI. Food security government policies and programs need to take into account these complex relationships in the context of an advanced nutrition transition.

Keywords: Food insecurity; obesity, under nutrition; nutrition transition; Mexico

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144/2044

PREVALENCE OF UNHEALTHY LUNCHBOXES IN PERUVIAN PRIMARY SCHOOL

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Background and objectives: The consumption of unhealthy food has increased in the world and Peru.

Objective: To determine the prevalence of unhealthy lunchboxes in Peruvian schoolchildren at the primary level.

Methods: Cross-sectional study. Probabilistic sampling, stratified and multistage. The calculated sample size was 5223 students. Unhealthy lunchbox defined as the missed of a fruit, drink and healthy complement (low in sugar, salt and oil) according to Peruvian law, it was evaluated by observation. The analysis was performed using complex samples adjusted by weighting factor. It was calculated percentages, confidence interval of 95% and chi square. The formal authorization from the principal, teachers, parents were requested, additionally refer consent was requested to students ≥ 9 years.

Results: The 100% of children carried drinks, 68.2% food complements, 38.6% fruit y 6.4% candies. The prevalence of unhealthy lunchboxes was 94.6%. The percentage of children bringing unhealthy drinks was 89.6 and 44.7% carried unhealthy complements. In the urban area, the highest prevalence of unhealthy drink was 82.2% and 89.9% of unhealthy complements. The schoolchidren who resided in Lima Metropolitan had 33.4% of unhealthy drinks and 45.9% of unhealthy complements. Children who resided in the cost had 27.7% of unhealthy drinks and 26.8% of unhealthy complements. The drink most consumed were soda or artificial nectar (15.8%), water or sugar-free drink (10.4%), and

natural fruit soda with sugar (10.1%). The complement most consumed were the Sandwich with jams, butter, cheese, chicken, hamburger (21.6%), cookies (17.2%) and preparation make in home as Steak (14.9%) and yogurt (9.5%).

Conclusions: The prevalence of unhealthy lunchboxes in Peruvian schoolchildren is high, predominating in urban areas, Metropolitan Lima and the Peruvian coast

Keywords: Food; Fruit; Water, Drinking; School Health; Diet; Food; and Nutrition.

144/2045

NUTRITIONAL STATUS AND FAMILY SOCIOECONOMIC LEVEL OF CHILDREN ATTENDING A SELECTED SCHOOL

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Background and objectives: The growth and development of a child and its health trajectory are closely linked to its nutritional status (NS), suggesting that the latter could reflect the family socioeconomic and cultural level. Therefore, we set out to identify the NS and the socioeconomic level (SEL) of children Basic School No. 264 of the city of San Lorenzo, Paraguay.

Methods: The research was framed in the Institutional Project "Healthy Child Healthy Country" of the Faculty of Chemical Sciences, which in 2015 helped school No. 264. The sample consisted of 41 students between 5 and 12 years old. We evaluated the NS of the children through the Body Mass Index for age (BMI / E) and height for age (T / E) from the WHO 2007 standart. We used the SEL index of the Mexican Association Of Market Intelligence and Opinion (AMAI). We collected the anthropometric data in the school and the socioeconomic survey we do it to the heads of the home in their respective houses.

Results: Children had a mean age of 9.3 ± 1.7 years, mean weight of 27.4 ± 9 kg, mean height of 121.1 ± 13.7 cm and mean BMI of 17 ± 2.7 kg / m2. According to IMC / E, 68.3% of the children were eutrophic and 24.4% were overweight or obese, while for age (T / E), 75.6% of the children were of normal height. 58.5% of the families were of the low SEL. We found that in the high NSE 73.1% of the children were eutrophic vs 60% in the low NSE, the excess weight was higher in the high NSE than in the low NSE (33.3% vs 19.2%). Finally, 6.7% of the children had low stature in the high SES vs. 3.8% in the low SES.

Conclusions: We found that cases of excess weight and risk of stunting coexist in children in the high NSE of the school No. 264.

Keywords: Nutritional status, socioeconomic level, children, double burden

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144/2050

THE HEALTHY KITCHENS, HEALTHY CHILDREN STUDY; A COMMUNITY-BASED SCHOOL NUTRITION INTERVENTION IMPROVES DIET DIVERSITY IN PALESTINIAN REFUGEE SCHOOLCHILDREN IN LEBANON

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Background and objectives: Palestinian refugees in Lebanon are protracted refugees with high rates of food insecurity and low diet quality. In this context we implemented a school nutrition intervention that consisted of a subsidized nutritious snack, plus nutrition education in two elementary schools. We assessed the impact of this intervention on diet diversity and nutritional status of schoolchildren receiving the intervention as compared to children attending two neighboring schools who only received the nutrition education component.

Methods: We collected socio-demographic and nutrition status data from 1433 students (aged 5-15y) and their parents at baseline, and 1362 at 8-months follow-up in 4 schools. Snacks were sold at a subsided price, 5 days a week in two intervention schools. We conducted a difference in difference analysis for diet diversity and hemoglobin levels of children who participated in the intervention at least 50% of the time (high-participation) as compared to those who participated less than 50% (low-participation), or who only received nutrition education (control). Analyses were adjusted for child age and gender, maternal education, household expenditure and school cluster effect.

Results: There were 648 children in the control group, 260 children in the low-participation group, and 454 in the high-participation group. After adjusting for co-variates, there was a significantly greater increase in overall diet diversity score in the high-participation group than in controls (p=0.016), but not in the low-participation group. However, both low and high-participation groups had higher odds of consuming meat or chicken as compared to control; OR=1.8; p=0.000 and OR= 2.1; p=0.006 respectively. The high-participation group also had higher odds of consuming dairy (OR = 1.22; p=0.000), and lower odds of consuming sweetened beverages (OR= 0.73; p=0.015) and desserts (OR= 0.57; p=0.011) than control. Both low and high-participation groups had inversely and significantly changes in hemoglobin (Δ=+1.6mg/dl) as compared to the control group (Δ = -1.0mg/dl); p=0.05.

Conclusions: A community-based school nutrition intervention improved diet diversity and hemoglobin levels of refugee children that had participation level above 50%.

144/2058

BASELINE AND PROCESS EVALUATION ANALYSIS OF A RURAL NUTRITION-SENSITIVE INTERVENTION WITHIN THE FIRST 1000-DAY WINDOW OF OPPORTUNITY IN CENTRAL AMERICA AND DOMINICAN REPUBLIC, 2016-2019

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Background and objectives: The first 1000-day window of opportunity is a crucial period for largest and efficient impact of food and nutritional interventions to reduce malnutrition in poor-resourced settings. Nutrition-sensitive interventions as agriculture have the potential to improve several determinants of food and nutrition status through the promotion of dietary diversity, household income improvement and women's empowerment. However studies that assess the impact in rural settings of Central America and Dominican Republic are lacking. In this study the aim is to determine the baseline level of food insecurity, agricultural food production capacity that will allow to generate evidence to support the implementation of an intervention focused on pregnant women and mothers with children less than 24 months old in rural areas of Central America and Dominican Republic.

Methods: A multi-component intervention was designed to increase agricultural management production of foods and improve family economy and to assess the impact on food and nutrition security for a three-year period, 2016-2019. Target communities were randomly selected from high-cluster of child growth retardation in seven countries. Around 850 rural families are expected to enrol. For baseline, food insecurity scale and socio-demographics factors were determined. An adequacy approach was used to evaluate the level of implementation of the project in areas of home gardening, educational activities on health and nutrition, agricultural practices, nutritional policy advocacy.

Results: One-third of the enrolled participants have a primary education level. Access to safe drinking water is reported in almost half of the households. Wood is the main fuel for cooking. Almost all families perform agricultural activities, but formal agricultural training to use local production for consumption is almost null.

Climate risk management training was found scarce and food insecurity affects almost one-fifth of the rural families.

Conclusions: Rural families in Central America and Dominican are highly vulnerable to food and nutritional insecurity. This situation may be worse in rural communities where lack of climate mitigation strategies is limited. Baseline information has been useful to design and strengthen capacities and enhance local food production of high nutritional value for self-consumption.

Keywords: Agriculture, 1000-day, food insecurity, intervention

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144/2059

A SYSTEMATIC REVIEW AND META-ANALYSIS EXAMINING THE EFFECT OF DIET ON COGNITIVE FUNCTION IN COGNITIVELY HEALTHY ADULTS

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Background and objectives: Cognitive impairment is a major public health concern due to increasing prevalence, high morbidity and rising socioeconomic burden. Modifying dietary behaviour could be a promising way to reduce age-related cognitive decline, however findings from clinical trials have reported inconsistent results. The objective of this systematic review was to examine the effectiveness of diet interventions on domains of cognitive function in adults without known cognitive impairment.

Methods: PubMed, EMBASE and PsycINFO were systematically searched to December 2016 to identify randomised controlled trials (RCTs) that examined the effect of diet on cognitive function or dementia events in cognitively healthy adults > 18 years. Data extraction and Cochrane risk of bias for included RCTs were performed by two independent reviewers. Standardized mean differences (95% CI) were combined, using a random-effects meta-analysis.

Results: Fourteen RCTs in 6370 participants (3333 diet intervention and 3037 control) were included. Diet significantly improved performance on measures of global cognition (SMD = 0.16; 95% CI 0.02, 0.30, P = 0.02), executive function (SMD = 0.11; 95% CI 0.04, 0.18, P = 0.003) and information processing speed (SMD = 0.12; 95% CI 0.05, 0.19, P = 0.001) compared to control. Significant heterogeneity (I2 = 79%) and funnel plot asymmetry was detected only for global cognition. RCTs were graded as low (n =1,7%), moderate (n = 7, 50%) or high (n = 6, 43%) risk of bias.

Conclusions: The pooled analysis of available RCT data showed small positive effects of diet on non-memory cognitive domains in adults without known cognitive impairment. Further studies are required to determine the therapeutic potential of diet on rate of cognitive decline and for dementia prevention.

Keywords: Diet, cognitive function, meta-analysis

144/2064

GENDER DIFFERENCES IN OBJECTIVELY MEASURED PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOR PATTERNS AMONG MOROCCAN CHILDREN

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Background and objectives: Physical activity (PA) in childhood plays an important role in reducing the risk of cardiovascular health diseases, diabetes and obesity in adulthood. According to this evidence, it has been recommended for children to participate in at least 60 minutes per day in Moderate-to-Vigorous PA (MVPA).The present study examined gender differences in objectively measured sedentary behavior, physical activity, and physical activity guideline attainment among Moroccan children.

Methods: In total, 173 children 49.1% are boys, aged between 8 to 14 years old participated in this study. To asses PA, children wore triaxial accelerometer for 7 consecutive days and had at least 4 days wearing with minimum 10 h-wearing time per day.

Results: Participant spent 533.16± 87.82(min/day) in sedentary behavior accounted for 62.8% of average daily wearing time. Boys were more physically active and took more steps/day than girls,(11632.88±3713.41 vs 9526.05±2870.84 min/day, p <0.001). Girls spent equal time in sedentary than boys (258.65±51.18/day vs 258.54±50.70min/day; p=0.421). Boys were eight times more likely to meet physical activity guidelines than girls (OR: 8.06, 95 % CI: 4.03–16.13) p<0.0001.

Conclusions: Boys engaged in more physical activity and were more likely to attain guidelines than girls. These findings highlight the need for effective and sustainable strategies and programs aiming to promote physical activity and to reduce sedentary behavior among Moroccan children, specially for girls.

Keywords: Accelerometery. Children. Physical activity. sedentary time.

144/2065

HEALTH BENEFITS AND COST SAVINGS OF TWO WEIGHT LOSS INTERVENTIONS: DIETARY COUNSELLING BY PRACTICE NURSES AND PROMOTING SMARTPHONE WEIGHT LOSS APPS

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Background and objectives: Obesity is an important risk factor for many chronic diseases which cause premature death, reduce quality of life and are expensive for health systems. Dietary counselling by practice nurses and mHealth interventions are two approaches which can offer information and support to those attempting to lose weight. Here we model the effect of these two interventions on health gain (quality-adjusted life-years (QALYs)) and health system costs.

Methods: The modelled interventions were a mHealth promotion intervention using currently available smartphone apps and dietary counselling by dietician trained practice nurses. A multi-state life-table model was used to project all-cause mortality and morbidity rates by sex and age for the New Zealand population (including Māori, indigenous population). It includes 14 Body Mass Index related disease life-tables, where proportions of the modelled population simultaneously reside. The change in incidence in these disease life-tables flows through to impact on mortality and morbidity to change QALYs and associated health system costs.

Results: The smartphone app promotion intervention was estimated to generate 150 QALYs (95%UI: 100 to 210) over the lifetime of the population. It also generated US$2.7 million [m] (95%UI: 1.7 to 4.0m) in savings to the health system. Greater impacts were seen from dietary counselling by practice nurses with 1350 QALYs gained (95%UI: -230 to 3110) and cost-savings of US$22.1m (95%UI: -4.0 to 51.7m), however the uncertainty interval includes zero indicating that this intervention may not generate health gains. Those individuals receiving the intervention could expect to increase their average number of days lived in good health by approximately 1 day for the mHealth intervention and 2 days for the counselling intervention.

Conclusions: In this modelling study, these two weight loss interventions were associated with relatively small health gains at a population level. Nevertheless, these are likely to be cost-saving interventions, especially the mHealth one, and could therefore still form a small component of a wider obesity reduction strategy (especially if app quality and uptake increases in the future). However, other strategies to change the obesogenic environment (marketing controls, taxes/subsidies etc.) are more effective in controlling obesity in this type of developed country.

Keywords: Weight loss; Cost-effectiveness modelling; Smartphone apps; Dietary counselling.

144/2069

IMPACT OF SOCIOECONOMIC FACTORS ON THE SPANISH POPULATION'S PERCEPTION ON BODY COMPOSITION: RESULTS FROM THE ANIBES STUDY

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Background and objectives: Background: The increase in obesity prevalence is well known and many factors can play an important role in its development. The relative contributions of energy intake and expenditure to the obesity epidemic, however, remain poorly defined in Spain. Moreover, few studies in our country undertake the investigation of subject's perception on their nutritional status and its relation with socioeconomic status in the Spanish population.

Objectives: To analyse the relevance of perception, attitudes and socioeconomic status in relation to body composition

Methods: A total de 2009 individuals (1,013 men, 996 women), aged 9–75 years from the ANIBES cross-sectional Study using a nationally-representative sample from the Spanish population

was studied. The following variables were investigated: age groups, gender, geographical distribution, locality size, unemployment rate, percentage of foreigners, education or economic level, anthropometric factors Anthropometry measurements (weight, height, body mass index, waist circumference, % body fat, % body water), perceived health, quality of life and diet.

Results: Body fat percentage (%) decreases with increasing habitat size, population density (χ^2 =0,042) and socioeconomic status (χ^2 =0,000). Individuals have a clearer perception of their weight (χ^2 =0,000) as well as their diet (χ^2 =0,000) related to body fat composition. A better health status perception is observed in subjects with lower BMI values, while higher BMI subjects declare a higher effort to improve their diets (χ^2 =0,004). At normal BMI values, better perception of weight and diet (χ^2 =0,000) and at lower BMIs, subjects declare higher number of hours of sleep (χ^2 =0,000).

Conclusions: Self-reported perception on diet and health status are associated with an adequate body image in the Spanish population. In addition, subjects living in cities with higher population density and having a better socioeconomic status present lower obesity prevalence.

Keywords: Body Mass Index, Obesity, perception, socioeconomic status

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144/2071

THE PARTICIPATION OF NUTRITIONISTS AS A SOURCE OF INFORMATION FOR PRESS ARTICLES RELATED TO OBESITY, PUBLISHED DURING THE YEARS 2008-2013 IN COLOMBIA

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Background and objectives: Overweight and obesity are a public health problem in Colombia. By 2010 one in two colombians had one of these problems. One of the functions of the mass media is to mobilize society around this topics and is very important the participation of nutritionists as a part of the nutrition education in these kind of communication channels. The aim of this paper is to describe the participation of nutritionists as a source of information supporting the publication of articles about obesity in newspapers during the years 2008-2013.

Methods: Cross-sectional study. 163 news were selected from two newspapers; 48 from El Espectador and 115 from El Colombiano. A descriptive analysis was performed using X2 tests to establish the relationship between the variables of interest. α = 0.05. SPSS v.18.

Results: During the study period a gradual increase in news related to obesity was found. The most used source of information in the news was scientific-academic (42.3%) and only 6.7% of the articles used nutritionist as a source. When a nutritionist was used as a source to produce the news, there is not an association between the topic and the source.

Conclusions: The newspaper articles related with obesity increased in Colombia. The challenge for nutritionists is to gain participation in mass media like press, in order to achieve the objectives around the prevention and control of this issue.

Keywords: Obesity; press; mass media; health communication.

144/2072

USE OF MARKETING TECHNIQUES ON A SELECTED SAMPLE OF FOOD PACKAGES IN ARGENTINA

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Background and objectives: Marketing of unhealthy foods plays an important role in the rising prevalence of childhood obesity. Product packaging is a significant marketing method. The objective of our study was to investigate marketing techniques (characters and premium offers) used on food packages of a selected sample of products.

Methods: Data for breakfast cereals, cookies and milk desserts was collected at a major supermarket chain in Argentina in June 2016. Pictures were taken on the front, sides and back of all products, including Nutrition Information Panel (NIP) and ingredient list. We translated and adapted the internationally standardised International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) protocol. Pictures and nutrient data from the NIP were entered into a food database designed and tested for this study. For the analysis of nutritional quality we used the PAHO and the WHO Europe nutrient profiles (NP) models. Statistical analysis were conducted using R Statistical software.

Results: We analyzed 301 food packages: 42 breakfast cereals, 209 cookies and 50 milk desserts. Premium offers were found in 18% (n=55) of all products, 45% of this were found on the front side of the packages (n=25). Promotional characters appeared on 32% (n=95) of all products, of those 69% (n=56) appeared on the front side of the package.

In each category, 62% (n=31) of breakfast cereals, 25% (n=52) of cookies and 62% (n=31) of milk desserts featured promotion-al characters, and 2% (n=1) of breakfast cereals, 16% (n=33) of cookies and 42% (n=21) of milk desserts included premium offers.

Products with one excess nutrient (PAHO NP model) had significantly more promotional characters and premium offers (p<0.0005). Only 23% (n=9) without excess nutrients included promotional characters and 3% (n=1) included premium offers.

Conclusions: Promotional characters and premium offers are used to promote unhealthy food products in Argentina. Evidence-based public health policies should restrict the use of these marketing techniques on products with high levels of sugars, fats and/or sodium, especially when children are exposed to them.

Keywords: Childhood obesity, Marketing, Food Packaging, Nutritional Quality, Argentina

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144/2073

NUTRITIONAL STATUS OF THE PEOPLE ASISTED IN THE PRIMARY LEVEL HEALTH SERVICES IN MONTEVIDEO AND INLAND OF URUGUAY

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Background and objectives: To characterize the nutritional status (NS) of the assisted population in primary care services in Montevideo and inland between April and November 2016. To compare the type and magnitude of the nutritional problems between services of Montevideo and it's inland, and between services of Montevideo, according to municipal grouping based on the proportion of poor families (PF).

Methods: The information collected by the students in the last year of the Nutrition Degree was systematized, and they applied a survey with Google forms. The information collected was: sex, age, reason for referral, anthropometric diagnosis and service. The NS in children was assessed by anthropometric indicators and compared with WHO standard on 2006. In adults, the body mass index was used and compared with the WHO reference on 1998. The services were grouped by location considering the municipal division of Montevideo according to the proportion of FP by level of income.

Results: The assisted population was 1982 corresponding to 17 services. Of all, 75% were women and almost half were over 18 years of age. 50% of referral reasons were Non-Communicable Diseases. Over-malnutrition exceeded the value identified in studies at the national level in one-third of services. Deficit malnutrition varied in services between 5% and 20%. In children under 18, the prevalence of malnutrition due to deficit and excess was bigger than in other national studies. There are important differences in malnutrition due to deficit and excess in adults and children among services with a higher proportion of PF.

Conclusions: There are problems of excess and deficit that surpass the national data. The nutritional stage in which the user is captured and the proportion of PF are probably determinants

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of the type and magnitude of the nutritional problems found in nutritional care.

Keywords: nutritional care, poverty, nutritional problems

144/2075

THE EFFECT OF PEER SUPPORT ON CARDIOVAS-CULAR RISK FACTORS: A META-ANALYSIS

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Background and objectives: Diet interventions are effective for prevention of cardiovascular disease (CVD) but are generally resource intensive and prohibitively expensive to scale-up for wider public health benefit. Social support provided by lay people (peer support) is an alternative low-cost approach to facilitate self-management of diet behaviour, but the effect of peer support on health outcomes is not clear. This systematic review aimed to evaluate the effect of peer support on CVD risk.

Methods: PubMed, EMBASE and CINAHL were systematically searched to identify randomised controlled trials (RCTs) addressing the effect of peer support on CVD risk factors including, obesity, markers of diabetes risk, blood pressure and blood lipid levels in adults > 18 years. Data extraction and assessment of bias were performed by two independent reviewers and data were pooled using a random-effects meta-analysis.

Results: Twenty-six RCTs were included in the review. Peer support showed significant improvements in glycaemic control (HbA1c -0.22% [95% CI -0.40, -0.04] P = 0.02) and obesity (BMI -0.83kg/m2 [95% CI -1.58, -0.07], P = 0.03) in comparison to control, with evidence of significant heterogeneity across studies (I2 = 49%, and 59% respectively) and funnel plot asymmetry. There was no significant effect of peer support on blood pressure or lipid levels. Most RCTs (n =18, 69%) were graded as high risk of bias.

Conclusions: Despite some evidence supporting a beneficial effect of peer support for established vascular risk factors, trials were heterogeneous with poor methodological quality, which limits the ability to draw firm conclusions. There is a need for further well-designed RCTs to evaluate the effect and sustainability of peer support on cardiovascular disease risk.

Keywords: peer support, cardiovascular risk factors

144/2076

ENERGY EXPENDITURE BY DOUBLY LABELED WATER COMPARED TO PHYSICAL ACTIVITY MEASURED BY TRIAXIAL ACCELEROMETER IN MOROCCAN CHILDREN

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Background and objectives: A large numbers of methods are used for the assessment of physical activity. The ability to assess accurately physical activity (PA) in free-living conditions is extremely important in the global context of non-communicable diseases. The purpose of the study is to examine the association between physical activity Energy Expenditure (PAEE) measured using triaxial accelerometer (GT3X+) and energy expenditure (EE) measured using the doubly labeled water (DLW) method in free-living of 11-14y old Moroccan children.

Methods: Total Energy Expenditure (TEE) was measured in 21children over a fourteen-day period during the school year. Physical activity was measured simultaneously using accelerometry over seven consecutive days. TEE was also calculated from the Actigraph using a published equation.

Results: 21 children (mean z-score BMI (-0.45± 1.47 kg/m2), mean age (12.10± 0.80 year) participated in this study. TEE measured using (DLW) was significantly higher than TEE estimated by accelerometry ((10.03± 2.14 MJ /day) vs (8.12± 1.08 MJ /day); p <0.001), also PAEE measured using (DLW) was significantly higher than PAEE estimated by accelerometry (3.66 ± 1.59 MJ /day) vs (1.95 ± 0.87 MJ/ day) ; p <0.001). Positive correlation between DLW outcomes and physical activity intensity measured by accelerometry was only observed with light intensity physical activity, specifically with PAEE (Rho =0.468 (p=0.025)) and PAL (Rho =0.621 (p=0.002).

Conclusions: PAL and PAEE were influenced by time spent in light-intensity activities. This study suggests that in this sample of children, light activity seems to contribute mainly to free-living PAEE and PAL. Further studies to assess these variations are needed particularly in low- and middle-income countries.

Keywords: Accelerometry, Doubly labeled water, Energy expenditure, Physical activity

144/2078

NUTRITIONAL INTERVENTION PROGRAM "PANI" OF BENEFICIARY CHILDREN ATTENDING THE REGIONAL HOSPITAL OF CONCEPCIÓN

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Background and objectives: Introduction: Anti-hunger programs have proven to be effective tools for reducing the prevalence of child malnutrition. There are just a few researches of results about patients beneficiaries of the national anti-hunger program.

Objective: To evaluate the effect of anti-hunger program "PANI" in anthrometric and biochemical indicators in children of 4 months to 5 years old, at risk of malnutrition and malnourished attending the regional hospital of Concepcion when entering the program versus six months of intervention.

Methods: Material and method: Quasi - experimental design. Showing: 195 children under the age of five beneficiaries attending clinics at the regional hospital of Concepcion. Variables studied: Weight, height, sex, origin, maternal age, maternal education, practice of exclusive breast feeding, parasites, presence of fluent and clear water and basic sanitation. Score z weight/age, z weight/size and z height/age (WHO Standards). Biochemical indicators of Hb, VCM and ferritin. Parametric and non parametric measures were used. It was considered p<0,05.

Results: 51,8% were male. The average of age were 22,9 months (4 - 59 m). 61,2% were under five years old, teen mothers 12,8% , with less than six years of study 18,5%, prevalence of exclusive breast feeding 10,3%. The prevalence of malnutrition on admission was 17,9% . The severe malnutrition was 4,6% , at risk of malnutrition are 66,2%, with acute malnutrition are 10,8% with chronically malnutrition 28,7%. It was observed a significant decrease in prevalence with malnutrition after six month of treatment, of 15,6% vs 4,4% (p<0,01), prevalence at risk of malnutrition had decreased from 72,6% to 27,6% after six month of treatment. At the admission anemia was recorded 64%) Hb 10,5 g/dL±1,27DE, VCM 74,2 ± 9,03, Ferritin 30,5 ug/L ± 23,58. At the sixth month of treatment was an improvement without anemia 37% vs 55,6% . Finally regarding adherence to regular monitoring (6 visits) 42, 6% irregular (≤5) 44, 6%, neglect 12,8%.

Conclusions: In Concepcion is found a statistically significant decrease of the parameters, anthropometric and biochemical at the sixth month of treatment of the anti-hunger program.

Keywords: nutritional program, children, malnutrition, anemia

144/2095

NUTRITION AND HEALTH CLAIMS ON A SELECTED SAMPLE OF FOOD PACKAGES IN ARGENTINA

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Background and objectives: Nutrition and health claims have been documented to influence consumers perceptions of products and their purchase decisions. We assessed the use of nutrition and health claims according to the nutritional quality of products.

Methods: Data for breakfast cereals, cookies and milk desserts was collected at a major supermarket chain in Argentina in June 2016. Pictures were taken on the front, sides and back of all products, including Nutrition Information Panel (NIP) and ingredient list. We translated and adapted the internationally standardised International Network for Food and Obesity/Non-Communicable Diseases Research, Monitoring and Action Support (INFORMAS) protocol. Pictures and nutrient data from the NIP were entered into a food database designed and tested for this study. For the analysis of nutritional quality we used the PAHO and the WHO Europe nutrient profiles (NP) models. Statistical analysis were conducted using R Statistical software.

Results: Claims were analyzed for 301 food packages: 42 breakfast cereals, 209 cookies and 50 milk desserts. Of the total, 40% (n=119) had nutrient claims, most claims (73%-n=87) appeared on the front of package. Health claims featured on 9% (n=26) of packages and, of those, 27% (n=7) appeared on the front. For each category, nutrient claims appeared on 71% (n=30) of breakfast cereals, 50% (n=25) of milk desserts and 31% (n=64) of cookies and health claims appeared in 55% (n=23) of breakfast cereals, 2% (n=1) of milk desserts, and 1% (n=2) of cookies. From the total number of products that exceed the WHO Europe NP model thresholds (n=273), 36% (n=99) had nutrition claims and 4% (n=10) had health claims (p<0.0005). From the total number of products that had excess in at least one critical nutrient (n=262) according to the PAHO NP model, 37% (n=97) had nutrition claims and 3.8% (n=10) had health claims (p<0.0005).

Conclusions: Many products that exceeded the thresholds of the selected Nutrient Profile Models had at least one nutrition or health claim. This suggests that, to prevent misleading consumers perceptions of nutritional quality of foods, the regulation of nutrient claims should be revised, so that only products with appropriate nutrient profiles are allowed to display them.

Keywords: Nutrition claims, Health claims, Food Packaging, Nutritional Quality, Public Policies

144/2097

VITAMIN D DEFICIENCY, SOCIO-ECONOMIC STATUS AND DIETARY HABITS OF SCHOOL AGE CHILDREN IN RURAL OF MOROCCO

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Background and objectives: Micronutrients deficiencies can affect the growth and development of children. In Morocco many clinical studies showed that vitamin D deficiency is a public health problem. Very few foods naturally contain vitamin D and foods that are fortified with vitamin D can't satisfy human vitamin D requirement.The aim of this study is to determine vitamin D, socio-economic status and dietary habits of schoolchildren in a rural region of Morocco.

Methods: In an observational study, 191 school children aged 7-9 years selected from 3 primary schools. Weight, height, age and sex were recorded. Fasting blood samples were taken to assess vitamin D as serum [25(OH) D] concentration and questionnaires were used to determine socio-economic status and food frequency.

Results: Vitamin D deficiency was prevalent in schoolchildren; 65.8% of subjects had a 25 OHD <75 nmol/l and a median equal to 73.1nmol/l (Q1=65.9nmol/l and Q3=89.6nmol/l). The majority of families were illiterate. Dietary habits of deficient children showed that 21.6% consumed eggs, 3.4% fish, 5.2 %yogurt and 0.9% cheese at least once per day.

Conclusions: This study showed that among the school children in Morocco, the prevalence of vitamin D deficiency is very high and their diet is very poor in foods rich in vitamin D and thus can't satisfy children's growing needs.

Keywords: Micronutrient,Growth, Vitamin, Deficiency, Fortified.

144/2098

PHYSICAL ACTIVITY LEVELS AND PHYSICAL ENVIRONMENTAL FACTORS ASSOCIATED WITH SEDENTARY BEHAVIOR IN MOROCCAN SCHOOLCHILDREN

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Background and objectives: The school is an important setting for physical activity. Identifying determinants of sedentary behaviour and in particular those that are modifiable is a necessary step to develop effective interventions targeted at reducing sedentary time. This study is the first one of its kind in Morocco using objective method to assess sedentary time among children. The aim of this study was to synthesize the current evidence base on the determinants of sedentary behaviour specifically in school children.

Methods: 100 children aged between 8-14 years old (mean age =11.28±1.35years, 50% of boys) were recruited from different public schools. Moderate to Vigorous Physical Activity (MVPA) and sedentary time were measured by accelerometers GT3X+. Obesity was defined by the WHO reference body mass index (BMI)-for-age. School environment was assessed by adapted questionnaire

Results: 21% of children were overweight. Boys accumulated more minutes of MVPA compared with girls.56% of boys vs 16% of girls meet the recommendation of at least 60 minutes/day (p<0.0001). Children spent an average of 477.68 ±127.15 min/day in sedentary time. The most frequently available outdoor facilities for children across schools were soccer fields and playgrounds for other games. However, those areas are poorly equipped and most of them are built from cement. All schools programmed only 60 min per week of physical education. Also in the neighborhood surrounding the school, there aren't free/low cost facilities (recreation centers, clubs), there is a lack of outdoor playgrounds, cycle facilities, inaccessible sidewalks around schools caused by street vendors.

Conclusions: This study demonstrated that there is a gender difference in time spent in MVPA .Girls were less active compared with boys, and also that physical school environment factors can

influence children's physical activity levels and sedentary behavior, for example, school neighborhood and design, transport system and also reduced time of physical education per day. Our findings suggest that there is a need to design school environmental changes to promote physical activity in schoolchildren.

Keywords: School environment, children, sedentary, triaxial accelerometer, physical activity.

CHILDHOOD UNDERNUTRITION AND ITS DETERMINANTS AMONG UNDER-FIVE CHILDREN IN NIGERIA

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Background and objectives: Child undernutrition continues to be a public health problem in Nigeria. Because few studies indicate the determinants of malnutrition among under-5s re-analysis of nationally representative data could help inform programme planning to meet the national target to reduce stunting and wasting by 20% and 10%, respectively by 2018. This study aimed to find determinants of stunting and wasting among 0-59 months old children in Nigeria.

Methods: A secondary data analysis of the 2011 Nigeria Multiple Indicator Cluster Survey (MICS) including all 25,192 children aged 0-59 months old surveyed. The prevalence of stunting was defined as height-for-age $\leq$-2SD and wasting as weight-for-height $\leq$-2SD of the WHO Growth Reference Standards . The UNICEF conceptual framework of malnutrition was used to build the logistic regression models, following chi-square tests on the MICS measures of the immediate, underlying or basic causes of undernutrition.

Results: The study confirmed that 35.8% and 10.2% of the children were stunted and wasted, respectively. Girls (12%, 15%), children who were no longer being breastfed (20%, 47%), absence of recent episodes of fever (12%, 21%), increase in maternal age (22-35%, 4-30%) and in duration of maternal education (14-36%, 13-18%) and households with higher wealth index (2-63%, 4-27%) were all at reduced risks of stunting and wasting. However, non-Christian children (47-48%, 18-49%) and children residing in the Northern Nigeria (55-64%, 11-39%) had increased risks of stunting and wasting. Children with no birth certificate had increased (23-28%), absence of diarrhoea episodes (15%) and household animals (19%) were associated with a reduced risk of stunting. Households with fewer toddlers ($\leq$2 under-5s) and $\geq$36 months-old were associated with a reduced risk of wasting.

Conclusions: Interventions to reduce child undernutrition should target children $\geq$36 months-old. They should also include strengthening of the Maternal and Child health system and health workers, improving the educational level of women especially in the Northern Nigeria and financial empowerment of women. Every State of the Federation should also develop a costed plan of action on nutrition to tackle the problem in their states.

Keywords: Stunting, wasting, determinants, children, developing countries

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POSITION OF THE LATIN AMERICAN SOCIETY FOR NUTRITION ON CONFLICT OF INTEREST

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Background and objectives: In November 2015, a group of researchers and nutrition professionals who are members of the SLAN [Latin America Society for Nutrition], sent the current Chair of the SLAN a request to take urgent action on conflict of interest in this society. This due to a critical concern for cases of inappropriate industry influences in the development of academic nutrition events. These measures should allow the research agenda and priority issues to be generated in discussions free of commercial influence. In order to clarify SLAN's relations with industry, the COI-SLAN committee has prepared Guidelines for Prevention and Management of Conflict of Interest [LPGCDI-SLAN].

Methods: Through the collaboration of some SLAN members representing a number of countries, such as Chile, Mexico, Guatemala and the United States, a consensus was reached to determine the guidelines through which the SLAN could be governed, with some Experts on the subject, established the guidelines for the management of conflict of interest of the SLAN (LGCDI-SLAN).

Results: The relationship of the food industry with professional groups are common and have become notorious and problematic in population health and nutrition. The SLAN, recognizes that health professionals and the organizations with which they collaborate have relationships with actors that could represent interest that conflict with the SLAN principles.

Conclusions: The LPGCDI-SLAN provide guidelines for identifying and proceeding with the CDIs that are presented around the Society. Being the first document on its kind, it will serve as a basis for strengthening this critical area for the health sciences.

Keywords: Conflict of interest, SLAN, nutrition

Further collaborators: Conflict of interest-SLAN committee: PhD. Ricardo Uauy, PhD. Rafael Pérez-Escamilla, PhD. Reynaldo Martorell, PhD. Manuel Ramírez, MSc. Deborah Navarro.

PARENTAL INFLUENCE ON THE SCHOOL CHILDREN'S EATING BEHAVIOR, PHYSICAL ACTIVITY, AND SEDENTARY ACTIVITY: A DETERMINANT FOR CHILDHOOD OBESITY IN CHINA

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Background and objectives: In China, childhood obesity is becoming a significant public health problem. Family with high SES may increase purchasing power of obesogenic goods or control over of children's time which may amplify the children's risk for obesity. We investigated whether parent's educational attainment affect the eating behaviour, physical activity and sedentary activity for weekday and weekend among children.

Methods: A national school-based survey was conducted in China. A total of 11,439 fourth to six grade school children, 11,439 of their fathers or mothers were sampled using a multistage cluster random sampling method. Height and weight was measured for children and self-reported height and weight was collected for parents. Questionnaire collected information on eating behavior, physical activity and sedentary activity for weekday and weekend. Logistic regression models were used to describe the association between educational attainment of parents and children's weight status, eating behavior, physical activity and sedentary activity for weekday and weekend.

Results: Approximately 20% of fourth to six grade school children in urban areas and 12.6% in rural areas were overweight and obese, and 8.5% in urban areas and 4.7% in rural areas were obese. Children whose parents had higher SES were more likely to be overweight or obese, regardless of the weight status of parents (P<0.05). More than one parent having a high school level or above was positively related to healthy eating behaviours among children and negatively related to high-calorie eating behaviours (P<0.05), but associations with consuming western fast food once a day were positive in rural areas (P<0.05), and association with sedentary activity on weekend, i.e., homework, indoor extracurricular activities were positive both in urban and rural areas.

Conclusions: Results highlight the relevance of investigating eating behaviours, physical activity, and sedentary activity for weekday and weekend. Compared with environmental factor, knowledge and eating behaviours appear only minor effects on the rising of childhood obesity in China. In addition to continued focus on school –based intervention, target parent support for weekend physical activity and sedentary activity may be health promotion priorities. Effective intervention should take academic performance into account.

Keywords: childhood obesity, eating behaviour, physical activity. sedentary activity. Parental control.

Further collaborators: Lloyd Kolbe. Professor of School Health. Department of Applied Health Science. Indiana University. Bloomington. Indiana.

CHARACTERIZATION OF THE CONSUMPTION OF LIQUID BEVERAGES IN INHABITANTS OF MEDELLIN, COLOMBIA

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Background and objectives: Background: To evaluate the consumption of liquid and the amount of them consumed per day, is important for health professionals, to design policies that relate to a better well-being of the community in this aspect, in order to prevent diseases that can be derived of inadequate intake of liquids. Objective: To compare between both sexes, the taste for the consumption of different types of drinks and the quantity consumed per day. The study was conducted in inhabitants of Medellin Colombia in over 18 years of age

Methods: We used multivariate analysis of variance (MANOVA) with canonical orthogonal type contrast, multiple correspondence analysis with indexed hierarchical classification, one-dimensional and two-dimensional frequency analysis.

Results: A significant difference was detected between sexes in the taste to consume aromatic drinks, and dietary soda (p<0.05), No difference was detected (p>0.05) in the amount of fluid consumed per day by sex.

Conclusions: The main conclusion is that more than 80% of those surveyed like to consume water frequently and claim to

Keywords: Water, consumption of liquid beverages

144/2118

EVALUATION OF THE INTENTION OF CONSUMPTION OF FRUITS, AND VEGETABLES OF THE EMPLOYEES OF AN EVENTS SPACE IN THE CITY OF SÃO PAULO - BRASIL

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Background and objectives: Fruits and vegetables are essential components of a healthy diet. They have low energetic density, high fiber content, antioxidant components, besides being sources of micronutrients. The World Health Organization advocates consumption of at least 400 g / day. Studies indicate that fruit and vegetable consumption (FLV) is below recommended levels and is among the top ten factors in determining the global burden of disease in the last decade. The main objetive of this study was to evaluate the intention of FLV consumption of employees of a space of events.

Methods: This is a cross-sectional, non-directional, quantitative, descriptive and analytical study. We collected quantities of servings served by the employees, in four days of October / 2014 characterizing the consumption intention. It was stipulated as adequate consumption when the total amount of FLV / day was greater than or equal to 120 g. An average of sixty clients was evaluated, totaling an analysis of 240 meals.

Results: In the menu we observed the incidence of two types of salads daily, besides the presence of fruit in 75% of the days. The presence of tubers (mandioquinha and potato ball) was observed as salads in 50% of the days. 20.4% of the meals did not have any type of salad and the prevalence occurred in the male gender. In 41.8% of the meals people used only one of the salads. In relation to the intention of consumption of the two types of salads was observed 38.3%. Meals that had a salad and fruit, or two salads and fruit were around 14% each. In 4.4% of the meals no type of salad was chosen, only fruit. In 54.6% the fruit was not chosen. Meals without salad and without fruit totaled 12.2%. The quantities of FLV considering the presence or absence of tubers showed that the percentage of adequate consumption decreased from 44.6% to 34.2%. Thus, the proportion of underweight increased from 55.4% to 65.8%.

Conclusions: According to the literature, FLV consumption was low. The female gender had greater consumption than the male. The presentation of the meals, when attractive, can generate increase of the consumption.

Keywords: FLV consumption. Eating habits. Food behavior. Collective feeding.

144/2119

COMPARISON OF THE AVAILABLE INFORMATION FROM BASIC FOOD BASKET (BFB) IN LATIN AMERICAN COUNTRIES

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Background and objectives: Basic Food Basket (BFB) is used in Latin American countries as official poverty measure methodology, indicating the minimum income a household should have to purchase at least the calories and macronutrients they need to live. Is calculated using household consumption aggregate collected by income and expenses national surveys. The BFB gives information about the most commonly purchased foods by the country population, daily amount bought in grams by a family of average members, energy, price in country currency, unit of measurement in grams and cost per day. The objective was to compare BFB characteristics in Latin American Countries.

Methods: Searched BFB for 19 countries reported previously by UN Economic Commission for Latin America and the Caribbean (CEPAL) that use this methodology. Information was collected online from official sources as National Statistics Institutes or similar responsible for BFB monthly price publication in the following countries: Guatemala, El Salvador, Honduras, Nicaragua, Belice, Costa Rica, Dominican Republic, Panama, Mexico, Ecuador, Colombia, Venezuela, Brazil, Peru, Bolivia, Paraguay, Argentina, Chile, Uruguay. Characteristics were compared: Year of creation, Number of BFB (urban, rural or by country regions); for the urban or country capital, we collected information of amount of foods, number of food groups, Nutritional Value (number of calories and % of Protein), out of household purchase included in the foods.

Results: There are countries where BFB methodology is not available and some don´t report monthly prices anymore (Venezuela, since 2014) whilst others have between 2 and 6 official BFB. El Salvador and Ecuador have the oldest BFB from 1982. There are differences in energy (from 2000 Cal in Chile to 2750 Cal in Argentina); food groups (between 5 in Nicaragua to 19 in Uruguay), amount of foods (between 22 in El Salvador and 121 in Mexico). Methodology description is heterogenic, the reference population stratum is not clear in most of the documents.

Conclusions: Poverty is a main concern in Latin America, and BFB is as an indirect indicator of Sustainable Development Goals. Region must make efforts to update the BFB and make information available to calculate the cost of diet.

Keywords: Basic Food Basket. Poverty. Latin America.

144/2124

DEFINING AN ANTHROPOMETRIC AND PHYSICAL ACTIVITY PROFILE FOR VENEZUELAN POPULATION: PRELIMINARY RESULTS FROM THE LATIN AMERICAN STUDY OF NUTRITION AND HEALTH (ELANS)

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Background and objectives: Nutrition status is important for the wellbeing of the population and physical activity (PA) is an important component of a healthy lifestyle. Evidence about the benefits have been well documented. The aim of this study is to identify an anthropometric and physical activity profile for Venezuelan population, as part of the Latin American Study of Nutrition and Health (ELANS).

Methods: A randomized representative sample of 1131 subjects ages between 15 -65, underwent through anthropometric evaluation: weight, height and an adapted version of long IPAQ was applied. Descriptive statistics, contingency tables to compare BMI, Vigorous activities and MET categorization were performed. Chi sq test was also performed to identify differences between genders.

Results: 33.4% of the population was overweight and 28.3% was obese. There were no significant differences on BMI values among different socioeconomic status. The bus is the most relevant public transport used by Venezuelans (67%) and 40.2% report using cars and motorcycle. According to SES it is important to highlight the use of individually owned vehicles among low SES (38.1%) and of those 12.5% are motorcycles. Sedentary behaviors reported that 92.4% of the sample perform seated activities of which the most important were: watching TV (92.1%), talking to friends (80.5%), use the telephone (74.8%) and reading (47.2%) being the most important watching TV on most days of the week. Regarding the perception of security of the surroundings, 75.4% reported insecurity in the neighborhood. Comparison between categorizations BMI and vigorous activity shows a Chi square significant values (p= 0.001 in men and p=0.029 in women) and comparison table show a trend for normal BMI on those individuals who perform vigorous PA, a higher BMI is observed on those who do not. Comparison between BMI and MET categorization shows differences among men but not in women, showing a trend for men with higher BMI to report moderate or low MET categories while, men with normal BMI show a higher MET values.

Conclusions: This study shows the need for implementation of public policies that promote physical activity for Venezuelan population.

Keywords: Venezuela, Physical activity, Anthropometry, Health Profile

144/2129

THE MODELLED EFFECT OF BIOFORTIFIED CROPS ON NUTRIENT ADEQUACY OF CHILDREN AND WOMEN IN BANGLADESH AND GUATEMALA

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Background and objectives: Guatemala and Bangladesh are countries were micronutrient deficiencies are high and biofortified crops with higher concentration of micronutrients are currently being introduced to reduce these deficiencies. With this study we aimed to assess the effect of the replacement of currently consumed crops with biofortified crops on nutrient adequacy by formulating food based dietary guidelines for women and children in Bangladesh and Guatemala.

Methods: We used two existing data sets with 24 hour recall data from Bangladesh and Guatemala. Target groups were; infants 6-8 months, infants 9-11 months, infants 12-23 months and lactating women for Guatemala; children 24-35 months, children 36-48 months and their mothers for Bangladesh. Optifood, a linear programming tool, was used to model and compare the food based dietary recommendations with and without the replacement of the biofortified crops in reaching nutrient adequacy (> 70% of recommended nutrient intake) for 13 nutrients.

Results: When adding biofortified crops to the diet, reaching nutrient adequacy was not reached for children 6 – 23 months in neither Bangladesh nor Guatemala. For children 24-48 months in Bangladesh, only nutrient adequacy for vitamin A was reached with biofortification, although vitamin A was not a problem nutrient for older children in Bangladesh or in any age group in Guatemala. For children 36-48 months in Bangladesh as well as their caretakers, biofortification ensured adequacy for zinc.

Conclusions: Biofortification is able to ensure nutrient adequacy for vitamin A and zinc in children older than 24 months as well as for zinc in adult women. For children under 24 months of age the intake of crops that could be biofortified is insufficient to result in better nutrient adequacy when biofortified crops are consumed. An increased intake of biofortified crops or other food-based-interventions are needed to ensure nutrient adequacy.

Keywords: Linear programming, Nutrient adequacy, Biofortification, Guatemala, Bangladesh

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144/2130

CHARACTERIZATION OF SODIUM KNOWLEDGE AND ITS USE IN FOOD IN HABITANTS OF MEDELLIN COLOMBIA CITY

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Background and objectives: The knowledge of sodium, its uses and implications for health, are of interest to health entities, in order to design information campaigns about the suitable use of this mineral, which lead to a healthy life style to preserve health and prevent appearance of non-communicable chronic diseases. Objective: to evaluate and to compare then knowledge and use of sodium in daily food, in adults of both sexes in Medellin Colombia.

Methods: The size of the sample was constituted by 322 persons randomly selected in the city of Medellin Colombia, whose ages ranged between 18 and 50 years of age. We used multivariate analysis of variance (MANOVA) with canonical orthogonal type contrast, multiple correspondence analysis with indexed hierarchical classification, Z method comparison tests, frequency analysis.

Results: Significant difference was detected between the knowledge of the sexes, related to the risks that brings to the health the excess in the consumption of sodium, in the knowledge of dietary salt and hypertension, noting that is the female sex which demonstrated to possess a greater knowledge

Conclusions: The main conclusion is that the people surveyed know what sodium is and know the recommendation for its use, however, they add salt to the preparations before testing them, and they also consume food sources of sodium as concentrated broths, sausages and packet soups.

Keywords: Hypertension, cardiovascular risk, salt, sodium.

144/2140

CONSUMER AWARENESS AND PERCEPTION OF SWEETENERS INFLUENCES FOOD AND BEVERAGE DECISIONS

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Background and objectives: Non-nutritive sweeteners are gaining substantial interest among consumers. Heightened interest for healthier lifestyles and continued concerns with rising obesity in adults and children, have food manufacturers actively looking for ways to reduce sugar and calories. To determine consumer perception of sweeteners and factors that motivate food choice, online surveys were conducted across several countries.

Methods: Data for Mexico (January 2017) and India (March 2016) are provided. Surveys were designed to be nationally representative and included a male/female split of 505/495 in Mexico and 520/480 in India. Most responses were on a scale of "very much agree" to "very much disagree."

Results: Results show that participants in Mexico and India reported high levels of concern around sugar intake with 74% and 84% very/somewhat concerned, respectively. Awareness was higher in Mexico versus India with 76% vs. 35% of participants responding "yes" when asked if aware of stevia. For those aware of stevia, 78% and 83% indicated a very/somewhat positive overall impression, in Mexico and India, respectively. When asked if they agreed or disagreed with whether sweeteners (i.e., stevia, sugar, sucralose, & aspartame) were "good for a healthy lifestyle", "natural" or "great tasting", stevia ranked highest on all three. In Mexico, 75% either completely/somewhat agreed that stevia is "good for a healthy lifestyle" versus 46% who agreed the same for sugar, 45% for sucralose, and 38% for aspartame. In India, 88% completely/somewhat agreed that stevia is "good for a healthy lifestyle" versus 47% for sugar, 51% for sucralose, and 40% for aspartame. Among parents with children at home, 85% versus 80% of parents in Mexico and India, respectively, indicated that were very/somewhat concerned about the level of sugar in foods/beverages they give their children. When asked, how likely these parents would be to purchase foods/beverages with stevia for their children, over 60% of parents in both Mexico and India indicated that they would either definitely/probably purchase foods or beverages with stevia.

Conclusions: As individuals and families pursue healthy lifestyles, sweeteners like stevia can play a pivotal role.

Keywords: consumers, stevia, awareness, sugar, children

Conflict of Interest Disclosure: Dr Priscilla Samuel heads the Global Stevia Institute which is supported by PureCircle Ltd.

Ashi Okonneh works at PureCircle Ltd which funded the insights research.

144/2141

FORTIFICATION OF THE WHEAT FLOUR IN MOROCCO: CHANGE OF THE ELEMENTARY IRON BY THE NAFEEDTA

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Background and objectives: In Morocco, Iron Deficiency Anaemia is 32% among children that are less than 5 years old with 58% of them having ferritin levels less than 12 µg/l. This anaemia is 33% among women in childbearing age, 37% among pregnant women, and 18% among men. The consumption of the wheat flour in Morocco is 365 g / p / d of flour. To fight against this iron deficiency, the wheat flour was fortified with 45mg iron / kg of flour (in the form of electrolytic elementary iron). Unfortunately ten years after this fortification, the iron status of the Moroccan population did not improve. So in Morocco we realized a feasibility study of the fortification of the flour by another iron type, the NaFeEDTA which seems more bioavailability and insensible in chelators, such as the tannins of the tea.

Methods: We have fortified wheat flour with 80 ppm NaFeEDTA. We carried out the feasibility study of fortification under Moroccan culinary conditions. We supplied the premix containing 80 ppm of NaFeEDTA and 1 ppm of vitamin B9 to 30 industrial mills to determine the range of analyzes in order to put in place the legislation for quality control. We analyzed 60 samples (30 samples with fortified flour and 30 samples with non-fortified flour).

Results: The addition of NaFeEDTA and folic acid to the flour did not alter the technological quality of the flour. The organoleptic qualities of the flour were not altered. The range of analysis varies between 22 mg / kg and 49 mg / kg (mg iron / kg flour)

Conclusions: This study of bioavailability showed the possibility of the change of elemental iron by the NaFeEDTA without altering the technological quality and the organoleptic quality of the flour. A bioavailability study of NaFeEDTA under Moroccan culinary conditions is under way in partnership with the IAEA.

Keywords: Fortification, wheat flour, Morocco, elementary iron, NaFeEDTA

144/2142

EFFECTS OF A FEEDING AND NUTRITION PROGRAM IN SCHOOL CHILDREN IN MEXICO CITY

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Background and objectives: In Mexico obesity is the most frequent problem among children and adolescent populations, the increasing in overweight and obesity (OW+Ob) prevalence has been a main concern mostly in individuals from 5 to 11 years old. Data from National Health and Nutrition survey (ENSANUT-201) shown a National prevalence of 34.9% and a slightly greater (35.2%) in Mexico City.

Objective: To assess education and nutrition components of SaludArte program in participant schools during 2013-2015.

Methods: A three cohort comparative study was used consisting on 1283 school children from 144 schools. Two panels were defined: complete and continuous time. Information about food intake, feeding behaviors, food preservation and hygiene, physical activity (PI) and anthropometry was obtained. A differences in differences method for effect estimates was applied, logistic-multinomial and logistic regression models were also used.

Results: Effects attributable to the program were as follows: better personal hygiene (p=0.045), better nutrition knowledge's (p=0.003), physical activity (p=0.002 2013-2014; p=0.032 2015) and fiber Intake (p=0.064). Disagreeing with the expected, sugar intake was significant, (p=0.012 continuous time and; p=0.037 complete time).

Conclusions: Findings shown better hygiene practices among the program beneficiaries, this is related with positive effects over the health because decreases infections risk and thereby morbidity costs associated with infections. SaludArte had positive effects over some components, however it is necessary to consider the learned lessons in order to institutionalize the program and give it permanence.

Keywords: Schools, program evaluation, food intake, physical activity, Mexico

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144/2149

AVAILABILITY OF PORK AND BEEF IN SOUTH AMERICAN COUNTRIES THROUGH THE PERIOD OF TIME FROM 1961 TO 2010

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Background and objectives: The knowledge related with the bovine and swine production is of vital interest by part of governmental and private bodies to plan the alimentary supply referred to this products, to design strategies that let the elaboration of plans of action to prospect better a country in this place.

Objective: make a comparative analysis related with the supply of beef and pork, and the quantity of energy, protein, and fat per person for each day that they give in countries in South America in the period of fifty years (1961-2010).

Methods: The General linear model was used, employing the multivariate analysis of variance (MANOVA) technique, with a canonical contrast of orthogonal type, analysis of principal components, explorative and descriptive analysis of unidimensional style, taking into account the base of information coming from the FAO.

Results: Argentina shows a highly important difference in the availability of beef for its population with respect to the rest of South America (p<0.0001). Paraguay is the country with the highest availability of pork for its population. The country with the lowest participation of sources of beef and pork is Peru.

Conclusions: there is a great divergence between dome countries of South America in the quantity of the supplies of meat from the bovine and the swine, which impacts in the availability of energy resources, protein, and fat for the population.

Keywords: beef, pork, availability, consumption, South America.

144/2153

ASSOCIATION OF MODIFIABLE CARDIOVASCULAR RISK FACTORS WITH METABOLIC SYNDROME (MS) IN ADOLESCENTS

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Background and objectives: The prevalence of overweight and obesity has increased in alarming proportions worldwide, affecting even the youngest age groups and bringing with it the early appearance of several clinical complications due to metabolic disorders. The aim of this study is to assess the presence of modifiable cardiovascular risk factors (MCRF) in adolescents with and without metabolic syndrome.

Methods: Multicenter, cross-sectional study using data from the ERICA study (BMC Public Health (2015)15:94). The sample consists of 7,404 adolescents, aged between 12 and 17 years, enrolled in public or private schools of 4 Brazilian municipalities, whose weight of the stratification represents 900,120 adolescents (Cad. Saúde Pública, Rio de Janeiro, 31(5):1-10). Adolescents were classified as metabolically healthy (MH) and metabolically unhealthy (MU) according to the established metabolic syndrome (MS) criteria and an analysis was made on the presence of MCRF in this population. Parametric and non-parametric tests were performed with the studied variables. The analyses were performed using Stata software version 13 and R version 3.3.1.

Results: The mean age found was 14.4 years, 50% were female, 69.6% studied in public schools and 2.2% presented MS. Among the MCRF evaluated, 47.5% were sedentary, 26% had altered LDL-c, in 43% of cases CRP was altered, 4.3% had abnormal hemoglobin A1c and 11% presented altered HOMA-IR. According to the MS classification, 33.6% of the MH normal weight presented more than one risk factor, 100% of the MU normal weight presented between two and three risk factors, 61.7% of the MH obese presented more than one risk factor and 81.5% of the MU obese presented more than one risk factor.

Conclusions: The present study draws attention to the number of adolescents who presented up to five MCRF associated or not with the MS criteria. The dimension and impact of health problems related to obesity and the presence of cardiovascular risk factors in this age group are of great magnitude, and it is urgent to adopt public health measures to prevent obesity and promote a healthy lifestyle.

Keywords: Adolescent, metabolic syndrome, risk factors.

COMPREHENSIVE INTAKE ASSESSMENT OF TRANS FATTY ACIDS AMONG THE PORTUGUESE POPULATION – RESULTS FROM THE NATIONAL FOOD, NUTRITION AND PHYSICAL ACTIVITY SURVEY 2015-2016

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Background and objectives: WHO/FAO recommends that intake of trans fatty acids (TFA) should be restricted to less than 1% of total daily energy intake. Limited information is available on the actual TFA intake.

The present work aims to describe TFA usual intake, and to identify the main sociodemographic factors associated, among the Portuguese population; to estimate the contribution of different food categories to TFA intake.

Methods: Distribution of TFA intake was assessed combining individual food consumption with food TFA concentration datasets. Individual food consumption data was obtained from a national representative sample of 5819 individuals (www.ian-af.up.pt). Food diaries or 24h recalls (if > 10 yrs) were face-to-face applied twice. All reported food items were described using the FoodEx2 system. The content of TFA in foods was extracted from the Portuguese Food Composition Table (PFCT). When applicable, TFA levels presented in the PFCT were substituted by current levels, recently reevaluated and published.

The usual TFA intake was estimated using Statistical program for age-adjusted Dietary assessment (SPADE). A weighted generalized linear model was used to measure the effect of the several exposures on TFA intake.

Results: Median TFA intake among the Portuguese population was 0,43% of energy intake (0.9 g/day). Intake of TFA exceeding 1% of energy intake was estimated to occur in 8, 14, 4 and 7% of the observations in children, adolescents, adults and elderly, respectively. Foods containing TFA produced during manufacturing (fats and oils, pastry and snack products, etc) contributes with 42% to the total TFA intake.

TFA intake (g/day) among young adults (18-40 yrs), middle adults (41-64 yrs) and the elderly (65-84 yrs) was significantly lower [β=-0.49, 95%CI=(-0.80, -0.18), β=-0.64, 95%CI=(-0.98,-0.30) and β=-0.67, 95%CI=(-1.02,-0.32), respectively]; those more educated [β=0.40, 95%CI=(0.24,0.55)] and living in Lisbon [β=0.24, 95%CI=(0.05,0.44)] or Madeira Island [β=0.28, 95%CI=(0.11,0.45)] had significantly higher TFA intake.

Conclusions: TFA intake among the general Portuguese population can be considered low. A relevant proportion of adolescents are consuming more than 1% of energy from TFA. However, it should be noted that ruminant derived products are the main contributors to TFA intake. Younger age, higher education and residence in Lisbon or Madeira regions were positively associated with TFA intake.

Keywords: Trans fatty acids, Intake assessment, Individual food consumption, National food consumption survey

Conflict of Interest Disclosure: No conflict of interest to declare
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DIETARY AND ENVIRONMENTAL TOXIC EXPOSURE IN AN AGRICULTURAL CORE POPULATION OF THE PROVINCE OF CÓRDOBA, ARGENTINA

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Background and objectives: Argentina have the major world crop production per capita. To achieve these results, the following production model is applied: genetically modified seeds, direct seeding and intensive use of pesticides. Environmental exposures are multiple and complex; diet and toxic, such as pesticides, participate in the modulation of the occurrence of chronic diseases with high impact in Public Health, being a healthy diet, a protective factor against its the occurrence. Aims: To identify the dietary patterns and exposure to pesticides in a local population of the agricultural core zone of the Pampa Húmeda Argentina

Methods: A population-based study was conducted in a random sample of subjects older than 18 years of age, in Monte Buey, Córdoba Province, Argentina, throughout 2015 to 2016 (n=416). A standardized questionnaire was administered, investigating environmental, sociodemographic and lifestyle characteristics. Potential sources of exposure to agricultural pesticides were identified and geo-referenced: deposits of agricultural machinery, pesticides and silos, proximity of housing to cultivated fields, among others. A validated food frequency questionnaire was used to investigate the usual qualitative and quantitative food consumption. Descriptive statis-

tics and Factorial Analysis of Principal Components were identified for the identification of food patterns using Stata13 software.

Results: Of the total number of subjects studied, 50.4% were women, mean age (SD) was 46.6 (14.7) years. About 60% completed secondary or higher education; 49% had an average socio-economic level and 21% high level. Four dietary patterns, known as "Prudent" (AB vegetables, fruits, oils), "Meat" (red fat meats), "Glucose" (refined grains and sugars) and "Beverages" (alcohol and teas) were identified. Also, 32%; 48 per cent and 37 per cent of households were within 500 m of cultivated fields sprayed with pesticides, agricultural machinery and pesticide and other agricultural inputs, respectively.

Conclusions: There was evidence of a positive change in food selection towards a healthier, more prudent pattern, as a measure of self-care, by the exposed population. However, it is necessary to work on public policies that aim at sustainable production modes by reducing the level of exposure described, accompanying the acquisition of healthy habits.

Keywords: food patterns - pesticides - environmental exposure - agricultural core.

144/2156

SUSTAINABLE DIETS IN SMALL ISLAND DEVELOPING STATES OF THE WESTERN PACIFIC: A REVIEW

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Background and objectives: The ecosystems of Pacific Island countries, e.g., atoll islands of Melanesia and Polynesia, are rich in terrestrial and marine biodiversity that would likely support sustainable diets. Yet many of these Small Island Developing States (SIDS) are experiencing extensive loss of biodiversity and degradation of natural resources, and the nearly-11 million inhabitants have some of the highest rates in the world of obesity and associated chronic diseases. They are particularly precarious in their vulnerabilities to various manifestations of climate change and other anthropogenic and natural phenomena affecting agriculture, fisheries, food trade. The question to be answered is this: is it possible to have 'sustainable diets' in these Pacific Island States?

Methods: National, regional and UN-compiled data sets from the sectors/disciplines of nutrition, health, agriculture and the environment will be interrogated, along with indicators developed to characterise sustainable diets in selected ecosystems of Pacific Island countries. Tonga, Fiji, Kiribati and Tokelau Islands are used as the test environments.

Results: Diets are laden with high fat/high sugar imported convenience foods with the consequences of high rates of obesity, diabetes, heart disease, and shortened life expectancy. At the same time, highly nutritious traditional foods are neglected and underutilised. Some solutions to the problems are beyond the direct control of SIDS (e.g., rising sea levels), but many, including modifications to practices and policies have yielded, and could further yield, immediate benefits, e.g., conservation of local food biodiversity through sustainable use, benefiting the environment and improving nutrition.

Conclusions: Multi-sectoral policies and actions informed by the Sustainable Development Goals (especially Goal 2 and its targets), Aichi Targets, UN Decade of Action on Nutrition, and regional commitments, are needed. Although the recommendations from this review are based on four Pacific SIDS, there is potential relevance to at least 22 Pacific Island countries and territories, other SIDS around the world, and to low-lying coastal areas in non-island countries that share similar ecosystems and food/nutrition-related vulnerabilities.

Keywords: sustainable diets, ecosystem, nutrition, obesity, biodiversity

Further collaborators:
Researchers from the Secretariat of the Pacific Communities, University of the South Pacific, Caritas (NZ) and FAO sub-regional office for the Pacific

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144/2160

NUTRITIONAL STATUS AND FOOD PATTERNS OF PRESCHOOL AGE CHILDREN OF PANAMANIAN INDIGENOUS COMMUNITIES: A CROSS-SECTIONAL STUDY

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Background and objectives: The current nutritional situation among indigenous people from Ngabe Bugle group is affected by increased under nutrition and overweight rates among children under five years. The objective of this study was to determine the nutritional status and food patterns in children under five years of an indigenous group in Panama, the Ngabe Bugle group.

Methods: This is a cross-sectional follow-up study of 110 children under five years whom are beneficiaries of "Chi Nugue Kwin – healthy and happy children" Project implemented by Nutre Hogar, a national NGO working with indigenous people. We ran descriptive analysis including socio-demographics, anthropometric and 24 h recall assessments from January to March 2016.

Results: The mean±SD of HAZ and BAZ were -2.31±0.96 and 1.44±1.42, respectively, and 55% were girls. The prevalence of moderate Stunting (<-2 SD HAZ) was 46% and 19% presented

severe (<-3 SD). According with BAZ, 19% presented overweight (>2 SD BAZ) and 8% was classified as obese (>3 SD BAZ). The reported food patterns was predominantly composed by starch (grains, cereals, and sugar). Low consumption of high value animal protein was observed. As well as a scarce consumption of fruit or vegetables.

Conclusions: Children under five in this analysis are affected by double burden of malnutrition and presented low food diversity based in starch and simple sugar. Comprehensive and multi sectorial nutritional interventions are needed to improve the nutritional situation among children under five years in Panamanian indigenous areas.

Keywords: Stunting, Malnutrition, Overweight, Obesity, Indigenous people.

144/2166

PATHWAYS TO ACHIEVING DIETARY VITAMIN A ADEQUACY AMONG YOUNG CHILDREN: AN APPLICATION OF AN ECONOMIC OPTIMIZATION MODEL IN CAMEROON

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Background and objectives: National efforts to reduce vitamin A deficiency (VAD) among children need to be more efficient and fiscally sustainable, but vulnerable children must be protected during programmatic transitions. GAVA has proposed a framework that provides guidance for transitions, but data and tools are needed to inform program choices.

Methods: The Micronutrient Intervention Modeling (MINIMOD) tool is used to explore transitional pathways for VA programs. We predict dietary VA adequacy using national dietary data and lives saved using LiST. An economic optimization model links benefits and costs, and identifies alternative 10-year pathways for enhancing efficiency while protecting vulnerable children. We modeled, year-by-year, one possible pathway: a) lagged improvements in an existing VA oil fortification program, b) lagged development of a VA-fortified bouillon cube program, and c) maintaining VA supplementation via Child Health Days (CHD) when/where the prevalence of inadequate VA intake is >10%.

Results: Program costs and impacts vary across Cameroon's macro-regions (South, North, and Cities). In the South, where inadequate VA intake was lowest, after 4 years, the combined oil and cube programs achieve inadequate intake < 10%; cost after year 4 is $336k/year. During the 3-year transition period, VAS protects children at risk of VA-related mortality; total cost of program investments and CHD is ~$1.5m per year and 1913 child deaths are averted. If two biomarker surveys confirm resolution of VAD, as proposed by the framework, CHD are discontinued in the South in year 7, yielding ~$1.3m per year savings. The scenario is similar for the Cities macro-region. However, in the North, where VAD is more severe, combined oil and cube fortification programs do not reduce VA dietary inadequacy below 10%; other VA programs are needed or CHD need to be maintained indefinitely.

Conclusions: Depending on the nature and extent of VA deficiencies, well-planned and well-managed food fortification programs have the potential meet VA dietary intake requirements of young children. Vulnerable children need to be protected until investments in fortification programs mature. In some areas, currently available fortification programs will not meet VA dietary intake needs; new programs need to be developed.

Keywords: VA deficiency. VA fortification. VA supplementation. MINIMOD. Cameroon

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144/2169

TOXIC FOOD ENVIRONMENT INSIDE AND AROUND PUBLIC PARKS IN MEXICO CITY

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Background and objectives: According to the Mexican National Institute of Statistic and Geography (INEGI), more than 60% of people attend public parks. Urbanists state that offering food in public spaces increases the participation. However, energy-dense food availability and advertising is linked with obesity. The aim of the study is to characterize the toxic food environment inside and around public parks of Mexico City.

Methods: Trained interviewers performed the evaluation of the inside and around food supply and advertising of 33 parks in Mexico City. Data collection was made using a Mexican context questionnaire. Food availability was defined as those foods sold inside and around the parks. Around was defined as the circumference of the parks. Parks were mapped using three different databases including local (Roji Guide), Google and INEGI maps and were classified according to their dimensions into three typologies: 1) metropolitan (>0.01 km2), 2) local (0.003 a 0.01 km2), and 3) district (0.0004-0.003 km2).

Results: Information of 5.9% metropolitan, 36.4% lineal and 12.1% district parks of Mexico City was collected. Overall, 39.4% of the food kiosks were located inside the parks, whereas 78.8% were around. The most prevalent food inside corresponds to sweet snacks

(19.7%), followed by chips (18.2%); while around parks were found traditional Mexican fast food (fried tortilla with meat/chicken/pork/beans) in restaurants (16.9%) and street vendors (16.1%). In total, 3% of the parks have food advertising inside and 15.7% around.

Conclusions: While parks are the most popular public spaces to perform physical activity in Mexico City, our results show that most of the available food inside and around the parks is energy-dense food. In addition, 3% of the parks have food advertising inside. Regulatory guidelines are needed to promote healthy environments, because the beneficial contribution on health of these spaces could be attenuated by the high availability and advertising of energy-dense foods.

Keywords: Parks, energy-dense food, food environment

144/2170

NEW CHILEAN LABELLING LAW AND SCHOOL SNACKS: CHILDREN PERCEPTION

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Background and objectives: In Chile with the aim of reducing prevalence of child obesity and create healthy environments the Law 20,606 was created, by the Ministry of Health (MINSAL). It was implemented its first stage in June, 2016 and labels the package of foods/products with "High in" black signs when they exceed the limits of critical nutrients (sugar, sodium, saturated fats and calories).

The objective of the study was to verify the impact of the new labeling on the perception and nutritional quality of the snacks consumption during the school day of adolescents from a subsidized school in Santiago, Chile.

Methods: A crossover study with qualitative approach was done. The nutritional status was evaluated and clasified according to Z-score reference (WHO, 2007). The children filled a weekly snack form specifying the eaten snack. These snacks were clasified according to the presence of the "black signs" according to the nutritional limits of the law. An interview was performed to know what they think about the black signs and if the presence of them impacted on their decision to eat/drink the product. A descriptive analysis was done and the Kruskal-Wallis test was applied considering the significance level of 5%. The Stata 13 software was used. Perception answers were transcribed and analyzed by the iterative method.

Results: We evaluated 48 adolescents (12-14y) of both sexes, being 60,4% females; 58,5% were overweight. 530 snacks were consumed in this period, being only 7,5% without black signs and 35,3% with 3 or 4 black signs. No significant difference in the snacks quality and nutritional status were observed. Perception evidences showed that the adolescents (89,7%) have the knowledge about the problem of obesity in Chile and why some foods/products are receiving the black signs. 75% mencionated that the foods

without signs are healthier, but the presence of the black signs only affected the decision of consumption and aquisition of 8,3%.

Conclusions: The presence of black signs did not impact in the adolescent snack selection. but it is important to mention that they recognized that it is easiest to understand the nutritional information with the "black signs".

Keywords: Nutritional Status, snacks nutritional quality, Chilean law 20,606.

144/2175

FOOD AND NUTRITION EDUCATION AS CORE ELEMENT OF SCHOOL FOOD AND NUTRITION PROGRAMMES IN LATIN AMERICA AND THE CARIBBEAN

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Background and objectives: Food and Nutrition Education (FNE) is defined as any combination of educational strategies implemented at different levels, whose objectives are to assist individuals in achieving sustainable improvements in their feeding behavior and practices. It is believed that the School Food and Nutrition Programmes (SFNPs) should include FNE in their interventions to create a long-range impact, and not only provide food assistance. The objective of this study was to identify and review successful practices and programmes that may be expanded/replicated in other countries in Latin America and the Caribbean (LAC).

Methods: During the first phase of this study, a desk audit per LAC country was performed to understand experiences at SFNP and FNE levels. An in-depth review was implemented during the second phase to better assess and understand the experiences of countries with active FNE, which may serve as an example for other countries in the LAC region. The countries reviewed included: Brazil, Costa Rica, El Salvador, Mexico, Peru, the Dominican Republic, and Trinidad and Tobago.

Results: Overall, findings from this study support robust insights from FNE programs that call for more effective and responsive policies, programs and funding streams to strengthen school-based efforts. Development of a policy framework is need-

ed to sustain FNE and national malnutrition and hunger plans and strategies. Aspects of FNE such as feeding and hygiene are included in school curricula, but FNE as a core educational subject is not present in most countries in the region. FNE is most effective when promoted and integrated throughout the school environment. This includes the regulation of school kiosks to offer nutritious and local food, adequate physical activities, and presence of pedagogical school gardens.

Conclusions: An effective FNE policy requires that a communication agenda, an implementation methodology, and technical support be provided to central as well as local governments. Its adoption and activation also require that an item be allocated for it in the public budget.

Keywords: Nutrition Education, School, Nutrition Policy, Nutrition, Latin America

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144/2176

ANALYSIS OF NUTRITION INFORMATION IN PACKAGING OF SWEET AND SALTED BISCUITS AVAILABLE IN MEXICO CITY

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Background and objectives: Nowadays, large quantities of food and beverages are made with modifications in its composition, so it is necessary to establish nutritional specifications that must be subject to these products. 'Nutrition claim' means any claim which states, suggests or implies that a food has particular beneficial nutritional properties. Analize of nutrition information in packaging of sweet and salted biscuits, of nutrition claims available in Mexico City According to the official Mexican standard 086-SSA1-1994 (NOM-086).

Methods: There were photographed 977 biscuits packaging available in 51 supermarkets in Mexico City, on December 1st 2015 to March 31st 2016. Biscuits are classified in two groups: sweet biscuits (N=883), and, salted (N=98). It was used as an inclusion criteria all those packages of biscuits that showed at least one nutrition claim on the front face of the product. To find out if it meet the nutritional specifications of the NOM-086 were analyzed nutrition claims per serving/100g and using as parameters the classification of the following denominations: fat free (<5g per serving), sugar free (<0.5g per serving) and energy free (<5 calories per serving). A descriptive analysis was made out using the SPSS v. 23.

Results: Of the 977 Biscuits, only 37.9% had nutrition claim; of which 17.9% of the packaging presented 2 nutrition claims and 4.5% had 12 nutrition claims. In comparison sweets biscuits had more nutrition claims than salted (86.5% and 13.5%, respectively).

The nutrition claims identified were: "fat free" 39.2%, "sugar free" 31.9% and "energy free" 7.3%. Only 12.3% met the parameters according to their nutrient content to submit nutrition claims. Of the products who carried a nutrition claim and that do not meet the nutritional parameters, to contain higher values to the permitted was 98% "fat free", 84% "sugar free" and 99.7% "energy free".

Conclusions: There is a need to update and monitor the implementation of the regulation for the use of nutrition claims presented in industrialized cookies, as it may be a determined factor in the choice of food. This would contribute to the various strategies implemented to reduce the high prevalence of overweight and obesity in Mexico.

Keywords: Nutrition, claim, NOM-086, biscuits

144/2181

PREVALENCE OF INADEQUATE MICRONUTRIENT INTAKE AMONG URBAN COSTA RICAN POPULATION: RESULTS FROM THE LATIN AMERICAN STUDY OF NUTRITION AND HEALTH (ELANS)

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Background and objectives: Invisible, but still very common in developing countries, micronutrient deficiencies can lead to serious health consequences. Hypovitaminosis can reduce the ability to combat diseases, diminish cell and organ function and affect the development of children and wellbeing of adults and elderly. The study aimed to estimate the prevalence of inadequate micronutrient intake in an urban Costa Rican population and to identify individuals at risk of nutritional deficiency.

Methods: ELANS is a multicenter cross-sectional study including a representative sample of urban population from eight LA countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela). In Costa Rica, 798 participants (15-65 years old) provided two 24-h dietary recalls. Nutritional data was entered into the Nutrition Data System for Research (NDS-R) software, after a harmonization process between local foods and NDS-R database, and adjusting for mandatory micronutrient fortification of sugar, rice, wheat flour and corn flour and milk. The rates of prevalence of inadequate micronutrient intake were estimated according to gender and age group, using the EAR (Estimated Average Requirement) method as cut off points.

Results: High prevalence (>95%) of inadequate intake of vitamin D, E and Calcium was observed in both genders. The prevalence of inadequate intake of vitamin A, riboflavin and niacin

were 39.8%, 24.6% and 16.5%, respectively. Lower prevalence was found for for iron (3.3%), thiamin (7.8%), cobalamin (10.2%) and folate (13.9%). For all analysis, vitamins and minerals inadequacy was higher for women than men, with exception of riboflavin and vitamin A. For niacin, cobalamin, calcium and thiamin the prevalence of inadequate intake was greater in older groups (p<0.005).

Conclusions: Vitamin and mineral intake among urban Costa Rican population were lower than recommended, with a tendency of a greater inadequacy rate in older groups. Healthy eating that facilitate meeting the EAR from a variety of foods most be encourage to improve this situation.

Keywords: Vitamins. Minerals. Costa Rica. Inadequate intake

144/2194

FREE SUGARS AND EXCESS WEIGHT IN CHILDREN AND ADOLESCENTS FROM LATIN AMERICA: A SYSTEMATIC REVIEW

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Background and objectives: Free sugars (FS) contribute to increasing the energy density of the diet and may promote a positive energy balance, its high intake has been associated with excess weight (EW). Our aim was to identify the association between FS consumption and EW in children and adolescents from Latin America.

Methods: We conducted a systematic review of research articles published between 2005 and 2016. We searched VHL, Pubmed and Embase databases since August 26 until September 30 of 2016. The primary variables were children and adolescents, Latin America countries, consumption of FS (Soda, Fruit drinks, Sugar-sweetened beverages, Sweets, Sugary foods), weight gain, overweight and obesity. There was no restriction according to type of study. Articles written in English, Spanish and Portuguese were included. Data Extraction: The Selection of studies, data collection and quality assessment were performed independently by two trained reviewers.

Results: Fourteen of one hundred and seventy-five articles were eligible for systematic review, A single article could have associated more than one variable. Distribution according to type of study: Descriptives: four, Cross sectional: eight, Prospective: one, Cases and controls: one. Nine of the included articles were made in Brazilian population. The measurement of the association between soda consumption and anthropometric indicators related to EW was the highest number of positive associations (p< 0,05). For all food categories containing FS, there were 9 positive and 2 negative associations (p <0.05) with EW indicators, in 12 occasions no association was reported.

Conclusions: The articles found present heterogeneous results respect to the association between FS consumption and EW in children and adolescents of the region. The type of research that has been carried out in Latin America does not allow to infer causal associations between these variables.

Keywords: Child, adolescents, body weight, dietary sugar, free sugar.

144/2198

NUTRITIONAL STATUS AND MONITORING COVERAGE BY THE FOOD AND NUTRITION SURVEILLANCE SYSTEM IN THE STATE OF MATO GROSSO DO SUL, BRAZIL

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Background and objectives: The Food and Nutrition Surveillance System (SISVAN) aim to characterize the nutritional status and food consumption among all population groups in Brazil. According SISVAN results, decisions could be formulated to develop health promotion policies and programs. This study aimed to evaluate nutritional monitoring by the SISVAN, in the different lifecycles in the State of Mato Grosso do Sul, Brazil, in 2015.

Methods: It is a descriptive study with secondary data from SISVAN. The 79 municipalities of the State were included, divided into 11 micro-regions. Population coverage was estimated based on the number of people enrolled in SISVAN and the population estimated by the Brazilian Institute of Geography and Statistics (IBGE). In order to classify the nutritional status, we adopted the WHO references for the following anthropometric indexes: children and adolescents (sex- and age-specific BMI z-scores), adults and elderly individuals (age-specific BMI).

Results: The percentage of general population coverage was considered low (10.4%) ranging from 5.3% to 20%. According the age groups, the coverage was higher among children (23.3%) and lower among elderly individuals (2.7%). Regarding nutritional status, the prevalence of underweight was 5.1% for children, 3.0% for adolescents, 2.5% for adults and 11.8% for elderly population. Overweight (including obesity) was found to be high for all age groups, mainly for adults and elderly individuals, as follows: children (14.2%), adolescents (9.1%), adults (66%), and elderly (54%).

Conclusions: The prevalence of underweight was high among children and elderly. Obesity were especially high among all age groups, mainly for adults and elderly. Therefore, the population coverage for the SISVAN was considered low. The SISVAN should be effectively implemented in the basic care to develop health promotion programs.

Keywords: Nutritional Surveillance, Nutritional Status, Age groups.

144/2206

EVALUATION OF INDUSTRIAL FOOD AND BEVERAGES NUTRITION CLAIMS AVAILABLE IN SUPERMARKET IN MEXICO CITY

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Background and objectives: The high prevalence of obesity is the result of changes in the power supply. The consumption of industrialized products is increasing. The information you provide on your packaging is not conducive to the population. Evaluate the compliance of nutrition claims in industrialized foods and beverages in relation to Official Mexican Standard 086-SSA1-1994 (NOM-86), which specifies changes in the nutritional composition of a product.

Methods: In 2015, 659 food and beverage products were photographed in 11 Supermarkets in Mexico City. The evaluated categories were beverages (N = 173), sweet snack (N = 81), salty snack (N = 98), dairy products (N = 211), breakfast cereals (N = 10). Food and beverages were analyzed by the NOM-086, to evaluate the correct use of nutrition claims. The evaluation of the nutrition claims was made with the nutritional specifications of the NOM-086, having as parameter of the following classification: "low sodium" ($\leq$140 mg / lot), "low fat", "energy free", through a descriptive analysis

Results: 42% of the products presented a nutrition claim in the frontal packing. However, 2% of the products met the requirements according to their nutritional content to carry the nutrition claim. However, of the products complying with NOM-086, 46.4% contain the claims: "low in sodium", 37.6% "low in fat", 15.9% "sugar free" and 5.76 % "energy free". In the salty snack group 90.8% of the nutrition claims presented in the products did not comply with the normativity required by the greater quantity of nutrients than those specified in the standard. In products that presented the claim "no sugar" in the sweet snack category 98.8% does not meet the specifications of NOM-086. On the other hand, in the foods and beverages that contain the nutrition claim "energy free" only in the category of drinks 22% complied with the requirement

Conclusions: The results showed the need to evaluate and monitor, through an independent body, the proper use of the nutrition claims, that appear in the front of industrialized foods and beverages. The actions implementation applies to contribute the correct use of NOM-086 to avoid confusing and incorrect information in the food and beverage industry.

Keywords: Label, Nutrition-claim, Low-sodium, Low-fat, Sugar-free

144/2217

TERRITORIAL INEQUALITIES IN THE AVAILABILITY OF FOOD IN THE MUNICIPALITY OF RIO DE JANEIRO, BRAZIL

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Background and objectives: Food environment can be defined as the set of physical, economic, political and socio-cultural environments as well as opportunities and conditions that influence food choices. Understanding the community food environment, characterized by availability and access to food, is important to help understand the food and nutritional security scenario to which populations are exposed. Objective: The study describes the food environment in the city of Rio de Janeiro, identifying the inequalities in food availability.

Methods: The addresses of food markets and establishments that sell food and meals, licensed and registered in the Health Surveillance Information System (VISAN) of the municipality until 2013 were collected and georeferenced. The 21 types of establishments were classified into three groups: G1) those that sold mainly healthy foods (e.g. food markets); G2) those that sold healthy and unhealthy foods (e.g. supermarkets and restaurants); G3) those that sold mainly unhealthy foods (e.g. fast foods). The following indicators, according to the groups, were constructed to evaluate the food environment of the 33 administrative regions (AR) of the municipality: 1) proportion of establishments (group); 2) density of establishments (group). Food environment was characterized by means of the construction of maps with the location of the establishments (groups) and the presentation of maps with the indicators considering the average income per capita of the AR.

Results: There was a higher proportion of G2 establishments (min: 53%, max: 88%, mean: 72%), followed by G3 (min: 1%, max: 30%, mean: 20%) and G1 (min:0%, max: 42%, mean: 8%). We observed inequality of healthy foods availability, since the RA with better income were also those ones that showed the highest density of G1 and G2 establishments.

Conclusions: The low availability of establishments that sold healthy foods suggests the predominance of an obesogenic envi-

ronment in the municipality, especially in poorer areas, pointing out the need for public supply policies that guarantee food and nutritional security of the population.

Keywords: Food environment, inequality, indicators, socio-spatial analysis

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CHANGES IN HOUSEHOLD FOOD INSECURITY BETWEEN ENROLLMENT AND EXIT FROM A BLANKET SUPPLEMENTARY FEEDING PROGRAM FOR CHILDREN 6 – 23 MONTHS OLD IN BURKINA FASO

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Background and objectives: In a cluster-randomized trial aimed to assess the effectiveness of four supplementary foods in the prevention of child malnutrition, we assess beneficiaries' household food insecurity between program enrollment and exit.

Methods: Children participating in a blanket supplementary feeding program were recruited on a rolling basis between August 2014 and June 2015. This is a preliminary, descriptive analysis of household food insecurity among participating households. Data were collected at baseline and households' exit from the program to capture socioeconomic characteristics including household food insecurity, based on the Household Food Insecurity Access Scale (HFIAS). A categorical variable representing combinations of seasons of program enrollment and exit was created: dry/dry, rainy/dry, dry/rainy, and rainy/rainy. Descriptive statistics of change in HFIAS score (endline – baseline) were calculated and stratified by baseline HFIAS category and season of program enrollment and exit.

Results: A total of 6,092 children were enrolled. Of these, 5,236 completed the program of food supplementation and 5,206 were included in analysis. At baseline and endline, respectively, 43% and 35% of households were food secure, while 15% and 18% were severely food insecure. Mean HFIAS scores were 3.81 ± 4.82, and 4.31 ± 4.95 at baseline and endline, respectively, with an overall increase in food insecurity of 0.51 ± 5.94 units. Disaggregated by season of baseline and endline, mean changes varied: dry/dry 0.36 ± 5.76, n=1066; rainy/rainy 1.89 ± 5.42, n=170; rainy/dry -1.65 ± 6.17, n=890; dry/rainy 1.10 ± 5.82, n=3080. Households that were food secure or mildly food insecure at baseline had an increase in food insecurity at endline, on average, while households that were moderately or severely food insecure at baseline had a decrease in food insecurity at endline, on average.

Conclusions: Overall, food insecurity increased among households enrolled in a supplementary feeding program for young children, but varied according to baseline status and season of program enrollment and exit. More work is needed to understand the dynamics of household food insecurity in the context of a SFP.

Keywords: supplementary feeding program, household food insecurity

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NUTRITIONAL STATUS OF THE PEOPLE ASISTED IN THE PRIMARY LEVEL HEALTH SERVICES IN MONTEVIDEO AND INLAND OF URUGUAY

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Background and objectives: To characterize the nutritional status (NS) of the assisted population in primary care services in Montevideo and inland between April and November 2016. To compare the type and magnitude of the nutritional problems between services of Montevideo and it's inland, and between services of Montevideo, according to municipal grouping based on the proportion of poor families (PF).

Methods: The information collected by the students in the last year of the Nutrition Degree was systematized, and they applied a survey with Google forms. The information collected was: sex, age, reason for referral, anthropometric diagnosis and service. The NS in children was assessed by anthropometric indicators and compared with WHO standard on 2006. In adults, the body mass index was used and compared with the WHO reference on 1998. The services were grouped by location considering the municipal division of Montevideo according to the proportion of FP by level of income.

Results: The assisted population was 1982 corresponding to 17 services. Of all, 75% were women and almost half were over 18 years of age. 50% of referral reasons were Non-Communicable Diseases. Over-malnutrition exceeded the value identified in studies at the national level in one-third of services. Deficit malnutrition varied in services between 5% and 20%. In children under 18, the prevalence of malnutrition due to deficit and excess was bigger than in other national studies. There are important differences in malnutrition due to deficit and excess in adults and children among services with a higher proportion of PF.

Conclusions: There are problems of excess and deficit that surpass the national data. The nutritional stage in which the user is captured and the proportion of PF are probably determinants of the type and magnitude of the nutritional problems found in nutritional care.

Keywords: nutritional care, poverty, nutritional problems

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SUPPLEMENTATION OF HUMAN MILK AND ITS OSMOLALITY

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Background and objectives: Human milk is the ideal food for newborns. However, due to the increased nutritional need for preterm infants, human milk is often insufficient as an exclusive source of nutrition to meet its nutritional needs. As a result, it is often necessary to add fortifiers and/or vitamins in the milk offered to them. These products, however, do not only increase nutrients, but also osmolality, which can lead to health problems such as necrotizing enterocolitis.

Considering the need to understand the effects of physical and chemical factors on human milk, this study aims to analyze the variations of the osmolality in human milk samples, according to their nutritional and vitamin supplementation, and also to different preparation times and temperatures.

Methods: Prospective, quantitative and experimental study. Samples of human milk, supplemented with FM85®, Enfamil HMF® and vitamins protovit plus®, viter c® and mineral fersil®, collected at the Human Milk Bank of Fernandes Figueira Institute (FIOCRUZ), after the signing of a free and informed consent form by donors. The samples were analyzed in triplicate at the following moments: in up to 5 minutes; after 20 and 40 minutes; every hour until the completion of 8 hours; after 12 and 24 hours, at room temperature and also under refrigeration at 6 °C. The results of the osmolality determinations were obtained automatically using a digital Osmometer (Advanced Instruments A+, model 3320) calibrated according to the recommendations of the manufacturer.

Results: The samples with the FM85® fortifier and with the vitamin protovit plus® were the ones that presented the highest osmolalities, surpassing the value recommended by the American Academy of Pediatrics (AAP), in the different periods of time and temperature. Samples with higher concentrations of vitamins and fortifiers presented proportionally higher values of osmolality.

Conclusions: Increased osmolality was observed with respect to time and temperature. Some samples of human milk did not meet the safety specifications recommended by AAP. It was evidenced the need to elaborate protocols for the supplementation of human milk, in order to maintain control of its osmolality when added with additives and fortifiers, ensuring that it remains at levels that can be tolerated by the newborns.

Keywords: Human milk; Osmolality; Newborns; Fortifiers; Food Safety

144/2226

EMERGING ENVIRONMENTAL FACTORS IN CHILD STUNTING GLOBALLY

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Background and objectives: Linear growth stunting in children is considered a form of chronic malnutrition. However, nutritional interventions have modest effects on height. The World Health Organization (WHO) estimated that 171 million, or 23.8% of the world's children are stunted. Emerging research has implicated environmental exposures leading to poor intestinal health, which reduces nutrient absorption and growth hormone production. The condition is known as environmental enteric dysfunction (EED) and is onset by constant exposure to fecal pathogens with a possible link to mycotoxins created by mold species. A systematic review was conducted on EED and mycotoxins on stunting to understand current knowledge and novel areas for research expansion.

Methods: Specific search terms were used to conduct a systematic review in WHO Library and PubMed public databases. Next, duplicates were removed and remaining full-text articles were screened for eligibility. The criteria for article inclusion included: primary research, publication between 2011-2016, translatability to humans, and focus on the main topics of research interest.

Results: A total of 302 articles were found after the initial search, 191 articles remained after duplicates, and 23 articles met eligibility criteria. Among the final articles included in the review, 12 focused on EED and 11 on mycotoxins in stunting. EED etiology was confirmed in constant exposure to fecal pathogens in diverse underserved populations. EED interventions used micronutrient supplements, autoimmune treatments, and behavioral trials. None of the interventions significantly alleviated EED or stunting. Among mycotoxin-focused articles, studies found that aflatoxin affected linear growth and mycotoxin prevalence was established in new populations. Mycotoxin interventions tested absorbents for food and replaced contaminated maize in households with both studies showing promising results. Pathways linking mycotoxin exposure to EED was also articulated in recent articles.

Conclusions: Primary research conducted in the last five years have yielded modest impacts on stunting resolution but have expanded knowledge. Novel pathways between EED and mycotoxins have been implicated in linear growth and highlight the unmet need for continued etiologic and interventional research. A majority of studies was conducted in low- and middle-income country settings, which highlights the lack of access to adequate sanitation infrastructure and implications on stunting.

Keywords: review, stunting, environment, enteropathy, mycotoxins

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BODY IMAGE PERCEPTION AND ITS RELATIONSHIP WITH SCHOLASTIC ACHIEVEMENT CHILEAN ADOLESCENTS

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Background and objectives: During the last decades, an increase in sedentary lifestyle, poor dietary practices, overweight and obesity in adolescents, resulting in changes both in body image and perception which can affect scholastic achievement (SA). The aim of this study was to evaluate the relationship between scholastic achievement in the University Selection Test (PSU) of Language (PSUL) and Mathematics (PSUM) with the Body Image Perception (BIP) in Chilean adolescents.

Methods: A representative and proportional sample of 33 educational establishments was randomly selected, in the Metropolitan Region, Chile. During 2013, 418 school-age children of the 4st grade of high school, of both sexes, 43.1% were males (n = 180) and 57% females (n = 238) participated. The subjects'consent was obtained according to Declaration of Helsinki to undergo anthropometric measurements of weight and height to calculate BMI. BIP was assessed by Stunkard (1990) method which was validated for adolescents (Cortés et al., 2009), showing 9 male and female body silhouettes, ranging from very thin to more robust each silhouette has assigned its corresponding BMI from 17 kg/m2 to 33kg/m2: Underweight (silhouette 1), Normal (silhouettes 2-5), overweight (silhouettes 6-7) and obesity grade 1 and grade 2 (silhouettes 8-9). The calculated difference between BMI actual and perceived, obtaining three categories: Overestimation (they look fatter than they are), Adjusted Perception and Underestimation (they look thinner than they are). The socioeconomic strata (SES), using the Graffar modified method. SA was measured using the 2013 PSU both PSUL and PSUM, provided by the Department of Education of the Ministry of Education. Statistical analysis of the data was performed using the STATA 13 software.

Results: 25.8% of men tended to overestimate their perceived BIP, and 39.6% of women underestimated (p <0.0001). There was evidence of significant differences in PSUM in women (p <0.05) and in the low-SES adolescents (p <0.05) who underestimated their perceived BIP . They obtained the lowest PSUM scores in both groups.

Conclusions: The self-report survey is a good indicator BIP approach the nutritional status of adolescents and a new factor that could be influencing SA. Grants FONDECYT 1100431 and 1150524.

Keywords: Scholastic Achievement, Socioeconomic Factors, Nutritional Status, Body Image Perception.

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PERCEPTIONS OF PRICE AND STORE AVAILABILITY OF FRUIT AND VEGETABLE AND THEIR ASSOCIATIONS WITH FRUIT AND VEGETABLE INTAKE AMONG ADULTS IN FOUR SOUTH AMERICAN CITIES

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Background and objectives: Sufficient intake of fruits and vegetable(FV) has been associated with a reduced risk of chronic diseases and body weight management. South American(SA) diet is characterized by low intakes of FV. There is growing evidence, from developed countries, that consumer nutrition environment is an important determinant of dietary behavior. We investigated the perceptions about FVs availability and price in local food stores and their associations with FV's intake among adults in the following cities: Bariloche, Marcos Paz (Argentina), Temuco (Chile) and Canelones (Uruguay).

Methods: We examined data of 5009 men and women, aged 40-80y, participating in the CESCAS (Centro de Excelencia en Salud Cardiovascular del Cono Sur) I Study, a population-based prospective cohort. Perception about the store consumer nutrition environment was measured using the Perceived Nutrition Environment Measurement Survey(NEMS-P) and FV intake with a Food Frequency Questionnaire. Linear and logistic multivariate regression analyses were conducted to assess associations between the perceived environment and FV consumption (mean intake and frequency of ≥5 servings/d) adjusting for sex, age, city, education and perceived food insecurity.

Results: Average FV intake was 2.5 servings/d; only 7.5% reached ≥5 servings/d. Fifty-two per cent of participants strongly agreed that in their neighborhood "it is easy to buy FV", "the fresh produce is of high quality", and "there is a large selection of fresh FV". However, 71% reported that FV were expensive or very

expensive. Adjusting for covariates, those with better perceptions about FV store availability reported a slight difference in FV intakes (difference: + 0.28 servings/d, 95%CI: 0.19;0.36) and more frequently reached ≥5 servings/d (OR:1.40, 95%CI: 1.17;1.76). Price's perceptions were not associated with FV consumption.

Conclusions: Half of the participants had positive perceptions about FV availability, quality and large selection in local food stores, and that was independently associated with higher FV consumption. Most of the adults had a negative perception about price of these foods, however, that perception wasn't significantly associated with FV intakes. This information contributes to the knowledge of nutrition consumer environments in SA and their relation with diet behaviors. Comparisons with in-store audit measurements will help to further develop interventions to promote healthy diets in the region.

Keywords: Consumer Nutrition Environment, Fruit and vegetable, Diet, Price, South America

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144/2239

COMPLIANCE OF FOOD AND BEVERAGE MESSAGES WITH THE NUTRITIONAL CRITERIA OF THE ADVERTISING REGULATION IN OPEN TELEVISION IN MEXICO

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Background and objectives: It has been well documented that overweight and obesity are multifactorial diseases. Food and beverage (F&B) advertisements, particularly directed to children are one of such factors that influence food preferences, and consumption. In July 2014, the Government Guidelines of advertising of F&B to children on TV and movie theatres were implemented in Mexico. The Guidelines established nutritional criteria, restriction of time schedules and program genres (excluding soap operas, sports, news and programs directed to audiences above 12 years of age), where products with low nutritional value were restricted to be advertised towards children younger than 12 years of age.

The aim of this study was to observe the pattern of F&B advertisements within children's peak viewing time, time restriction schedule, and different program genres before and after the Guidelines were implemented.

Methods: From January 2013 to February 2015, programs were recorded from the four major Mexican television networks nationwide. A total of 20 recordings per channel were taken prior and after the Guidelines were implemented. Overall 2,533 hours

were recorded and coded. All F&B products were categorized either as core or non-core, according to their nutrient content

Results: From all of the identified advertisements (n=91,913) 18.1% were of F&B. During the restricted hours, after the implementation of the regulation, a reduction in the amount of F&B advertisements from 45.9 to 41.3% was shown; furthermore, there was a reduction in non-core F&B advertisements from 77.9 to 73.3%, nevertheless, this reduction did not happened in all the categories of F&B. For example: the group that increased the number of advertisements during the regulated hours was savory snacks (foods added salt or fat); their prevalence was 5.7% before guidelines and 8.3% after guidelines. Other groups that increased the percentage of advertisements was sweet breads, cakes, muffins, high fat savory biscuits, pies, pastries, and rice pudding, from 7.2% to 10.6% after the regulation

Conclusions: According to the obtained data, it is observed that the general population, especially children and adolescents in particular are exposed to a great quantity and variety of non healthy food and beverages advertisements, and their message is reinforced several times during TV hours

Keywords: obesity, advertisement, regulation, children, non-healhty-food

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EFFECT OF EXCESSIVE GESTATIONAL WEIGHT GAIN DURING PREGNANCY ON DAUGHTER'S BREAST DENSITY AT THE END OF PUBERTY ONSET

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Background and objectives: Breast density (BD), is one of the most important risk factors for breast cancer (BC). The relationship between maternal gestational weight gain (GWG) and BD in their daughters have not been explored.

The Institute of Medicine (IOM) 2009 established recommendations for GWG according to pre gestational body mass index (BMI). Thus our aim is to assess the association between excessive GWG according to IOM recommendations and daughter's breast composition (% of fibroglandular volume (%FGV) and absolute fibroglandular volume (AFGV) at the end of puberty onset (Tanner B4).

Methods: We included 341 girls from an ongoing cohort of 400 low-income Chilean girls born in 2002-2003 and their mothers. Maternal GWG was self-reported by questionnaire (year 2007) and in 2010 we performed digital mammography for measuring BD. In daughters, we collected data on anthropometry (weight and height) and breast composition by DXA at Tanner B4. %FGV and AFGV is derived considering a two-compartment model of adi-

pose and fibro-glandular tissue using a software developed at the University of California San Francisco; test-retest precision was 2.8%. Crude and adjusted (BMI z-score at B4, age at menarche, maternal schooling and maternal breast density) Odds Ratio (OR) and 95%CI were estimated to assess the relation between excessive GWG according to IOM 2009 and 80th percentile of %FGV and AFGV.

Results: Mean GWG was 13.7 kg (SD=7.0). A larger proportion of women with excess weight before pregnancy exceeded the recommended GWG compared to women with normal pre-gestational weight (58.8% vs 31.8% respectively). We did not observe an association between excessive GWG and %FGV; however, women who had excessive GWG their daughters had higher levels of AFGV (OR adjusted: 2.10; 95% CI 1.18 - 3.77) at B4.

Conclusions: Daughters of women who had excessive GWG according to IOM had higher AFGV. This could be explained by metabolic and hormonal exposure in utero, which could be modifiable at early life reducing BC risk in adulthood. Funding: WCRF 2010/245.

Keywords: Breast Density, Pregnancy Weight Gain, Breast Cancer.

144/2241
FOOD ENVIRONMENT CHARACTERIZATION OF A PUBLIC UNIVERSITY IN RIO DE JANEIRO

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Background and objectives: The characterization of the food environment helps to identify factors that can influence food behavior and is considered a promising strategy to promote healthy eating habits. Thus, this study has objective was to describe the food environment of the campuses of a public university in Rio de Janeiro, Brazil.

Methods: The data collection took place was performed during the second semester of 2016 in establishments located on university campuses, totaling 1 snack bar and 4 establishments of the mixed type. The instrument used for the data collection was proposed and validated by Franco (2016) for analysis of the universal food environment. There was preview approval by the Ethics Committee and with consent of all the responsible for the establishments in the analyzed university.

Results: The nutritional information wasn't found at the analyzed establishments. Only the fruit in natura was marketed at all establishment, raw and cooked vegetables and veggies was offered

by 80% and 60%, respectively, and 75% offered leguminous; a 100% of snack bars offered pastry and sandwiches. The products with the highest averages of different types were candy or chewing gum (8±7.1), soft drinks (9±3.7), chocolates and chocolates bar (8 ± 7.1), crackers (8 ± 12.3) and cookies (7±9.1). Sandwiches, snacks and other products with low nutritional value, had lower average price fruit or fruit salads; and sweetened drinks (like soda and natural guarana) also presented average price less than natural fruit juice.

Conclusions: The university's food environment hinders access to healthy feeding, presenting several barriers on college campuses.

Keywords: Food environment. University. Beverages. Foods. Price.

144/2246
PROGRAM TO IMPROVE FRUIT AVAILABILITY IN A WORKPLACE AND ITS EFFECT ON THE PERCEPTION OF CONSUMPTION BY EMPLOYEES

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Background and objectives: Grupo Éxito, is the biggest private employer in Colombia, with an amount of 42.000 employees, contemplates in its Nutrition Policy the promotion of a healthy work place, which aims contribute to the integral health of its employees through programs of health promotion and disease prevention. One of the actions implemented within this strategy is the program that delivery fruit in the office, began in 2015. The aim of this paper was analyze a change perception in the consumption of fruits in the employees who were impact by the program in its first year.

Methods: Cross-sectional study. A total 2,399 employees were qualified to answer the survey during two weeks on the company's virtual platform. The survey includes next variables: daily fruit consumption, portions of fruit consumed per day, origin of the fruit consumed, change perception of the amount of fruit consumed since the beginning of the program. A descriptive analysis was performed using X2 tests to establish the relationship between the variables of interest. α = 0.05. SPSS software v.23.

Results: 282 employees answered the survey, 11.8% of the qualified employees. 78.7% reported consuming fruit daily, of these 30.9% consume one serving daily, 33.0% two portions, 17.7% three portions and 17.0% four or more servings per day. The consumption of fruit comes mostly from the program offered by the company, followed by the home and finally from other sources such as retail. About the increase in fruit consumption, 64% of surveyed mentioned that their consumption increased with the program. A significant relationship was found between the increase of fruit consumption and the implementation of the program (p = 0.0087).

Conclusions: The companies can implement small actions such as facilitating access and availability of fruits in the workplace, promoting an adequate diet and providing environmental support for the achievement of healthy eating habits.

Keywords: Fruit, Workplace, Health, Strategies, Health Promotion.

Conflict of Interest Disclosure: This research project is funded by Grupo Éxito. The opinions expressed are those of the authors and do not necessarily represent the views or recommendations of their Affiliations.

PREVALENCE OF EXCLUSIVE BREASTFEEDING IIN CHILDREN ACCOMPANIED BY SISVAN-WEB IN THE MUNICIPALITY OF DOURADOS-MS BETWEEN YEARS OF 2008 TO 2015

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Background and objectives: Not breastfeeding (BF) in the first years of life has been raising infant morbidity/mortality rates. Therefore, official governmental must monitor this practice.

SISVAN – WEB (NUTRITIONAL SURVEILLANCE SYSTEM- WEB) was created in 2008 in Brazil in order to facilitate the health follow-ups registrations of Unified Health System's users, attended at basic health Unit. This system allows public acess to reports that contains the Diagnosis of the users' health.

This study's objective was to evaluate the prevalence of Exclusive Breastfeeding (EBF) at Dourados – MS (Brazil) by the SISVAN-WEB, among children aged 0 to 6 months between the years of 2008 and 2015.

Methods: It was analyzed public reports of food consumption from 2008 to 2015. In these reports it was evaluated the distribution of EBF children during the health care attendance and the distribution of EBF children according to the BF duration. Data from the Basic Care Information System (SIAB) were also analyzed to assess the total number of children under six months of age registered at basic health Unit.

Results: Analyzing the results it was possible to verified that the year 2010 was the period with the most prevalence of EBF (98,78% of 492 children), and the lowest prevalence was in 2008 (43,48% of 23 children). The prevalence of BF in Dourados's city have indicators considered good by the World Health Organization (WHO), with the exception of 2008. The SISVAN-WEB, in this period, was able to analyze on average 39% of the children registered by the basic health units. The data also showed that the majority of children were being breastfeed by a period of one month (8%).

Conclusions: Although the numbers show that the city of Dourados-MS has good levels in EBF according to WHO indicators, the results were hampered, due to the lack of Of SISVAN_

WEB data. Oftentimes the workers from units health, doesn't fill the data base due the lack of kwnoledge of its importance. In Brazil there is a need in promoting BF, since many mothers stop breastfeeding due to dificulties and the need for better understandment about breast milk importance.

Keywords: breastfeeding; SISVAN-WEB; basic health units

USE AND PERCEPTION OF THE NUTRITION LABELING OF PACKAGED FOODS AND BEVERAGES IN MEXICO

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Background and objectives: Nutrition labeling has been recognized as a tool that influences food choices towards healthier; furthermore, it promotes reformulation of processed foods. The aim of this study was to document the use and perception of the information of different nutrition labels (Guideline Daily Amounts GDA, nutrition information table, list of ingredients, logos and claims) displayed in packaged foods and beverages of Mexico.

Methods: Data was taken from a national representative survey. The semi-structured labeling questionnaire was previously piloted and validated with population from different socio-economic status, age groups, and regions of the country. The questionnaire consisted of 16 items. The first two questions were related to the knowledge about the daily calorie consumption of a normal healthy adult in a single day. The other questions were related to the knowledge, reading, use, comprehension and perception of the displayed information in the packaged food and beverages, when choosing a food product at the sale point. Answers were reported in a Likert scale.

Results: The survey collected data from 8,667 persons older than 20 years. From which, 52.3% were women, 26.7% were from the group of 20 to 29 years, and 16.9% of 60 years and older. From the total or participants 89.7% knows how to read.

At the national level, 76.3% (IC95%, 73.5,78.8) of the population did not know or did not respond how many calories they are supposed to consume, and 7.2% (IC95%, 6.1,8.6) responded that less than 500 calories.

At the national level, from the total of the population that knows how to read 40.6% (IC95% 38,43.3) reported reading the nutrition labeling of packaged foods and beverages. The percentage of the population that read the nutrition information displayed in the back of the package of processed foods is higher than the percentage of people that disclaimed reading the front of the package labeling (71.6% vs 55.9%) (p<0.05).

Conclusions: It is important to identify and apply a version of the front of the package labeling that is more susceptible of been understood and used by a larger sector of the population. This version must be implemented as a public health strategy.

Keywords: Nutrition, labelling, proccessed-foods, beverages

144/2263

ASSESSING BENEFICIARIES' APPROPRIATION OF A MULTIFACETED CASH TRANSFER PROGRAM IN NORTHERN TOGO THROUGH COMPREHENSIVE MIXED METHODS

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Background and objectives: A pilot cash transfer (CT) program was implemented in the two regions of Togo concentrating the worst nutritional outcomes. The intervention, which aimed at improving child's nutrition and health, combined Behavior Change Communication activities (BCCA) with a monthly cash transfer given to women during the "1,000 days period". A process evaluation was performed to understand beneficiaries' perception and utilization of the program.

Methods: Qualitative data, encompassing semi-structured interviews (n=60), focus groups (n=15) and non-participant observations of CT's payments and BCCA (n=40) were collected 8 months after the program's start on a purposive sampling of beneficiaries. Quantitative data were also collected on cash utilization from 400 beneficiaries, after 2 years of intervention. All data were collected in local dialects by experienced surveyors. Qualitative data were fully translated, transcribed and analyzed by thematic content using Nvivo®. Descriptive statistics were produced using R-3.3.3®.

Results: Beneficiaries were globally satisfied with the intervention. They particularly appreciated BBCA-CT's synergy that enabled them to acquire knowledge and apply it in practice. They mainly spent CT to meet their child needs: 91% of women declared using CT to buy them food and 68% to cover their health expenditures.This conformist utilization, in line with the program objectives, resulted from a strong social pressure. Despite this tight control, money was not always exclusively used by women nor devoted to children. Nearly 20% of beneficiaries regularly shared half of their CT, mainly with their spouse. Moreover, 30% of women who usually received money from their husband no longer benefited from it since they have entered the program. Another potential adverse effect of CTs lies in birth encouragement: 36% of women thought that CT may promote births, of which 70% said that CT personally encouraged them to have a child. Some women considered pregnancy as a way to continue receiving the CT. More farsighted women anticipated their program's exit by sparing some of their CTs or by initiating income-generating activities (40%).

Conclusions: Using mixed-methods enriched our understanding of beneficiaries' appropriation of the intervention, a crucial aspect that will help decoding program's "black box" and explaining its impact.

Keywords: cash transfer program, mixed methods, nutrition, process evaluation, Togo

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144/2268

DIGITAL MESSAGING INTERVENTION TO PROMOTE APPROPRIATE FEEDING PRACTICE

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Background and objectives: In Bangladesh preparing, serving and feeding children with bare hands is a common practice. Complementary feeding may not promote optimum childhood growth if consuming contaminated foods result in repeated bouts of illness. Proper health education is the only way to raise awareness among the community. So using video content for education is revolutionary approach to disseminate care education and emergency management to the underprivileged community through mobile phones for improving knowledge and practice. BRAC's mHealth programme is a comprehensive community based health care focusing on urban reproductive, maternal, neonatal, child and adolescent health. The purpose of the abstract is to demonstrate the achievement of digital nutritional interventions of the programme of 2016.

Methods: Video messages were implemented in four urban areas of Dhaka by community health workers through smart phones to educate and demonstrate about feeding and hygiene practice to mother of children under 5 years of age. Data were collected by Community Health worker's through observational checklist.

Results: Data from year 2015 shows that 68% of the parents are washing hand for preparing food and feeding. In 2016 about 90% were washing hand for preparing food and feeding, which reveals that using video content for education is more sustainable approach for health education. Data also shows that the incident of diarrhea reduced 35% in 2016.

Conclusions: Awareness and health education can make a big difference in behaviour and health practice of parent during food preparation and feeding. Enteric diseases are often caused by poor hygiene and can contribute to stunting. As the conventional awareness building mechanism cannot influence the parent's behaviour to the expected level, this video method of health education conceptualize an idea of awareness building and emergency management robustly influence their health practicing behaviour. A better understanding of the context of handwashing at these key times could help to develop effective interventions to improve hand hygiene practices thus the nutritional status of children under 5years of age.

Keywords: Complementary feeding, hand washing, health education, digital health messages, mHealth

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144/2271

FUNCTIONAL CAPACITY IN HEALTHY FREE LIVING ELDERLY WOMEN CÓRDOBA CITY, IN ACCORDANCE WITH THE AGE

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Background and objectives: Older adults are a vulnerable population group. Given the current conceptions regarding life quality within this group, keeping independence and autonomy at an advanced age is relevant.

Objective: to analyze the relations between functional capacity -physical and cognitive- by age in healthy free living elderly women from Córdoba city.

Methods: 178 healthy free living women ≥60 years old were included, which were evaluated by physical and cognitive functional tests. Functional capacity= physical+cognitive. Categories: independent (I), Partially dependent (PD), Dependent (D). Age (years): 60-69; 70-79; ≥80. Instruments: instrumental activities of daily living -IADLs- (points): with and without functional limitations (8 and 0-7 respectively). Folstein Minimental Examination –MME-(points): with and without cognitive decline (<24 and ≥24 respectively).

Results: Most women were functionally independent (78.09%). Cognitive decline doubled in relation to functional limitations as a cause of partial dependence.

Partial dependence was increased in relation to the age gaps. It was doubled in groups between 70-79 years and to four times more frequently in the ≥80 year's gap, regarding to 60-69 years.

Comparing the categories of functional capacity in each age range, the proportion of partial independence/dependence showed a ratio of almost 2 to 1 (51.41 vs 25%) among young women relation that resulted from 1 to 3 between the 80s and older (7.04 vs 22.22%). The distribution of functional capacity in each age group showed that functional independence decreased as the age was increased from 89.02% to 55.56%. The opposite was observed among partially dependent women, whose frequency doubled and quadrupled to younger people in groups of 70-79 and ≥80 years respectively. The age was associated with functional capacity (p=0.0029)

Two-thirds of partially dependent women had no physical limitations considering the IADLs, and 74.99% presented cognitive impairment.

Conclusions: Functional independence decreased as age increased. The contrary happened between the elderly partially dependent. Age and functional capacity were significantly associated.

Keywords: elderly women, physical function, cognitive function, functional capacity.

Further collaborators: PhD. Rafael H. Gallerano. Facultad de Ciencias Médicas. Universidad Nacional de Córdoba. Argentina

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144/2272

DIFFERENCE IN INDIVIDUAL DIURNAL WEIGHT FLUCTUATION IN COLLEGE ATHLETES

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Background and objectives: The aim of this study was to the college athletes who usually training, it is to clarify diurnal weight fluctuation.

Methods: Twelve female rhythmic gymnasts (19.5±0.5years) and two male rugby player(20.5±0.7years) participated in this study. Body composition was measured InBody230 and 720. Body weight was measured at early morning fasting and then measured at seven times by 16 o'clock at 90 minute intervals using UC-321. After 16 o'clock, measurements were taken after the end of training, After that, before and after dinner and the next day when waking up. It was carried out 11 times in total. The amount of physical activity was measured with a 3-dimensional accelerometer Active style Pro HJA-750C , attached to the waist until the end of measurement. Water was provided and food was taken free, on the day of measurement, and each intake was measured. The change in the day of the weight was based on the first time and calculated a rate of change. In addition, difference between dietary intake and two measurements was obtained and systematic error was confirmed by Bland-Altman analysis.

Results: There was a significant positive correlation between each meal amount and body weight(P <0.05). However, there was

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no significant relationship in weight loss between meals. A significant negative correlation was observed in weight loss during fasting in the early morning 12 hours after dinner.

Conclusions: In college athletes who usually training, It was suggested that weight gain is more difficult for weight loss at rest.

Keywords: college athletes, diurnal weight fluctuation, rhythmic gymnasts, rugby player, weight loss

144/2280

AVAILABILITY OF FRUITS AND VEGETABLES IN THE FOOD ENVIRONMENT OF A PUBLIC UNIVERSITY

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Background and objectives: The university food environment stands out as strategic for the health promotion, since the foods offered can influences the eating habits of the students exposed there. Objective: To analyze the supply of fruits and vegetables in the university food environment of a Brazilian public university.

Methods: Sectional study, conducted in December 2016, in all establishments that produce meals at the university. A checklist was used to assess the availability and quality of fruits and vegetables. To analyze the supply of fruits and vegetables (FV), were considered the ten fruits and ten best vegetables most purchased by the family in the southeast region, according to the "Pesquisa de Orçamento Familiar (POF- 2008-2009). The absolute and relative frequency of establishments selling fruits and vegetables were calculed.

Results: Eight establishments were studied, of which 50% offered fruit (n-4) and 100% (n-8) offered at least one type of vegetable. Of the establishments that offered fruit, 25% offered 1-2 varieties, 50% of 2-3 varieties and 25% more than 3 varieties of fruits. Pineapple, banana, papaya and melon were offered in 50% of establishments. As for vegetables, it was observed that 12.5% offered 1-5 varieties, 37.5% of 5-10 varieties and 50% more than 10 varieties of vegetables. Beet and tomato were offered in 100% of establishments. Regarding the quality of the studied FV, it was observed that all fruits presented good quality. For vegetables, in two establishments (25%) three varieties with poor quality were found.

Conclusions: Most establishments had a wide availability of vegetables and fruits, which had good quality and were therefore facilitators for healthy eating.

Keywords: food environmental, fruits and vegetables, and university

144/2281

DIETARY INTAKE OF PRESCHOOL CHILDREN IN UTTAR PRADESH INDIA

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Background and objectives: Limited data on individual dietary intakes of children up to the age of 60 months is available in India. In a statewide survey of children in Uttar Pradesh, India, dietary intakes of children and its association with nutritional status, defined as stunting, underweight and wasting, were examined.

Methods: We conducted a state representative survey between October and December 2016 to examine nutritional deficiencies, anthropometry, and dietary intake of rural and urban preschool children. A single 24-hour recall was collected from mothers of 564 urban and 674 rural children aged 6 to 59 months of age; duplicate recalls were collected in 100 children. Children were classified as stunted, underweight and wasted based on 2006 WHO child growth standards. Associations between energy-adjusted macronutrient intake and nutritional status of children 6-23 months and 24-59 months were examined in urban and rural settings using logistic regression

Results: Preliminary analyses indicated that median daily energy intake was 524 (95% CI: 452, 597) kcals and 770 (714, 827) kcals in children <2 years and ≥2 years, respectively. The mean percent energy intake from fat and protein were 28% and 12%, respectively in both age groups, and was not different between and urban and rural settings. All macronutrient intakes were comparable between urban and rural settings in both age groups. Prevalence of stunting was higher in rural (50%, 95% CI:47% to 55%) compared to urban children (43%, 95% CI: 39% to 48%). Prevalence of underweight and wasting were comparable in both settings (32% in rural and 7% in urban settings). Macronutrient intake was not associated with stunting and underweight across settings and age groups.

Conclusions: Macronutrient intakes were comparable between rural and urban settings. Co-existence of multiple indicators of undernutrition were observed in urban area.

Keywords: dietary intake, preschool children, stunting, malnutrition

144/2283

CARDIOMETABOLIC RISK RELATED TO CHRONO-TYPE OF CHILDREN BETWEEN 6 TO 12 YEARS

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Background and objectives: Alterations in normal sleep and wake rhythms directly influence the deterioration of health status and increase the risk of development of noncommunicable chronic diseases and associated comorbidities. The main objective was to determine the prevalence of factors associated with cardiometabolic risk according to the chronotype in children aged 6 to 12 years.

Methods: In this observational, descriptive, cross-sectional study, to determine the chronotype the Munich Chronotype Questionnaire (MCQ) was applied in an interview with 76 children, also anthropometric measurement (weight, height and abdominal perimeter) were measured. For the statistical analysis, the normality of the variables was checked. The variables were described as mean +/- standard deviation (ordinal variable) and n (%) (categorical variable). To determine the differences between groups, a factorial ANOVA was performed between the chronotype categories according to middle sleep time, according to the authors' criteria based on similar studies, (Q1, Q2, Q3, Q4 and Q5) and the cardiovascular risk level (low, high and very high risk).

Results: The prevalence of overweight according to body mass index for age of 13% in men and 20% in women. The prevalence of cardiometabolic risk, according to abdominal perimeter for age, were low risk, high risk and very high risk of 50, 20 and 30% in men and 50, 30 and 19% in women, respectively. No statistically significant differences were found in the prevalence of risk between groups according to MCQ variables, such as bedtime, sleep duration and chronotype; However, dividing the group into quintiles yielded a trend toward significance for the difference between groups. After, in the post hoc analysis no differences were found between the analyzed groups.

Conclusions: The phenotypic characteristics of the sample under study, as well as the related indexes, such as cardiovascular risk, do not show a relationship with the data derived from the MCQ. A large dispersion on data was found, which made it difficult to analyze and interpret the results. New lines of research, which may have a larger sample size, are necessary to elucidate the existing potential relationship between the aspects derived from the Munich chronotype and the nutritional status of a child population.

Keywords: Cardiometabolic risk, chronotype, child overweight.

144/2284

INVISIBILITY AND VULNERABILITY OF THE CELIAC PATIENT IN THE CONTEXT OF THE FOOD OUT OF HOME

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Background and objectives: Celiac disease is a chronic enteropathy characterized by total or partial atrophy of intestinal villi and permanent intolerance to gluten, whose prevalence is 1% of the world population. Considered a public health problem, celiac disease is triggered in genetically predisposed individuals by consuming gluten-containing cereals and the treatment consists in the permanent withdrawal of gluten from the diet. Gluten is the protein fraction found in cereals like wheat, oats, barley and malt. The consumption of gluten by celiac disease causes changes in the intestinal mucosa and consequently malabsorption of nutrients, which can lead the individual to serious complications such as osteoporosis and malignant diseases of the intestinal tract. The lack of knowledge about the disease on the part of society and the family, became the celiac in a constant situation of vulnerability.

The objective of this research was to identify the social impacts of the gluten-free diet on eating out of celiac people living in a southern Brazilian city.

Methods: Interviews were conducted with 20 celiac patients from the Celiac Association of Parana, through qualitative research.

Results: In the context of food outside the home, these individuals are often excluded, making themselves invisible to society because of the limited supply of establishments that prepare totally gluten-free foods. To know the difficulties of these people is to provide them with inclusion and visibility, as well as guaranteeing health and the right to an adequate diet, already recognized by the Universal Declaration of Human Rights and the Universal Declaration of Bioethics and Human Rights.

Conclusions: Reporting the invisibility and vulnerability situations these celiac sufferers are exposed to by seeking gluten-free

food in the context of eating out is critical if the right to adequate food is to be fulfilled.

Keywords: celiac disease, feeding, human rights, food.

FOOD INSECURITY AT HOME DECREASES DIETARY DIVERSITY IN MEXICAN ADULTS

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Background and objectives: The lack of income to purchase food has the consequence that adults decrease the number, quantity and quality of food they consume and, in extreme cases, stop eating for a whole day. These changes affect the quality of life and health of the population.

The aim of this work is to describe the dietary diversity (DD) of Mexican adults aged 20 to 59 years according to the severity of household food insecurity (HFI).

Methods: The study included 2297 women and men 20-59 years based on data from the Mexican National Health and Nutrition Survey (ENSANUT 2012). A diet diversity index was constructed from a seven-day food frequency questionnaire. The index included nine food groups. HFI was measured with the Latin American and Caribbean Food Security Scale (ELCSA). According to the number of positive responses, households were classified into four categories: food security (FS), mild food insecurity (MFI), moderate food insecurity (MFI) and severe food insecurity (SFI).

The number of foods and food groups consumed by adults according to level of food insecurity was calculated. The proportion of adults consuming each food group according to each level of HFI was obtained. Differences between categories of food insecurity were calculated using linear and logistic regression models adjusted for sociodemographic variables.

Results: FS adults consume a greater diversity (5.6 groups) and number of foods (20) per day compared to adults in SFI (Diversity=4.8 groups and 16.2 foods). A lower proportion of adults in SFI consume meat and fish as well as milk and dairy products.

Conclusions: HFI in the country affects the quality of the diet of a significant fraction of the population. It is necessary to support the existing strategies in public policy to improve the quality of life of the Mexican population.

Keywords: Food security, dietary diversity, nutrition survey, adults

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LONGITUDINAL NUTRITION ANALYSIS WITH NUTRIMETRY IN YUCATAN'S ELEMENTARY SCHOOL CHILDREN 2014-2016

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Background and objectives: Mexico is the first place in overweight and obesity in childhood, and Yucatan is among the first three places in the country, and also has one of the shortest height averages. Under this condition, Yucatán Government has implemented an Integral Program for Childhood Obesity Attention (PIAOIY) since 2010 which first step consists in assess some nutritional indicators at school, year by year to screening risk groups, and channeling them to appropriate health services. The objective of this study is present a longitudinal analysis of the program with Nutrimetry, combining BMI and height.

Methods: Yucatan's elementary school students measured for three consecutive years (2014-2016) were analyzed with Nutrimetry: according to WHO z-scores values were assigned, for height/age: $z \leq -2 = 1$, $z \geq 2 = 5$, or 3 to the rest, and for BMI/age: $z \leq -1 = 0$, $1 \leq z < 2 = 6$, $z \geq 2 = 12$ or 3 to the rest, values were crossed and 12 codes (1-3-5, 4-6-8, 7-9-11, 13-15-17) that combine underweight, normal-weight, overweight and obesity with short, normal and high heigh were obtained. Prevalences and changes over time were analyzed.

Results: Data of 6,011 students with a start age of 8.79 years (S.D.=1.33) were analyzed.

From the first to the third year, prevalence of low-height codes (1, 4, 7 and 13) decreased (mean=1.61); all high-height ones (5, 8, 11 and 17) increased (mean=0.11), and normal-height with overweight(9) and obesity(15) increased (mean=2.30), whereas those with normal-weight(6) and low-weight(3) first increased (mean=1.29) and then decreased (mean=1.73).

According to Nutrimetry first year classification, mean z-scores (BMI/Height) were compared with repeated measures ANOVA, in all codes except those with high-height p-value ≤ 0.05.

On the rest codes: z-height tend to increase yearly, but in underweight group, this was not significant every year. Z-BMI in underweight (1 and 3), and normal-weight (4 and 6) codes tend to increase, but it doesn't in overweight (7 and 9) and obesity (13 and 15) groups.

Conclusions: Prevalence of short-height is decreasing, but in underweight children, it is more complicated to fight against this condition.

Although in the overweight and obesity groups, z-BMI do not increase, the prevalence of these groups is still increasing, indicating that the approach should not only be interventional, but also preventive.

144/2302

ULTRA-PROCESSED FOODS AND ADDED SUGARS IN CHILEAN DIET (2010)

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Background and objectives: A rapid simultaneous increase in sales of ultra-processed foods and obesity prevalence has been observed in Chile in the last decade. This study evaluated the consumption of ultra-processed foods in Chile and its association with the intake of added sugars in the diet, one important driver of obesity.

Methods: A probabilistic sample of 4920 individuals (>2y) from a cross-sectional dietary study carried out in Chile in 2010 was included. Food consumption was measured through 24-hour recalls and classified into food groups according to the extent and purpose of food processing (NOVA classification). Gaussian regression analyses were used to estimate the association between energy contribution of ultra-processed foods and the energy intake of added sugars (as proportions of total energy intake). Poisson regression models were used to analyze the proportion of individuals consuming more than 5 and 10% of total energy from added sugars (World Health Organization, WHO, cutoffs) across quintiles of the energy share of ultra-processed foods.

Results: In the Chilean diet, ultra-processed foods represented 28.6±0.5% of total energy intake and 56.5±0.9% of added sugars intake. The mean percent of energy from added sugars was 13.5% and increased from 7.9±0.3% to 20±0.5% across quintiles of the dietary share of ultra-processed foods. After adjusting for several potential sociodemographic confounders, a 5 percentage points increase in the dietary share of ultra-processed foods determined a 1 percentage point increase in the dietary content of added sugars. Individuals in the highest quintile were 2.7 (95%IC: 2.3-3.2) times more likely to exceed the 10% upper limit for added sugars recommended by the WHO compared with those in the lowest quintile, after adjusting for sociodemographic variables. This association was stronger among individuals between 2-19y (3.9 (95%IC: 2.7-5.9)).

Conclusions: Ultra-processed foods are important contributors to the excessive added sugars content of the Chilean diet. Actions aimed at decreasing the consumption of ultra-processed foods emerge as useful tools for achieving WHO dietary recommendations on added sugars, especially among children and adolescents. Funding: FAPESP nº2016/13522-3

144/2304

NUTRITIONAL STATUS OF CHILDREN UNDER 5 YEARS IN TWO VULNERABLE TERRITORIES IN CALI – COLOMBIA

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Background and objectives: Introduction: child nutrition is fundamental for physical, cognitive, emotional and social development. The relevance of nutritional status lies on the fact that it is a direct reflection of a country´s progress and inequalities. Objectives: definition of the nutritional status of children under 5 years in two vulnerable territories in Cali – Colombia.

Methods: prevalence study using cluster randomized sampling. Univariates analysis was performed taking into account de variable nature and distribution. For the qualitative variables frequencies, central tendency and dispersion were estimated. ANTRO software of the WHO was used for child growth standards. The variables used were BMI/age, length/age and weight/length.

Results: for the variable BMI/age; 12% of the patients were obese, 18% overweight, 8% underweight and 11% in underweight risk. In gender terms boys were predominantly overweight and girls underweight with statistical significance. For the variable length/age; 23% presented short size and 27% were in risk. Boys were more affected but girls were more at risk. For the variable weight/length; 11.9% were obese, 15.7% overweight, 12.6% low weight for length and 7.8% very low weight for length. Excess was more frequent in boys and low weight in girls.

Conclusion: in two vulnerable territories in Cali – Colombia one out of two children presents an inadequacy in nutritional status,

this implies that is mandatory to create interventions for children under 5 years that prevent adverse consequences in the future.

Keywords: nutrition, status, prevalence, children, Colombia.

144/2314

FACTORS ASSOCIATED WITH MATERNAL PROFILE AND NEWBORNS WITH GASTROSCHISIS TREATED AT A REFERENCE CENTER IN THE CITY OF RIO DE JANEIRO

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Background and objectives: The increasing number of new cases of gastroschisis associated with lower mortality rate causes the increased prevalence of this disease, resulting in a significant increase of the costs of this malformation to the health systems.

Despite the high incidence of this malformation in Brazil, there is a shortage of national studies published in the literature. Therefore, this study aimed to trace the maternal profile and newborns with gastroschisis and the main associated risk factors.

Methods: Cross-sectional analysis of data collected in the period from January 2012 to July 2013, of all children with gastroschisis operated at the National Institute of Women's Health Child and Adolescent Fernandes Figueira (IFF). Maternal, obstetric and neonatal variables were evaluated.

Results: We found a higher prevalence of adolescent mothers (61.7%), brown (55.9%), single (76.3%) and gilts (81.7%). 73.3% of children were born by cesarean section, and the early majority (61.7%) and low birth weight (66.7%). The surgery steps for gastroschisis correction was the most frequent. The average length of stay was 43 days, 23 days to zero diet and 30 days for total parenteral nutrition. The survival rate was 91.7% and the most prevalent high diet was the exclusive breastfeeding (64.8%)

Conclusions: The results of this study show increased frequency of gastroschisis among infants born to young women, single, brown, gilts and eutrophic. It was also noted that the average length of stay as well as the zero diet differed in relation to other international studies. This can partly elucidated due to technological and socio-economic differences between Brazil and developed countries.

Keywords: Gastroschisis; Epidemiology; Child Health.

144/2323

ASSOCIATION BETWEEN AFFECTION AND NUTRITION IN INFANTS FROM 0 TO 12 MONTHS IN MARIO CORREA RENGIFO HOSPITAL

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Background and objectives: Introduction: few studies analyze the relationship between affection and inadequate alimentary habits, these are remarkably high in low income families where violence and chaotic surroundings are common and are predisposing factors for nutritional – affective repercussions of the minor. Objectives: explore the conditions that favors the affective bond in infants between 0-12 months of age that consult to Mario Correa Rengifo Hospital in Cali city.

Methods: mixed study, exploratory. A semi-structured interview was used, family Apgar and Massie- Campbell Scale for observation of mother – baby bonding indicator.

Results: 60% of the population of the study was considered as "Estrato 1" (classification system of Colombia depending on family incomes, 1 is the lowest and 6 is the highest). 33% of the families sleep in the same room with the baby. 85.71% of the mothers breastfeed the babies exclusively until the sixth month. 26.98% of the babies that don´t breastfeed presents medical complications like malnutrition, intestinal infection and diarrea. 76.19% of the mothers spend most of their time with the baby.

Conclusions: There was a relationship between breastfeeding and mother sensibility and bonding. Positive relation between mother and child are important. The mother represents de whole for the baby, not only in the feeding aspect but also love and well-

being. It is important to continue the investigation for promoting breastfeeding in Cali - Colombia.

Keywords: Nutrition, bonding, affection, children, Cali

144/2331

FOOD SECURITY'S PERCEPTION OF VULNERABLE FAMILIES IN THE SAN CAYETANO AND SURROUNDINGS NEIGHBORHOOD DURING 2017

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Background and objectives: Food security in families would have a positive impact on the quality of food and on proper nutrition of its members. It is related to better growth and development of children. Also, it may impact on the work capacity.

The aim of the study was evaluate the perception of food security in vulnerable families of San Cayetano and surroundings neighborhood during January - 2017.

Methods: A cross sectional study carried out on the head of the household of vulnerable families in the neighborhood of San Cayetano and surrounding areas during January 2017. The ELCSA validated questionnaire was used to measure the perception of food security.

Results: We evaluated 47 families, of which 35 families had at least one member younger than 18 years.

The median number of member of the families was 5.5 person (minimum 1 - maximum 10). The median of number of children younger than 5 years was 1.5 (maximum 4 - minimum 0). The heads of household were predominantly female (n = 39).

Only 10% (n = 5) of the families had the perception that they had food security. Of those who presented food insecurity, the highest percentage corresponded to those with mild food insecurity (45%, n = 21).

Conclusions: The majority of families evaluated presented some level of food insecurity. This situation is relevant because of the characteristics of their vulnerability situation that may worsts in the case of inundation.

Keywords: food security, vulnerability, ELCSA
Further collaborators:

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144/2340

ASSOCIATION BETWEEN ALTITUDE AND MALNUTRITION IN PERUVIAN CHILDREN UNDER FIVE YEARS

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Background and objectives: One-third of Peru's population lives above 2000 meters above sea level. There is evidence that children in these communities have a higher prevalence of growth retardation than other Peruvian children. Besides, it is a worry that obesity of these children might be increased, for these reasons the objective was to determine the influence of residence altitude on stunting and obesity in Peruvian children under five years of age.

Methods: Secondary analysis of the National Monitoring of Nutrition Indicators (2007-2010). The children (n = 3835) were weighed and carved. Stunting was defined as the Z Size / Age score less than -2SD, and the Obesity with Z score / Weight greater than 2 SD from the WHO growth reference. The cutoff point for altitude was 2500 meters above sea level. The poverty intervening variable had two categories: "poor" those with one or more Unsatisfied Basic Needs (NBI) and "non-poor" those who did not have any NBIs.

Results: In the first level of altitude (<2500 meters above sea level), the stunting was more prevalent in children older than 24m (13.3%) and in the poor (20.5%), while obesity was highest in children younger than 24m. (11.1%) and non-poor (8.5%). In the second level (≥ 2500 meters above sea level), stunting predominated in children older than 24m. (32.5%) and in the poor (35.8%). As for obesity, it was higher in children under 24m. (5.8%) and in the poor (4.5%). For stunting living in cities that are below 2500 meters above sea level, being less than 24 months and being considered not poor represented a protective factor. While for obesity living in cities below 2500 meters above sea level meant having 3 times more Risk of being obese, in the same way, having less than 24 months represented 2 times more risk of being obese.

Conclusions: The stunting is mainly located in the populations of higher altitude, in the majors of 24 months and in the considered as poor, whereas the obesity in the populations of lower altitude, in the children of less than 24 months and in the non-poor group.

Keywords: altitude, stunting, obesity, malnutrition

144/2345

PERCEPTIONS OF MOTHERS ABOUT SCHOOL BREAKFAST PROGRAM AT AN EDUCATIONAL INSTITUTION IN LIMA, PERU

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Background and objectives: Feeding during the school years is critical for the child and the breakfast is an important part of a good diet is breakfast; School Food Program from Peru provides school breakfasts, but we do not know if parents consider this type of breakfast to be optimal. The present study aimed to investigate mother´s perceptions, concerns, and attitudes about school breakfast program in an educational institution in Lima, Peru.

Methods: Qualitative research approach and grounded theory method. Four focus groups and seven in-depth interviews with a total 31 volunteer mothers of 6-8-year-old children. Mothers were asked their views about the school breakfast program, the attitudes about the food that the program offers their children. Conversations were tape-recorded and transcribed for thematic analysis.

Results: The mothers perceived that eating school breakfast improves health, academic performance and eating habits of children, also acknowledged the financial support to the family and the support offered to the mother; on the other hand, they perceived that at often times, children have breakfast both at their houses and at school, which, combined with junk food, could cause diseases. They also reported that the school breakfast had an inadequate variety, while their perceptions of safety, nutritional value and acceptability were varied. Regarding attitudes, mothers showed favorable attitudes to the consumption of school breakfast. However, some mothers showed favored the consumption of breakfast at home.

Conclusions: Mothers perceived both pros and cons of school breakfast, as well as positive and negative views regarding its quality.

Keywords: School, breakfast, perceptions, attitudes, children

144/2358

REGULAR MONITORING OF BABY FRIENDLY HOSPITALS STRENGTHEN THE IYCF PRACTICE IN BANGLADESH

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Background and objectives: Revitalization of Baby Friendly Hospital Initiative (BFHI) program has been started since 2012 and continued till 2016 throughout the country and certified 592 health facilities (HFs) in Bangladesh. To uphold the government investment and initiative, continuous monitoring is ongoing for bringing sustainability of Infant and Young Child Feeding (IYCF) practices in Bangladesh.

The main objective of BFHI monitoring is to strengthen the Baby Friendly Hospital (BFH) practices.

Methods: The revitalized BFHs (60 District hospitals, 414 Upazilla Health Complex (UHC), 64 Maternal and Child Welfare Center (MCWC) and 56 tertiary hospitals) are being continuously monitored through direct observation method following a structured monitoring tool by the 15 trained divisional officer in eight divisions of Bangladesh. Necessary information and technical support were also provided to the BFHs to strengthen BFHI committee, LMC/ breastfeeding Corner and practice of 10 steps of BFHI.

Results: From September 2016 to February 2017, a total of 97% (576) Baby Friendly Hospitals of eight divisions were monitored. According to the monitoring report, 75% (432) HFs are practicing the 10 steps of BFHI. Active BFHI Committee was found in 42% (241) HFs. Though the LMC was established in all HFs but 30% (178) of them were observed as functional. Compliance of Breast Milk Substitute (BMS) Act was increased and reduced violation. BMS products and leaflets were found only in 3% (17) HFs though representative of the BMS Company was not found in these HFs during Monitoring.

Conclusions: All Baby Friendly Hospitals are not following the indicators in all extents, therefore a strong and continuous monitoring system need to strengthen the BFHI practices as well as the IYCF movement in Bangladesh.

Keywords: Baby Friendly Hospital Initiative, BFHI, Monitoring, Lactation Management Centre, BFHI Committee.

144/2364

NUTRITIONAL STATUS AND NUTRITIONAL KNOWLEDGE ABOUT INFANT AND MATERNAL NUTRITION AMONG PREGNANT AND MOTHERS IN QUICHE, GUATEMALA

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Background and objectives: Guatemala is one of the countries of high rate of maternal mortality and under 5 mortality in Latin America. However specific reason which supposed to relate malnutrition in Guatemala is further consideration.

The aim of this study is to clarify nutritional status and nutritional knowledge among pregnant and to examine nutritional knowledge and attitudes for infants among mothers. Further, to detect methodology to improve nutritional status and nutritional knowledge among pregnant and mothers.

Methods: Two non-consecutive days for 24-hour dietary recall and self-reported height and weight were obtained from pregnant. Knowledge, Attitudes and Practices (KAP) survey for nutrition were conducted from both pregnant and mothers. All survey were conducted between August and September, 2016.

Results: Underweight 2nd trimester pregnant was 13.4% and 3rd trimester pregnant was 12.6%. Illiterate pregnant was 48.0%. Only 8.0% of 2nd trimester pregnant and 3.6% of 3rd trimester pregnant consumed energy more than estimate energy requirements.

Infant who exclusively breastfed were 73.7%. Mothers did not feel difficult to breastfeed her baby exclusively for six months (94.6%).

Conclusions: Present study clarified malnutrition of pregnant and very limited nutritional knowledge among pregnant and mothers.

It is needed to consider high rate of illiteracy to develop materials about nutritional education to improve nutritional status of pregnant, mothers and infant in the next period of proyect.

Keywords: Nutrition, KAP survey, pregnant, infant, Guatemala

Further collaborators:

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144/2379

OPINION OF SENIOR UNDERGRADUATE STUDENTS OF A NUTRITION PROGRAM ON THE CONTRIBUTION OF SUPERVISED INTERNSHIP IN THE DEVELOPMENT OF PROFESSIONAL SKILLS AND COMPETENCES

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Background and objectives: The National Curricular Guidelines (Brazil) establish that supervised internships in undergraduate nutrition programs should be developed in three basic areas: collective feeding, public health and clinical nutrition. Additionally, professional training must provide them with knowledge to develop the following general skills and competences: health care; decision-making; communication; leadership; administration and management and permanent education. Hence, our aim was to determine the opinion of senior undergraduate students in a nutrition program of a private educational institution of the city of São Paulo on the contribution of the supervised internship in the development of skills and competences required by the National Curricular Guidelines.

Methods: Students graduating in 2016 were asked about the contribution of each area of supervised internship in the skills and competences development. The five-point Likert scale was adopted with the items: totally agree, partially agree, indifferent, partially disagree and totally disagree. The responses were analyzed by means of the average ranking (AR), ranging from 1 to 5, and the closer to 5, the higher the level of agreement. AR below 1.5 constitutes level of "total disagreement", AR between 1.5 to 2.5 is "partial disagreement", AR 2.5 to 3.5 is "indifference", AR 3.5 to 4.5 is "partial agreement "and AR greater than 4.5 is "total agreement". The research was approved by the institution's Ethics Committee.

Results: The study had 102 participants. In the collective feeding area, 58 answered totally agree and 32 partially agree, with AR 4.37 (partial agreement). In the clinical nutrition area, 77 answered totally agree and 22 partially agree, with AR 4.70 (total agreement). In the public health area, 67 answered totally agree and 27 partially agree, and AR 4.53, also represented total agreement level.

Conclusions: The supervised internship allows the students to experience a professional practice. Although it seems to positively influence the development of the professional identity on students in all three basic areas, the levels of agreement were higher in the clinical nutrition and public health.

Keywords: Nutricionist. Internships. Professional practice.

144/2386

PREVALENCE OF INSULIN RESISTANCE AND RISK OF METABOLIC SYNDROME AMONG YOUNG ADOLESCENTS IN KUALA LUMPUR

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Background and objectives: Insulin resistance, one of the consequences of central obesity, has been proposed to be the metabolic mediator of metabolic dysfunction, such as hyperlipidemia, hypertension, and impaired glucose, which may progress to cardiovascular diseases and type II diabetes. As metabolic alteration is one of the factors that seem to affect obese children and adolescents, therefore, this study aimed to evaluate the prevalence of insulin resistance and the effects of dysregulated glucose homeostasis with metabolic component among children.

Methods: Subjects comprised 207 boys and 201 girls aged 9-14 years old in Kuala Lumpur. Anthropometric measurements included weight, height, waist circumferences (WC), skinfold at 5 sites namely biceps, triceps, subscapular, iliac crest and medial calf; body composition was assessed with bioelectrical impedance technique. WHO 2007 BMI-for-age growth reference was used to group subjects into overweight/obese (O/O) and non-overweight/obese groups (non-O/O). Blood pressure (BP) was taken, fasting blood glucose (FBG), triglycerides (TG), high-density lipoprotein (HDL-C), low-density lipoprotein (LDL-C), total cholesterol (TC) and insulin were determined in overnight fasting blood sample. The International Diabetes Federation 2007 criteria for children were used to identify metabolic syndrome (MS) risk while homeostasis model assessment method was used to calculate insulin sensitivity (IR).

Results: Girls was found to have significantly higher TC (P<0.05), higher skinfold: biceps (p<0.001), triceps (p<0.001), subscapular (p<0.001), iliac crest (p<0.001) and medial calf (p<0.001) compared to boys. MS was found in 2.5% among the adolescents, with 7.9% among O/O subjects. Prevalence of insulin resistance was 14.5%, with 39.7% among O/O subjects. Adolescents with larger WC [OR:19.3 (95%CI: 9.7, 38.5)], high FBG [OR: 8.0 (95%CI: 2.2, 29.2)] and high TG [OR: 4.6 (95%CI: 1.2, 17.2) were found to have higher risk of developing IR compared to adolescents who did not have poor biochemical profiles.

Conclusions: We conclude that Insulin resistance was strongly related to metabolic risk and may be used as an indicator to assess children's risk for MS. Appropriate intervention programs should be planned to increase awareness and to promote healthy lifestyles in order to prevent central obesity among children and thus lower metabolic syndrome risk.

Keywords: children, insulin resistance, metabolic syndrome

144/2388

NUTRITIONAL STATUS AT BIRTH IS ASSOCIATED WITH BMI IN YOUNG ADULTS. TWO COHORTS STUDY IN CHILE

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Background and objectives: Studies in developed countries have shown that nutritional status at birth was related with early symptoms of chronic disease however, controversy remains whether the Body Mass Index (BMI) in adulthood is also dependent on the nutritional status at birth. As we are following two bidirectional cohorts born 15 years apart –a period of hasty economic growth–in Chile, we aim at evaluating if a differential association between nutritional status at birth and adult BMI would be observed in those cohorts.

Methods: Cohort 1 (n=999), born in 1974-78 was evaluated in 2001-02; Cohort 2 (n=746 as yet), born in 1988-92 is being evaluated in 2014-17. Weight and length were collected from birth records so that birth and BMI at birth are surrogates of nutritional status at birth; weight and height in adult life are being assessed concurrently as they grow old. Analyses used multivariate linear regression adjusting by sex and stratifying by cohort as an effect modifier.

Results: Mean birth weight (±SD) was 12.95 (±1.39) in Cohort 1 and 13.52 (±2.89) in Cohort 2, while BMI at 24-28 were 25.8 (±4.46) and 27.4(±5.6) respectively, all differences significant (p <0.001). Multivariate liner regression reveals that for 1 unit increases of newborn's BMI adult's BMI rise by 0.196 whereas as birth weight increased by 1 kg adulthood BMI rose 1.35 (95% CI 0.88 to 1.83) in adulthood. Cohort effect does not modify the observed effect as shown through stratified analysis.

Conclusions: These data show a direct–rather than Barker's inverse– relationship between birth weight or BMI at birth and BMI in adult life. I seems that both BMI and weight at birth are good predictors of overweight in young adults thus, being useful early alert for children growth surveillance.

Keywords: Birth weight, Adult Nutritional Status, cohort study

144/2390

FACTS AND MISBELIEVES - REPRESENTATIVE NUTRITIONAL KNOWLEDGE STUDY IN HUNGARY

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Background and objectives: Recent years the communication of healthy lifestyle has changed a lot. The spread of free access of internet for many people gave opportunity to get information about health even from unverifiable sources, where there is no health care professional control.

Our goal was with this study to collect data among the Hungarian adults regarding their nutritional knowledge, believes, and misbelieves, food safety, labelling, healthy lifestyle and other habits.

Methods: A representative study with a questionnaire for 1,019 participants in Hungary (CAPI=569 and CAWI=450). The sample was representative for Hungarian population in terms of age (15-69), sex, region and settlement type. The study was carried out between June and July in 2016.

Results: Three quarter of the respondents feels informed about healthy diet (62%).

Barriers to a healthier lifestyle are: money (66%), willpower (39%), healthier products (36%). Half of the respondents are unaware of the recommended daily energy intake (48%) and also their own actual intake (57%). 42% finds that certain food types are unhealthy by their nature.

Unhealthy food is characterized by artificial ingredients (47%) and lack of freshness (28%). About half of the consumers claim reading the labels (61%) (but mostly when buying a new product), and considering the indicated nutritional information. For them, the most important info are ingredients (51%) and the expiry date (41%). Nutritional facts are less frequently mentioned (39%).

Conclusions: Proper nutrition and physical activity are fundamental to achieve or maintain good health. However, the average consumer is often reluctant to give up on good (familiar) taste, alcohol and convenience. Low physical activity level is general. Moreover, many of them are not able (or willing to) spend more money on food. The lifestyle-related diseases mean serious medical, public health and economic problems, and they require higher public awareness and political support.

Keywords: facts, misbelieves, attitute, nutritional habits

144/2410

DETERMINATION OF THE THRESHOLD OF PERCEPTION OF SWEET TASTE IN MOROCCO

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Background and objectives: According to its new guidelines, the World Health Organization recommends reducing the intake of free sugars to less than 10% of the total energy intake in adults and children. Following these recommandation, Morocco has recently developed a plan of sugar reduction in order to reinforce prevention of non-communicable diseases which is a major problem at the national level. The present study is a masterpiece of this national strategy since its objective is to determine the threshold of perception of sugar taste in the Moroccan population.

Methods: The study involved 199 people who tested 9 solutions containing different concentrations of sucrose: 0; 0.111; 0.333; 1; 3; 9; 27; 81; 243 mmol/l. The panelists evaluated the samples per session using the blind Alternative Forced Choice method. The test is repeated twice when consumers perceive the sweet taste for confirmation of the threshold of perception. Informations on age, sex, height, weight and Body Mass Idex was collected and transcribed on SPSS software for statistical processing.

Results: The results showed that 40.20% of the testers had a threshold of perception of the sweet taste at 27 mmol/l (9.24g/l) of sucrose. Only 25.62% and 15.07% of the testers have a threshold of perception of sweetness respectively at 9 mmol/l (3.08g/l) and 3 mmol/l (1.03g/l). A proportion corresponding to 7.53% of the testers perceived the sweet taste only from the solutions containing 81 mmol/l (83.17g/l) of sucrose. The khi2 test shows a significant correlation between the perception of the sweet taste and the age of testers (p value = 0,050) and the perception of the sweet taste and the BMI (p value = 0,021). The sexe has no significant effect on the threshold of perception of the sweet taste (p value = 0.610).

Conclusions: The results obtained explain the pronounced taste of Moroccan children and adults for sweet. who takes 2.7 times more sugar compared to a Caucasian for which the thresh-

old of perception of sweet taste is 10 mmol/l. The national plan for the reduction of sugar consumption will take this into account in order to gradually reduce the sugar content in processed foods.

Keywords: Threshold of perception. Sweet taste. Morocco.

144/2417

DIETARY QUALITY AND FOOD PROCESSING LEVELS IN SUBSTANTIAL OUT-OF-HOME EATERS AND NON-SUBSTANTIAL OUT-OF- HOME EATERS

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Background and objectives: Consumption of convenient ready-prepared foods and eating out-of-home has raised in low-and-middle income countries. Eating out-of-home has been associated with unhealthy dietary patterns rich in processed and ultra-processed foods. The aim of this study is to compare the dietary quality and foods processing levels between Substantial out-of-home (SOH) and Non-substantial out-of-home (NSOH) eaters.

Methods: A cross-sectional study was performed among 779 adolescents from an urban and a rural area in Ecuador (2008-2009). Two non-consecutive 24-hour recalls were used to estimate dietary intake; eating out-of home was defined when food items were prepared in any place different than: the student home and relative's or friends home. Participants were classified as SOH eaters if they obtained more than 25% of their daily energy intake out-of-home; meanwhile, those who obtained ≤25% of daily energy intake out-of-home were identified as NSOH. Food processing levels were categorized using the NOVA Brazilian classification into non-processed, culinary ingredients, processed and ultra-processed foods. Two sample t-test was used to compare mean daily energy intake, energy density and macronutrient energy %, as well as energy % intake by food processing levels between SOH and NSOH eaters.

Results: Overall, 71.89% of participants were classified as SOH eaters. Total energy intake (1927 kcal vs. 1825 kcal; p = 0.01), energy density (1.82 kcal/g vs. 1.62 kcal/g; p = 0.00) and total fat %

(24.7% vs. 22.1%; p = 0.00) intakes were higher among SOH eaters compared with NSOH eaters. In addition, SOH eaters obtained less energy from non-processed food (48.4% vs. 60.7%; P<0.001) but more energy from processed (4.5% vs. 2.2%; P<0.001) and ultra-processed (34.7% vs. 22.5%; P<0.001) foods when compared with NSOH eaters.

Conclusions: A great percentage of our population were SOH eaters and their dietary quality was considerably unhealthy. SOH eaters consumed more processed and ultra-processed foods, which are associated with the development of non-communicable diseases. Therefore, out-of-home preparation places should be considered when establishing nutritional policies.

Keywords: eating-out-of-home, food processing levels, dietary quality

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144/2421

ULTRA-PROCESSED FOODS CONSUMED BY CHILDREN BELOW FIVE YEARS OF AGE IN THE CITY OF RIO DE JANEIRO, BRAZIL

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Background and objectives: The prevalence of obesity and non-communicable chronic diseases has increased rapidly worldwide. Scientific evidence indicates that these outcomes are associated to the inversion of dietary patterns, identified by the substitution of traditional food by ultra-processed and ready-to-eat foods and beverages. Our aim was to characterize ultra-processed foods (UPF) consumed by children below five years of age assisted at the public health care system in the city of Rio de Janeiro, Brazil.

Methods: A descriptive, cross-sectional study was performed in a probabilistic sample of children between six and 59 months assisted in the Unified Health System (n=539). Twenty-four-hour dietary recalls were applied and all mentioned UPF and their respective brands were listed. A market research was conducted aiming the collection of data about UPF's nutritional composition. These products were grouped by similarity (e.g. cookies and crackers, sugary drinks, etc.), and groups were characterized, among others, in relation to: energy, fat and sodium, per 100 g (or 100 ml) and per portion reported by the manufacturers. For this, the mean portions of each group's products were calculated.

Results: A total of 387 UPFs were reported, of which: sugary drinks (97); Cookies and crackers (69), Ice-cream, sweets and candies (58); yogurts and dairy beverages (39); snacks and chips (15), and instant cereals (15). Considering the analysis per 100g and / or per portion, the products that presented the worst nutritional profile in relation to energy (E), lipids (L) and sodium (S) were: E

/ L / S - instant noodles, chips, processed meats and fast food fries; E / L – cookies and crackers, cakes and popcorn; L / S – creamy cheese; E: ready to eat "farofa"; S - margarine, instant seasoning and tomato sauce.

Conclusions: There is a wide range of UPF consumed by the study population. Nutritional profile of these UPF presents characteristics that are harmful to children's health. This evidence supports the revision of the Food Guide for Children under Two Years, conducted by the Brazilian Ministry of Health and currently in progress.

Keywords: Ultra-processed foods; nutritional profile; Macronutrients; Sodium.

144/2423

ACCEPTABILITY AND FEASIBILITY OF A NUTRITION EDUCATION INTERVENTION TO PROMOTE CONSUMPTION OF PULSE BASED FOOD PRODUCTS IN CHILDCARE CENTRES IN SASKATCHEWAN: A PILOT STUDY

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Background and objectives: The consumption of nutritionally beneficial foods during the early years, can lead to healthy eating habits that continue into adulthood. One type of food high in nutritional value are pulse crops. However, despite the nutritional benefits of pulses they are not widely consumed by the young children within the Canada. The study objective was to evaluate the acceptability and feasibility of a pilot pulse based nutrition education curriculum entitled "Pulse Discovery Tool Kit" (PDTK) among 2 to 5 years old children. The kit is designed to promote healthy eating habits and promote pulse consumption within childcare centres.

Methods: The study was conducted in two childcare centres in Saskatchewan, over a 3 –month period. The intervention included weekly lesson plans, a food service guide, pulse recipes and parent's newsletter. Data was captured on feasibility and acceptability of the PDTK through sensory evaluations, lesson plan evaluations, teachers' and cook's interviews and individualized plate waste.

Results: Sensory analysis revealed that majority of the children liked the pulse recipes, 44% liked the green split pea spread initially, which was increased to 56 % during a repeated taste testing session. The lesson plan evaluations and the teachers' interviews indicated that most of the lesson plan activities could be implemented into existing curriculum and had excellent nutrition concepts. Cooks from both centres believed that it was feasible to include recipes from the PDTK into their regular menus and expressed no barriers to cooking and serving pulses within their facilities. Measurements of the individualized plate waste indicated that the pulse recipes had lower amounts of saturated fat, calories and sodium in comparison to regular recipes.

Conclusions: The pilot testing of the PDTK showed that it was both acceptable and feasible to implement this model within childcare centres to improve pulse consumption for children 2-5 years old.

Keywords: Pulse Discovery Tool Kit, Nutrition Education, Childcare centres

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144/2424

SCALING UP A COMMUNITY-BASED GRAINBANK INTERVENTION FOR IMPROVED INFANT AND YOUNG CHILD FEEDING (IYCF) IN ETHIOPIA

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Background and objectives: Child malnutrition remains high in Ethiopia and inadequate complementary feeding is a contributing factor. In this context developing partners designed a community-based intervention to provide locally-made quality complementary food for children 6-23 months, using a bartering system, in four Ethiopian regions. After a pilot phase, the intervention was scaled up from 8 to 180 localities in the same regions. We conducted a process evaluation to determine enablers and barriers for the scaling up of this intervention.

Methods: Eight study sites were selected to perform 52 key informant interviews (KII) and 31 focus group discussions (FGD) with purposely selected informants. A total of 52 KIIs and 31 FGDs were performed. For analysis, we used a framework describing six elements of successful scaling up: socio-political context, attributes of the intervention, attributes of the implementers, appropriate delivery strategy, the adopting community, and use of research to inform the scale up process.

Results: A strong political will, the alignment of the intervention with national priorities and the integration with the healthcare

system were instrumental in the scaling up process. The participatory approach in decision making reinforced ownership at community level, and knowledge acquired through program training motivated mothers and women's groups to participate. However, the management of the complex intervention, limited human resources and lack of incentives for female volunteers proved challenging. In the bartering model, the barter rate was accepted but the bartering was hindered by unavailability of cereals, and limited financial and material resources to contribute (like firewood) at community level threatening the sustainability.

Conclusions: Scaling up strategies for nutrition interventions require sufficient time, thorough planning and assessment of the community's capacity to contribute human, financial and material resources.

Keywords: Ethiopia, IYCF, scaling up implementation, community-based, process evaluation.

144/2425

IMPROVING THE MINIMUM ACCEPTABLE DIET AMONG INFANTS

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Background and objectives: In Rwanda, there is a positive correlation between adequate food intake and child stunting. Children under 2 years with adequate infant and young child feeding have about half the prevalence of stunting as those without adequate food. Appropriate complementary feeding of children 6 to 24 months remains extremely low. We assessed the impact of multi sectoral nutrition programme on meeting the child minimum acceptable diet(MAD).

Methods: A cross-sectional survey was conducted to collect data on the targeted population in the two districts between August and September 2016. Two-stage sample stratification by district and wealth category was done and 1679 children were sampled aged 6-23 months. Effects of 1000 days campaign, cooking demonstration, growth monitoring, distribution of nutrition booklets, Micro-Nutrient Powders (MNP), complementary interventions with fortified blended food supplements on MAD to under 2 years children were assessed.

Results: Children enrolled in complementary intervention were able to improve minimum acceptable diet from 2 to 6 times with children 6 to 23 months meeting the MAD ranging between 16.7% for 6-11 months and 21.5% for 12-17 months with an overall rate of 19.2%, higher than baseline rate (12.1%). In households that received MNP, the 27.5 % of the children attained MAD with those who consumed MNP prior to survey increasing to 31.7%. In complementary feeding using fortified blended food supplements in poor households, 37.6% of children that consumed CSB++ the day before the survey met the MAD compared to 7.8% of those who did not consume reaching the minimum acceptable diet. 30.6% of Households that received these booklet met the minimum acceptable diet.

Conclusions: Children receiving high quality diet are less likely to be stunted and inclusion of one UN interventions in future nutrition programs improves the children Minimum Acceptable Diet.

Keywords: micro nutrient powders, minimum acceptable diet,stunting

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144/2430

PREVALENCE OF FOOD ALLERGY AND COMMON FOOD ALLERGENS AMONG ECUADORIAN ADOLESCENTS: A CROSS SECTIONAL STUDY

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Background and objectives: Food allergy (FA) affects millions of people around the world and is an important risk factor for fatal anaphylaxis in adolescents and young adults. In developing countries little is known about FA. Therefore, the objectives of this study are to determine the prevalence of FA as well as to identify the most common food allergens among Ecuadorian adolescents.

Methods: The study involved 1379 school-going adolescents from Cuenca (n= 917) and Santa Isabel (n= 462) cantons. Parents and adolescents filled-out a self-reported questionnaire to assess sociodemographic characteristics and history of food-associated allergic symptoms either self-perceived or identified by physician. IgE mediated food sensitization was measured by skin prick test (SPT) using food commercial allergens. Positive SPT was defined when the wheal size was ≥ 3 mm that negative control. Self-perceived FA was defined when the participants reported perceived food-associated symptoms and had a positive SPT; meanwhile, physician diagnosed FA was defined with a positive SPT and a concomitant food-associated symptoms identified by a physician. Prevalence rates of FA are reported in percentages with confidence intervals (CI). Differences in FA by gender were estimated using Chi-Square tests.

Results: Self-perceived FA was prevalent among 1.02% (95% CI 0.49-1.54) of the participants. Physician diagnosed FA was prevalent in 0.44% (95% CI 0.04-0.68) of the adolescents. The

most frequent food allergens were shrimp (0.73%; CI 0.28-1.18), followed by milk (0.2%; CI 0.07-0.35), walnut (0.2%; CI 0.07-0.35), peanut (0.2%; CI 0.07-0.35), soybean (0.07%; CI 0.07-0.21), meat (0.07%; CI 0.07-0.21), fish (0.07%; CI 0.07-0.21) and tomato (0.07%; CI 0.07-0.21). The reported prevalence were not different according with the participants' gender.

Conclusions: FA was prevalent among Ecuadorian adolescents. More important food allergens identified in this population (shrimp, milk, walnut, peanut) are similar than those reported in developed countries. Monitoring adolescents with self-perceived FA is crucial to identify and prevent fatal anaphylaxis.

Keywords: adolescent, Ecuadorian, food allergen, skin prick test.

144/2434

DEVELOPMENT AND EVALUATION OF THE RELIABILITY OF AN INSTRUMENT FOR ASSESSING THE UNIVERSITY FOOD ENVIRONMENT

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Background and objectives: The organizational food environment, including the university, has been recognized as strategic for health promotion, since the foods offered there influence the eating habits of the individuals who attend these spaces. There are few studies on the evaluation of the performance of instruments used to assess university food environment. In developing countries, up to this moment there were no studies. This study proposes an instrument to assess the university food environment and evaluates its reliability in public universities in Brazil.

Methods: A checklist was prepared for the assessment of the university food environment, containing the following blocks: characterization of establishments, observation of the environment, availability, price, nutritional information and advertisements of healthy and unhealthy food markers. A convenience sample (n=64) of establishments with different characteristics distributed on seven campuses of three different public universities located in the state of Rio de Janeiro was studied. Data were collected from November 2015 to February 2016 by trained fieldworkers. The reliability of the instrument was examined by inter-observer and test-retest tests. For categorical and counting variables, instrument stability was estimated by calculating percent agreement (PA), kappa and prevalence- and interviewer bias-adjusted kappa

(ka). For continuous variables intra-class correlation coefficients (ICC) were calculated. The values of PA, k, ka and ICC were classified according to the criteria of Landis & Koch (1977).

Results: 73.5% and 65% of the 204 items evaluated presented a substantial or near perfect agreement, respectively, for the inter-observer test and the test-retest. Considering the ka, both the inter-observer test and the test-retest showed that 93% of the items presented substantial or near-perfect agreement. Of the 176 items also assessed by means of PA, 100% showed substantial or near-perfect agreement for the inter-observer test and the test-retest.

Conclusions: The instrument presented excellent performance in the context in which it was applied.

Keywords: food environment, instrument, reliability, university

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144/2435

UNIVERSITY FOOD ENVIRONMENT: CHANGE IN TIME IN A BRAZILIAN UNIVERSITY

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Background and objectives: The food environment is characterized by the availability of food and drink to individuals. The organizational food environment, including the university, has been recognized as strategic for health promotion. Studies suggest that the University food environment (UFE) represents a barrier to healthy eating practices. We did not identify studies that evaluate changes in UFE over time. This study evaluated the availability of healthy food (HFM) and unhealthy food (UFM) markers over time in a public university in the State of Rio de Janeiro.

Methods: Data collection took place in 2011, 2012 and 2016, through a census of food retailers. A checklist (pscicometrically tested for reliability and content validity) was used to evaluate the availability of HFM (fruit juice, fruits, vegetables, meals per kilo or meals per plate) and UFM (sugary beverages, salads, sandwiches, savory snacks and candies). Analyses were performed comparing the relative frequencies of the studied variables observed in each year.

Results: 15, 17 and 25 establishments were evaluated, respectively, at each time point. The availability of HFM has been reduced over the years: juices: 66.7, 58.8 and 44.4%, vegetables: approximately 47% in the first two years and 32% in the last one, fruits: 40%, 47.1% and 24%, meals per kilo or meals per plate: 26.7%, 23.5% e 20%. As for the UFM, there was stability in the availability of sugary beverages (100% in all years) and sandwiches (~ 80%) and reduction in the availability of savory snacks (93.3%,

82.4 and 72% respectively) and candies (93.3%, 88.2 and 84.0%, respectively).

Conclusions: The food environment is dynamic. There was a worsening in the availability of HEM and stability of some UEM at the university studied, representing a barrier to the promotion of adequate and healthy food, since favorable environments are important factors for healthy eating practices. Analyzing the same food environment over time, the present study reveals how much it can change and points out the need to develop interventions that improve this environment focusing on promoting adequate and healthy food and ensuring food and nutritional security.

Keywords: food environment, university, time trend

144/2436

PLAYGROUND SIZE AND LEVELS OF PHYSICAL ACTIVITY IN FIRST GRADE CHILDREN OF BUENOS AIRES. DATA FROM MINISALTEN STUDY

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Background and objectives: Schools with more space to play have greater potential to increase children´s physical activity levels. The study aim was to examine if the playground size influences the levels of physical activity (PA) in a sample of first grade children of Buenos Aires.

Methods: This data correspond to the baseline assessment (June to November 2015) of MiniSALTEN Study (obesity prevention program targeting first grade children at public primary schools). All children of first grade attending to the 12 public primary schools from the city of Buenos Aires participating in MiniSALTEN were invited to participate. The levels of PA were measured using ActiGraph wGT3X-BT accelerometers for 7 consecutive days (24 hours). Accelerometers outcomes were: time in light, moderate and vigorous PA (minutes/day) determined by Evenson et al.'s cut points. Time in moderate to vigorous PA (MVPA) (minutes/day) was also determined. Accelerometer data were analyzed using the ActiLife 6.11.8 software. For classifying the playground size and school characteristics a scale was used and they were classified in small (S), medium (M) and large (L). Descriptive statistical analyzes of the variables measured for the total were made. Data were processed using IBM SPSS Statistic 18.

Results: Sample: 185 children (mean age = 6.7 years, 94 girls and 91 boys) wore accelerometers, 26 children were at S playgrounds , 105 at M and 54 at L. Children spent 7.4 more minutes/

day in MVPA in a larger space compare to a small one (S: 63.2, M: 63.8 and L: 70.6 minutes/day, p = 0.158) as well as more time in vigorous PA (17.9, 16.6 and 20.1 minutes/day respectively, p = 0.100). Also light PA and moderate PA increases progressively according the size of the space (light PA: 333.4, 355.1 and 363.3 minutes/day respectively, p = 0.034; moderate PA: 45.3, 47.2 and 50.5 minutes/day respectively, p = 0.237).

Conclusions: In this study a trend is observed, children are more active in large playgrounds compared to medium and small playgrounds. No significant data were found probably due to the small sample, would be interesting to be tested in a larger sample.

Keywords: Playground size, Schools, Physical activity, Accelerometers, Children.

Conflict of Interest Disclosure: The source of funding for the research is the Coca-Cola Foundation. The authors declare that they have no competing interests. The funding source had no role in study design, data collection and analysis, decision to publish, or preparation of manuscripts.

Further collaborators:
On behalf of the MiniSALTEN Study Group.

144/2441

EFFECTIVENESS OF A PROGRAM INTERVENTION WITH REDUCED-IRON MNPS ON MORBIDITY, IRON STATUS AND CHILD GROWTH IN YOUNG CHILDREN IN ETHIOPIA

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Background and objectives: WHO recommends a daily micronutrient powder supplementation for all young children in populations with a prevalence of childhood anaemia. We assessed the effectiveness of an integrated program with low dose iron (6 mg) MNPs on morbidity, growth and iron status of children 6-23 months of age in Ethiopia.

Methods: In a quasi-experimental design, 2356 infants 6-11 months of age, from program and matched-controlled clusters were followed longitudinally for 8 months. All children in program clusters received 15 sachets/month of lower iron dose (6 mg/serving) MNPs (15 nutrients formulation), in addition to a supply of locally produced complementary food. Iron status (Hemoglobin, serum Ferritin, sTfR) was assessed at base- and endline in a subsample. Morbidity from infectious diseases ((bloody) diarrhoea, upper and lower respiratory infections, fever and hospitalizations) were assessed every two weeks by recall. Anthropometry and information on infant feeding practices were collected every quarter.

Results: Changes in Hemoglobin concentrations during intervention differed significantly (p = 0.054) in intervention (+0.25; SD 1.50 g/dL) compared to non-intervention (-0.08; SD 1.13 g/dL). An increase in height (+11.6; SD 2.9 cm and +10.7; SD 3.3 cm, p<0.000) and decrease in height-for-age z-scores (-0.96; SD 1.20 and -1.18: SD 1.30, p<0.000) were significantly different between intervention and non-intervention groups. The prevalence of anaemia increased (29%) in non-intervention children and reduced (24%) in intervention children. Stunting increased in both groups, but the increase in stunting was lower in the intervention children (from 12.2% to 22.1%) compared to the non-intervention children (from 17.8% to 42.2%). The longitudinal prevalence of diarrhea was 3.65 % in the intervention group and 1.83% in the control group (p=0.000). The longitudinal prevalence of flu was also higher in the MNP group (5.75%) than in the control group (2.78%, p=0.000).

Conclusions: Providing low-dose iron MNPs every alternate day to 6-23 month old children for 8 months in the context of a program on local production of complementary foods, improved Hemoglobin concentrations and linear growth outcomes. However, MNPs also resulted in increased morbidity from infectious disease in the intervention compared to the non-intervention areas.

Keywords: low-dose iron MNPs ; morbidity; iron; young children; Ethiopia

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144/2443

EVALUATION OF THE PRIMARY OBESOGENIC MICROENVIRONMENT IN CHILDREN OF THE CITY DE CORRIENTES

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Background and objectives: Argentina is facing an epidemic of overweight / obesity, particularly in children of school age. To evaluate the frequency and preference of obesogenic foods, as well as, to rate the frequency and type of habitual physical activity and that which is performed during school hours.

Methods: In the course of 2014, by means of systematic random sampling, primary school students were selected with an age ranging from 6 to 14 years of age through a survey among tutors with demographic data. The survey included frequency and consumption of sodas, fast foods, fried foods and processed meat products. The survey inquired about food consumption outside home and its characteristics as well as the frequency of physical activity.

Results: We evaluated 1442 students; 45.63% (658) were female. Consumption of soft drinks was assessed in 449 surveys answered for this item, with 14.57% consuming soft drinks with a frequency of 3 or more times a day. From the total evaluated, 3.58% consumed fast foods, 26.14% fried foods, and 5.55% processed meat products. Of the total number of students, 333 (22.88%) answered for food preferences outside home, 23.14%

preferred hamburgers, 12.40% pizzas, 12.12% cookies, 7.16%, and a varied remaining percentages of low frequency. Physical activity of one hour a day is practiced between 3 to 4 days a week by 49.70% of the students. A 37.97% practice physical activity 2 days a week at school . These data present a relation between the different nutritional states including overweight-obesity (p = 0.02).

Conclusions: High consumption of differents obesogenic food groups is observed, as well as, a high percentage of sedentarism ; teachers and parents discussed strategies to overcome these habits, promoting healthy eating and increase physical activity in order to prevent this age group from engulfing the epidemic of non-communicable chronic diseases in the future.

Keywords: Obesogenic; Physical activity; School Feeding; Obesity; Overweight.

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144/2445

NEEDS OF NUTRITIONAL LABELING IN PROCESSED FOODS OF COSTA RICA

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Background and objectives: Although in Costa Rica there has existed regulation on nutrition labeling since 1992, currently, according to the Technical Regulation of Central America (RTCA 67.01.60:10), the declaration of nutrients is not mandatory. In addition, there is no optimal government surveillance system. This has caused some inconsistency in the presentation of information to consumers, and possibly causing confusion in them.

To describe the main needs of the legislation on nutritional labeling in processed foods in Costa Rica.

Methods: Quantitative, consists of the analysis of the declaration of nutritional labeling of 5259 processed foods in the year 2013 and 7570 in the year 2015. For the collection and analysis of data was used the smartphone application "Data Collector" and the methodology developed By the George Institute for Global Health of Australia.

Results: The deficiencies found in nutritional labeling in both years were similar. These deficiencies are: A) 36% (2013) - 32% (2015) of products with nutritional labeling did not reported sodium; B) lack of report of portion sizes, C) inadequate contrast, size and type of writing, which make the information illegible; D) lack of nutritional labeling despite the presence of nutritional de-

scriptors; E) incorrect use of units of measurement; F) incorrect translation of labels, among others.

Conclusions: In order to encourage a conscious selection of foods in the consumers and also to avoid confusions, it is necessary to establish as mandatory nutritional labeling of processed foods in Costa Rica and in Central America, through the update of RTCA 67.01.60: 10.

Keywords: Salt, sodium, nutritional labeling, food regulation, Costa Rica.

Further collaborators:

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NATIONAL ACTION PLAN TO REDUCE SALT, SUGAR AND FAT CONSUMPTION 2017-2021

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Background and objectives: The amount of salt, sugar and / or fat (saturated and trans) consumed in Morocco is at least 50% higher than what is recommended by the World Health Organization (WHO). However, too much salt, sugar and / or fat (saturated and trans) is harmful for the health. This is why the Ministry of Health of Morocco is committed to reduce the consumption of salt, sugar and / or fat (saturated and trans). The target by 2021, is to gradually reduce salt consumption to 6 g / p / d, sugar to 60 g / p / d, reduce consumption of saturated fat and banish trans fatty acids.

Methods: Three studies were carried out, one on salt, another on sugar and the last on fat. Two reports were prepared, one on the status of the nutritional situation in Morocco, another on the action plan for the reduction of salt, sugar and fat consumption. The working methodology of this plan was based on the holding of several workshops and meetings with the different actors concerned directly or indirectly by the reduce of the consumption of salt and fat (saturated and trans).

Results: This plan aims to reduce gradually, in collaboration with the food industry, the salt, sugar and fat (saturated and trans) content in processed products. At the same time, the population should be sensitized and responsible. This action plan includes 5 strategic axes, 10 actions, 24 measures and 46 activities.

Conclusions: In the longer term, consumption of salt, sugar and fat in Morocco must meet the WHO recommendations of 5 g/p/d of salt and 50 g/p/d of sugar, eliminate all trans fats produced industrially and Significantly reduce the saturated fat content of the diet

Keywords: National action plan, salt, sugar, fat (satured and trans)

144/2457

SOCIALIZATION DURING MEALS AND ITS ASSOCIATION WITH UNIVERSITY STUDENTS' NUTRITIONAL STATUS

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Background and objectives: Eating behaviour is an important factor influencing students' weight. Therefore, the purpose of this study was to evaluate the context of socialization during meals and its association with the nutritional status of university students.

Methods: Cross-sectional analysis of data derived from the baseline of the "Longitudinal Study of Nutrition and Health in University Students (NUTSAU)", conducted in second-semester students of Rio de Janeiro Federal University – Macaé Campus. The instrument used for data collection was a structured self-completion questionnaire. The anthropometric evaluation consisted of body mass and height measurements, and thus body mass index was calculated. Meal pattern was estimated based on six response options. Statistical analysis was performed using the SPSS program, version 19.0. The project was approved by the Research Ethics Committee of UFRJ-Macaé Campus.

Results: The sample consisted of 147 university students. Regarding the realization of the main meals, it was observed that among those who ate breakfast socializing with family (21.2%) and friends (16.8%), the minority was overweight (27.6% and 17.4% %, respectively) (p = 0.43). A similar behavior was observed for those who had lunch socializing with friends (68.6%) with the minority identified as overweight (23.4%) (p = 0.16). Additionally, the habit of having dinner socializing with family members (34.4%) and friends (18.0%) was related to a lower frequency of overweight (27.3% and 30.4%, respectively) (p = 0.50).

Conclusions: We did not observe statistically significant associations between socialization during meals and nutritional status. However, our data indicate a clinical relevance of this habit as a protective factor against overweight.

Keywords: Dietary patterns. Nutritional status. University.

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EATING PLACES AND ITS ASSOCIATION WITH UNIVERSITY STUDENTS' OVERWEIGHT

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Background and objectives: College or university is a critical period regarding unhealthy changes in eating behaviours in students. Therefore, the purpose of this study was to evaluate the context of eating places and its association with the nutritional status of university students.

Methods: Cross-sectional analysis of data derived from the baseline of the "Longitudinal Study of Nutrition and Health in University Students (NUTSAU)", conducted in second-semester students of Rio de Janeiro Federal University – Macaé Campus. The instrument used for data collection was a structured self-completion questionnaire. The anthropometric evaluation consisted of body mass and height measurements, and thus body mass index was calculated. Meal pattern was estimated based on six response options. Statistical analysis was performed using the SPSS program, version 19.0. The project was approved by the Research Ethics Committee of UFRJ-Macaé Campus.

Results: The sample consisted of 147 university students. Regarding the consumption of the main meals, it was observed that among those who ate breakfast at home (85.5%) a minority was overweight (24.6%) (p = 0.43). A similar behavior was observed for those who had lunch at home, who prepared their own packed-lunches and who bought packed-lunches (34.8%, 37.0% and 8.7%, respectively) with the minority identified as overweight (20,8%, 31,4% e 41,7%, respectively). Among those who generally ate fast-food the majority was classified as overweight (66.7%) (p=0.04). Having dinner at home was also related to a lower frequency of overweight (23.9%) (p=0.41)

Conclusions: It was observed that the patterns of having lunch at home, taking home-made packed-lunches and of buying packed-lunches may be protective habits against overweight in university students.

Keywords: Dietary patterns. Nutritional status. University.

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IMPACT OF OBESITY ON THE WORKING CONDITIONS OF TEACHERS AND EMPLOYEES OF THE BRAZILIAN STATE SCHOOL NETWORK

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Background and objectives: The prevalence of obesity has increased in state school teachers. Studies show that the healthier the workers are in the work environment, the greater and more consistent the company's prospects for success. This study verified the prevalence of obesity and its association with working conditions of teachers and employees of state schools in São Paulo.

Methods: A retrospective cross-sectional study using data of civil servants of the state schools in the city of São Paulo, composed by adults and elderly people of both sexes (n = 23,273). The study variables were: obesity measured by body mass index (BMI; kg/m2) considering obese when BMI ≥ 30 kg/m2; and working conditions (factors at work that affect feeding habits, working hours and annual health leave in the last 12 months) measured by specific questionnaire. Multiple logistic regression was used to verify the association between variables using the Stata / SE 13.0 program.

Results: Of the 23,273 individuals analyzed, 83.5% are female, 63.2% of the 19- to 49-year-old age group. The prevalence of obesity was 29.0%, higher in women (83.5%) and in the age group of 50 years and over (57.0%). It was found that working conditions that affect feeding habits (RP = 1.55), a workload of 30 hours and more (RP = 1.98), and annual health leave (RP = 1.26) were associated obesity in teachers and employees of the state school network.

Conclusions: The obesity was associated with working conditions in teachers and employees of the state school network. These results show the importance of developing political policies, which are able of stabilizing and finally, reverse the epidemiological situation presented.

Keywords: Obesity, working conditions, teachers, employees.

144/2465

NEXUS OF WATER, SANITATION, HYGIENE, GENDER, AND NUTRITION: A CONCEPTUAL FRAMEWORK OF THE PATHWAYS OF INFLUENCE

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Background and objectives: Globally, 2.5 billion people lack access to improved sanitation and 663 million people lack access to improved water for drinking. Of these, a disproportionate number are women and girls. We examined the adverse effects of gender-differentiated restricted access to water, sanitation, and hygiene facilities on women and girls' health and nutrition, and associated causal pathways.

Methods: We synthesized multidisciplinary literature on how gender-differential access to water, sanitation, and personal hygiene (WASH) impacts reproductive, maternal and child health and nutrition. We critically reviewed the evidence and developed a framework to articulate the direct and indirect pathways through which a lack of access to WASH resources and behaviors may affect the health and nutrition of women, adolescent girls, and young children.

Results: Underlying gendered norms and practices around WASH, as well as sex-based biological differences, result in differential impact on women and girls' health and nutrition through a number of causal pathways. These include women and girls' roles as WASH duty-bearers, which can require significant time commitment and caloric expenditure; gender-based constraints on freedom of movement, which pose barriers to necessary WASH resources and behaviors; and the sex-specific need for WASH resources and hygienic facilities for childbirth and menstrual hygiene management. These factors can increase women and girls' vulnerability to undernutrition, anemia, infectious disease, and adverse birth outcomes through multiple pathways. A lack of access to WASH resources and behaviors also increases women's time poverty and risk of depression, which can influence care practices, infant and young child feeding behaviors, and the nutritional status of children. Our review concludes with recommendations for policy, advocacy, and future research.

Conclusions: Women and girls bear a disproportionate burden of responsibilities and health and nutrition impacts related to WASH. Integrated programming that addresses the WASH needs of women and girls is necessary to achieve further gains in health and nutrition. Our framework provides a conceptual basis for future interdisciplinary research into the biological and behavioral pathways by which WASH may affect nutrition and growth.

Keywords: WASH, gender, anemia, undernutrition, women's nutrition

144/2466

IMPROVING ACCESS TO FRESH FRUIT AND VEGETABLES AMONG LOW INCOME FAMILIES IN THE USA: THE NEAT TRIAL

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Background and objectives: Eating a variety of fruit and vegetables has been shown to reduce the risk of chronic diseases. Thus, The Nutrition Education, Access and Texting (NEAT) trial sought to assess the impact of distribution of incentive coupons along with a texting-based marketing campaign promoting usage of a Mobile Market (MM), on increasing access, purchase, and intake of fruit and vegetables among SNAP-Ed participants.

Methods: NEAT was a randomized trial with low-income participants with children under 5 years old. Participants had unlimited texting plans and were willing to receive daily texting for a 4-week period. They completed a ½ hour baseline survey collecting demographic, and fruit and vegetables data. Participants were then assigned to the experimental group (n=100) receiving four $5 coupons for use at the MM during the next 6 weeks plus a month of daily text messages informing them about MM stop locations, tips on preparing/eating more fruit and vegetables, and reminders to use their coupons or the control group (n=93) that only received text messages about free family community events. Participants from both groups completed a 6-week follow-up phone interview.

Results: Both groups had similar baseline characteristics, mean age of 32±8.81 years, 79% were Hispanic, mostly female (96%), and receiving SNAP benefits (80%) (N=193). At follow-up (n=169) intervention group participants spent significantly more on fruits than those in the control group ($42 vs. $30, p=0.027), and were also more likely to buying their produce at the MM (46% vs. 23%, p=0.002). There was a also a significant increase in fruit intake in the intervention group only (p=0.001). Participants accessing the MM were very satisfied with the produce sold as well as the customer service.

Conclusions: NEAT was successfully implemented and led to higher use of MM, and increased spending and intake of fruits.

Keywords: food access, food security, fruit and vegetables, mobile market

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QUALITY OF LIFE AMONG ECUATORIAN ADOLESCENTS WITH FOOD ALLERGY DETERMINED BY SKIN TEST REACTIVITY AND SERUM IGE LEVELS

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Background and objectives: Food allergy (FA) can affect the quality of life of people. FA determined by skin test reactivity and serum IgE levels increase the precision of the diagnosis. Therefore, the objectives of this study are to determine the prevalence of food allergy (determined by skin prick reactivity and serum immunoglobulin E (IgE) levels) and its affectation on quality of life among Ecuadorian adolescents.

Methods: A cross-sectional study was conducted among 462 Ecuadorian adolescents from Santa Isabel between July 2014 and February 2016. Skin prick test (SPT) was applied in adolescents to identified allergic sensitization (wheal size > 3 mm that negative control) using 20 commercial food allergens. Adolescents with allergic sensitization were examined by a Immunologist to identify: i) history of food-associated allergic symptoms, ii) positive IgE specific serum using ImmunoCAP technique and iii) affectation in the quality of life applying a questionnaire. Positive IgE to a specific food was defined with serum levels ≥ 0.35 IU. FA was identified when the participants reported history of food-associated allergic symptoms and had a positive SPT or positive IgE specific levels. Affectation of quality of life evaluated three items: dietary restrictions, emotional impact and risk from accidental exposure.

Results: FA by SPT was prevalent among 4.33% of the adolescents. FA by SPT and serum IgE levels was prevalent in 1.73% of the participants. Shrimp and peanuts were the main allergens. FA by SPT and serum IgE levels affects the quality of life of adolescents an average of 0.05 / 6, SD ± 0.94.

Conclusions: FA is prevalent in adolescents from Santa Isabel. The use of specific IgE in combination with SPT increased the diagnostic accuracy. Adolescents with FA did not present significant affectation in their quality of life, contrarily to other studies that observe notable affectation. This opposite result can be explained by the lack of knowledge about their condition.

Keywords: adolescent, Ecuadorian, food allergen, IgE, quality of life.

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ACCEPTABILITY OF MULTI-MICRONUTRIENT POWDERS (MNP) IN YOUNG CHILDREN: FACTORS AFFECTING CAREGIVERS´ DECISIONS - BY FAMILY, HEALTH PERSONNEL AND COMMUNITY ACTORS IN THREE REGIONS OF PERU

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Background and objectives: Prevalence of anemia remains high in infants and young children in Peru. This study explored the experiences and practices, of families, health personnel and other community actors from government-funded social programs regarding MNP supplementation in children 6 to 36 months, leading to an understanding of the issues related to their acceptability and consumption by families and young children.

Methods: The qualitative study took place in three regions of Peru: Piura, Ucayali, Huancavelica, served by two Government-funded social programs (Day care centres and Family accompanying program of the Ministry of Development and Social Inclusion, MIDIS). Data was collected using semi-structured in-depth interviews, focus groups, exit interviews from primary health care services, and semi-participative observations during counseling sessions in health services, mealtimes at child care centers and in households, as well as during household visits carried out by the social programs. Data was transcribed, coded and analyzed to identify sub-themes and their relationship to the consumption and acceptability of MNPs.

Results: Caregivers give MNPs until they encounter a negative occurrence (diarrhea, illness) or lack of acceptability from the child. Health personnel and community actors are committed to the delivery of MNP with high perceptions of their value but there were weaknesses in training and counseling, which translated into inappropriate preparation practices and inadequate support networks when caregivers experience difficulties. Quality of monitoring data collected could be improved and further used to feedback into processes and practices.

Conclusions: Qualitative data provides a rich context to the processes surrounding supplementation with MNPs in these 3 regions to improve programs. Improved training, counseling and better support systems could enhance acceptability and consumption of MNP by caregivers.

Keywords: Multimicronutrients; acceptability; infants and young children; social programs; support networks

Further collaborators:

REASONS ALLEGED BY PUERPERAL WOMEN TO SEEK CARE IN A HUMAN MILK BANK OF A UNIVERSITY HOSPITAL

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Background and objectives: There are many reasons that make breastfeeding difficult. Within this context, it becomes relevant to know the reasons that lead women to seek help in human milk banks (BLH). The objective of the study was to describe the main reasons of women seeking care at the Human Milk Bank of a University Hospital in the city of Niterói, Rio de Janeiro state, also describing the characteristics of these women and their babies.

Methods: This is a retrospective study, based on data from service forms, in the year 2015. The data were extracted from the institution's BLH service forms, applied to women who sought care in that sector, in the year 2015.

To assess the profile of the women were collected socio-demographic, gestational, lifestyle, type of Childbirth, history of current breastfeeding, use of artificial nipples, breast exams, the reason for the demand for the milk bank and the main complaint of these women and the conduct adopted by the Multiprofessional team of the human milk bank.

Data were also collected from the newborn. For the evaluation of weight and gestational age at birth, the cutoff points of the Brazilian Society of Pediatrics and the World Health Organization were used.

Results: The majority of the study participants corresponded to adults, residents of the city of Niterói. Difficulty in breast-feeding was the motive most alleged by women who sought BLH, followed by breastfeeding pain. The majority started prenatal care in the first trimester (78.4%), but it was observed a low frequency of guidelines on breastfeeding during that period. The most prevalent type of delivery was the surgical one (81.1%), 38.5% offered artificial formulas for their babies, and of these 72% reported difficulties in relation to breastfeeding.

Conclusions: The main reasons that motivated the search for BLH were related to difficulties with breastfeeding, which could be avoided or at least minimized, with guidelines to support and promote breastfeeding even during prenatal care and in the Which emphasizes the role of the multiprofessional health team in the attention to women in the pregnancy-puerperal cycle.

Keywords: Human milk bank; Breastfeeding; women seeking care

EVIDENCE-BASED INTEGRATION OF NUTRITION INTO MULTI-SECTOR BRAC PROGRAMS IN BANGLADESH

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Background and objectives: Integrated multisector nutrition-specific and nutrition-sensitive interventions are a recognized and widely endorsed strategy to ensure sustainable improvements in the nutrition of women, adolescents and children. Despite broad agreement about the nature of barriers to effective integration in recent literature, there remains insufficient evidence of the actions which can eliminate those barriers. The Micronutrient Initiative has been conducting a research to identify these barriers particularly related to adolescent nutrition and inform designing integration of actionable nutrition packages through multisector programs of BRAC - an NGO known for its largest national-level programs in the world. The purpose of this research was to generate evidence on how to integrate nutrition into multiple-sector programs and preliminarily recommended evidence-based integration of actionable nutrition packages through multiple-sector programs

Methods: We conducted a review of nutrition gaps in Bangladesh; prepared Program Impact Pathways (PIP) to understand how BRAC programs operate; and explored nutrition activities carried out by other agencies. A step-wise focused ethnographic studies (FES) was used to understand the barriers and opportunities relevant to adolescent nutrition at individual-, household-, and community-levels. FES also informed existing gaps in delivery of services. The steps in FES provided opportunities for gradually strengthening the research protocols and pinpoint critical gaps that needed to be filled by different programs. Plotting of FES results on the PIPs identified components of different programs through which BCI and other nutrition services may be provided.

Results: Preliminary analysis suggested non-existence of any interventions BRAC or other agencies dedicated specifically to improving adolescent nutrition. Behaviour Change Intervention (BCI) material should be tailored to include different strategies for in- and out-of-school adolescents. Provision of weekly Iron and folic acid (WIFA) supplementation will need to be ensured. BRAC's Village Theatres, Adolescent Clubs, contacts by health volunteers, Nutri-garden, etc. are potential candidates to deliver nutrition services but have been so far neglected.

Conclusions: Preliminary results show opportunities to deliver nutrition interventions through multiple nutrition and non-nutrition sectors and to maximize the demand for services. The research is still in progress and the October IUNS presentation will further include how the evidence-generated interventions will have been operationalized into BRAC programs.

Keywords: Nutrition integration, multi-sectoral, adolescents

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COMPARISON OF "OUT OF HOUSEHOLD PURCHASED FOODS" (OHF) IN LATIN AMERICAN COUNTRIES BASIC FOOD BASKETS (BFB)

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Background and objectives: Basic Food Basket (BFB), used in Latin American countries as official poverty measure methodology, gives information about the most commonly purchased foods by the country population. Eating out for leisure is a habit among the 4th and 5th income quintile, but a need for most population during the working week. The expenditure that household allocates to purchase foods outside the household is necessary and more than half urban households had reported to purchase breakfast and/or lunch five to six days a week. The objective was to compare the inclusion and characteristics of OHF in Latin American Countries BFB.

Methods: We check in the official list of foods from 19 countries urban BFB, those that identify OHFs (breakfasts, lunches or dinners) as part of the structure of the average minimum diet. It was excluded from the analysis that the OHF were in the consumer´s price index, because it is not used to measure poverty directly as the BFB. Information was collected online from official sources as National Statistics Institutes or similar responsible for BFB monthly price publication in the following countries: Guatemala, El Salvador, Honduras, Nicaragua, Belize, Brazil, Costa Rica, Dominican Republic, Panama, Mexico, Ecuador, Colombia, Venezuela, Peru, Bolivia, Paraguay, Argentina, Chile, Uruguay.

Results: here are countries where BFB composition is not available. Only 6 include out of household purchase: Ecuador, Bolivia, Uruguay, Chile, Mexico and Paraguay. Ecuador, Bolivia, Paraguay have a food group named "Foods and Beverages consumed out of household" which includes various foods and complete meals such as lunches or dinners. Uruguay measure is more complex with Meals outside the household, prepared meals, expenses in restaurants, bars and hotels. Chile and Mexico reports individually lunch menu of other plates. For all countries, OHF represented more than 15% of household expenses.

Conclusions: Countries must make efforts to update the BFB and include out of household purchase to calculate the real cost of actual diets. Nutritionist must do research on OHF composition, nutrition value and the distribution into the family.

Keywords: Basic Food Basket, out of household purchased foods, Latin America

144/2483

EFFECT ON ONE UN PROGRAMME ON NUTRITION SECURITY IN RUTSIRO AND NYAMAGABE DISTRICTS

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Background and objectives: Food consumption score(FCS)is a measure of dietary diversity, food frequency and the relative nutritional importance of the food consumed. With evaluation of Food and Nutrition security status of households as a major One UN project objective, we aimed to study the effect of the various components of the One UN interventions on Food Consumption Score.

Methods: A cross-sectional survey was conducted to collect data on the targeted population in the two districts between August and September 2016. Sampled children were 3700. Two stage sample stratification by district and wealth category was done. Final sample size was 3700 children aged 6-59 months.

Results: Households with children enrolled in the Micro nutrient programme had a slightly higher percentage (39%) of children with acceptable food consumption score as compared to those not enrolled (36%). Households with children that consumed MNP before the survey were more food secure than those not enrolled and those enrolled and did not consume the MNP the day before the survey. Children who consumed CSB++ the day before the survey had slightly better consumption score as compared to those who did not consume CSB++ (39.7% vs. 37.6%).

Conclusions: The improvement of Food security situation after the One UN Project intervention highlights the need for incorporating such interventions in future nutrition programs.

Keywords: Micro nutrient ,food consumption score

144/2490

ASSESSMENT OF PLASMA CONCENTRATION OF VITAMIN A, VITAMIN B12 AND IRON AMONG TUBERCULOSIS PATIENTS WITH AND WITHOUT HIV INFECTION: A COHORT STUDY

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Background and objectives: The impact of micronutrients concentration in the body on TB development diseases progression and TB treatment outcome on micronutrients concentration level in the body is not fully understood. In this study, we determined the level of Plasma Vitamin A, Vitamin B12 and Iron in TB patients with and without HIV Infection before and after TB treatment,

Methods: A total of 262 study participants which composed of 144 active TB patients [57 HIV co-infected (HIV+TB+) and 87 HIV negative (HIV-TB+)], 71 HIV+ and Tuberculin Skin test negative (HIV+TST-), 22 HIV-TST+, and 25 controls (HIV-TST-) were recruited. Vitamin A concentration was measured using high performance liquid chromatography (HPLC), whereas Iron and vitamin B12 concentrations were measured using cobas® 6000 analyzer at baseline and after six months of anti-TB treatment (ATT)

Results: HIV-TB+ patients had low plasma concentrations of vitamin A ($0.07\mu mol/L$) and Iron ($0.25\mu g/dl$) and high level of concentration of vitamin B12 ($626pg/ml$) compared to HIV-TST+ ($0.15\mu mol/L$, $0.86\mu g/dl$ and $354.5pg/ml$ respectively) and to HIV-TST- ($0.15\mu mol/L$, $0.90\mu g/dl$ and $360.4pg/ml$ respectively). Similarly, the concentration of Iron was significantly lower in HIV+TST- patients ($0.58\mu g/dl$) compared to HIV-TST+ and HIV-TST- study participants. After ATT, HIV-TB+ patients had high concentrations of vitamin A ($0.15\mu mol/L$) and Iron ($0.85\mu g/dl$) and low level of concentration of vitamin B12 ($388.6pg/ml$) compared to the baseline concentration levels ($p<0.05$); but not significantly different compared to that of HIV-TST+ concentration and HIV-TST-.

Conclusions: The low concentrations of vitamin A and Iron, and high concentration of vitamin B12 in HIV-TB+ patients which can be due to the preceding deficiencies that enhanced susceptibility to TB diseases, suggests the need of micronutrient supplementation for TB patients . In addition, the changes in plasma vitamin A, vitamin B12 and Iron following anti-TB treatment indicates the value of these parameters used to monitor TB treatment responses.

Keywords: Tuberculosis, anti-TB treatment, Vitamin B 12, Retinol, Iron

144/2502

EFFECT OF HIGH PROTEIN INTAKE AND NUTRITIONAL ADVICE ON BODY WEIGHT MAINTAINANCE AMONG OVERWEIGHT AND OBESE POSTPARTUM WOMEN

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Background and objectives: Failure to return to pre-pregancy weight after childbirth may contribute to obesity. There is evidence that high protein and low carborhydrate intake in the general population helps to maintain boby weight. However, there is limitted evidence of the effect of high protien intake among postpartum women. To evaluate the effect of high protein intake and nutritional advice on body weight loss during first six months of postpartum.

Methods: Randomized controlled trial with ninety four overweight or obese postpartum womennfrom two public maternity ward situated in Rio de Janeiro state, Brazil. Postpartum women were randomized to intervention (IG) and control group (CG). The IG received protein foods sardine supplementation (130 g / one can per week) to increase dietary protein content combined with instructions to restrict the consumption of carbohydrates. The control group (CG) received nutritional advice to follow that national nutrion guideline with standart quantities of carbohydrate, protein and fat. To guarantee the trial adherence CG received 2 kg of pasta per month. Linear mixed-effects model was applied to test the effect of high protein intake on body weight loss during postpartum. Then, the interaction between IG (high protein intake) and intake of macronutrients (CH and Fat) were also investigated.

Results: The CG gained more weight over time (ß=0.824; SE=0.393; p= 0.037) than women in the IG (ß=0.013; SE=0.402; p= 0.975). Intake of (g/kg) of protein (ß=-0.88; p<0.001), lipids (ß=-1.76; p<0.001) and carbohydrate (ß= -0.39; p<0.001) over time were idenpendently associated with weight loss. There was a significant interaction between IG and lipdid intake (g/kg) (ß=-13.9; p= 0.012)

Conclusions: High protein intake and dietetic advice were associated with the maintenance of body weight during postpartum period.

144/2503

COEXISTENCE OF OVERWEIGHT, OBESITY AND UNDERWEIGHT AMONG PEOPLE LIVING WITH HIV: A FINDING FROM RWANDA 2015 NATIONAL NUTRITION AND FOOD SECURITY VULNERABILITY ASSESSMENT

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Background and objectives: HIV sensitive programming such as safety nets requires strong targeting process in order assist most affected PLHIV. To design appropriate intervention, WFP and Rwandan Biomedical Centre /HIV, STIs and OBBI Division conducted a national survey on the nutrition status, food security status, and vulnerability among PLHIV.

Methods: Two-stage cluster sampling, with cluster defined as district and the primary sampling unit (PSU) was the Hhealth facility (HF). The probability-proportional-to-size (PPS) sampling was applied with pre-stratification by program (Pre-ART and ART). A total of 2,386 PLHIV have been surveyed all category combined in 60 HFs selected countrywide, two by district.

Results: High overweight prevalence among adult PLHIV 17.5 % (BMI≥ 25.00) compared to underweight 13.7 % (BMI <20.00). The majority (79.5 %) was classified as pre-obese (BMI 25.00-29.99) and 20.5 % as obese (BMI ≥ 30.00). Of the 13.7 % underweight prevalence, 68.3 % were classified as mild (BMI between17-18.99), 18.7 % as moderate (BMI 16-16.99) and 13 % as severe (BMI <16). Clients with a higher viral load (greater than or equal to 1000 copies/ml) were found to be overweight/obese (23.1 %) compared to the category of clients with lower viral load category (<400 copies/ml) (18 %).The prevalence of overweight was also higher among women (22.1 %) than men (10.3 %) and in Kigali city (30.1 %). The highest prevalence of overweight/obesity was among clients who had at least completed secondary school (47.3 %), monthly salaried employees (39 %), those earning a monthly income above 50.000 RWF (37.6 %).

Conclusions: Overweight and obesity coexist with undernutrition among PLHIV in Rwanda. Overweight affects more women, urban, highly educated, client with higher viral load and the better off wealth category. However these findings hide critical vulnerability among lower socioeconomic category where undernutrition, food insecurity and poor copying strategy is high. Additional investigation is required to clearly understand the double burden of malnutrition among PLHIV for better targeting.

Keywords: Obesity, co existence

144/2515

PREVALENCE OF CARDIOVASCULAR RISK IN ADOLESCENTS REGISTERED IN PUBLIC EDUCATIONAL INSTITUTIONS OF THE CITY OF ASUNCIÓN

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Background and objectives: Obesity in the adolescent age presents great challenges for health and nutrition services, because if it is not corrected in time, it will be the gateway for the early onset of chronic noncommunicable diseases. Objective: To determine the prevalence of cardiovascular risk factors in adolescents enrolled for the 2016 school year in educational institutions in the city of Asunción

Methods: The study was observational, descriptive, transversal with analytical component. Sociodemographic, clinical, anthropometric and lifestyle variables were evaluated

Results: A total of 250 students were selected from 5 schools, 55% female, the mean age of the total was 13.6 ± 1.7 years, most of them belong to the third cycle of Basic School Education. All of them had a family history, the most frequent being hypertension, diabetes and obesity. The mean body weight was 51.9 ± 9.5 kg, BMI 20.7 ± 3.9 kg / m2, systolic blood pressure (SBP) 99.6 ± 8.7 mmHg, and diastolic blood pressure (DBP) 65.7 ± 5.7 mmHg. 65% presented adequate weight, 23% malnutrition by excess and the rest risk of malnutrition. 5% had high waist circumference and 2% had high blood pressure. 92% affirm to carry out sports, the women, walk and the men play soccer. One student reported smoking, she does it every day. 3% consume alcoholic beverages on certain occasions. The major risk factor for cardiovascular disease was excess malnutrition. There was no significant relationship between increased waist circumference, BMI and mean blood pressure.

Conclusions: The main risks for cardiovascular disease found in the sample were overweight and obesity

Keywords: Adolescents, Cardiovascular Risk, Nutritional Status, Blood Pressure

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144/2521

INFLUENCES OF MATERNAL METABOLIC STATUS ON ADAPTIVE BEHAVIOR AND SOCIAL-EMOTIONAL DEVELOPMENT IN THEIR OFFSPRING AT 6 AND 18 MONTHS OF LIFE

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Background and objectives: Maternal metabolic status before and during pregnancy exerts an important influence on neurodevelopment and behavior in the offspring. Maternal characteristics may be a significant predictor of behavioral problems in childhood and mental health problems during adulthood. The aim of the present study was to analyse the effect of maternal obesity or gestational diabetes (GD) conditions on adaptive behavior and social-emotional development in their offspring at 6 and 18 months of life.

Methods: From a total of 331 pregnant women participating in the PREOBE study, 215 pregnant women and their offspring were evaluated. The mothers were divided into 4 groups according to their pre-gestational body mass index or the development of GD: overweight (n:44), obese (n:32), GD (n:58), and healthy normal weight (n:81). Adaptive behavior and social-emotional development was assessed using the Adaptive Behavior Assessment System-Second Edition (ABAS-II) and Bayley's III Social-Emotional scale. Differences in scores were analysed by ANOVA, MANCOVA and Chi-Square Test, using SPSS version 22.0.

Results: At 6 months of life, those children born to obese mothers showed lower scores in social-emotional (p=0.005) and self-direction (p=0.035) skills, compared to those born to normal weight-healthy mothers. At 18 months of age, children born to overweight/obese mothers presented lower scores in self-direction (p=0.028), leisure (p=0.037) and self-care (p=0.024) than those born to normal weight-healthy mothers. However, in adjusted analysis by maternal age and cultural level, these results disappeared. Additionally, children born to normal weight-healthy and GD mothers showed higher scores in conceptual skills (communication, functional pre-academics and self direction) (p=0.001) than children born to obese/overweight mothers.

Conclusions: Obesity or Overweight during pregnancy are associated to poorer child's social-emotional and adaptive behavior development at 6 and 18 months of life. Problems in early life to adapt to the natural and social demands of environment can be predictors of learning disorders or attention deficits. These results couldn help to understand the underlying aetiology of cognitive and behaviors problems in preschool children.

Keywords: Pregnancy, Obese, Gestational Diabetes, Adaptive Behaviour, Social-Emotional

144/2523

CHALLENGES AROUND HEALTHY EATING OF MOTHERS OF PRESCHOOL CHILDREN IN LIMA-PERU

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Background and objectives: One of the major health problems in children is overweight and obesity. At the age of preschool, children are still being looked after by an adult. In low-income families, the biological mother is the one who takes this role, which is why it is important to analyze the mother's perceptions of healthy eating, her aspirations, and challenges. The present study aimed to comprehend the challenges faced by low-income mothers when feeding their children in a district of Lima.

Methods: Using qualitative methods, we conducted 4 focus groups and 11 in-depth interviews in Spanish with a total of 30 volunteer mothers of preschool-aged children from low-income households in Virgen de la Candelaria, district of Villa Maria del Triunfo, Lima, Peru. The method was grounded theory. We analyzed verbatim transcripts using an inductive method of open coding, and themes were established by consensus among authors, the information was summarized creating a thematic framework.

Results: Children to reach a good nutritional status. The mother's mean age was of 30 years old; 87% were from different departments of Peru; 56% had a high school education or less, and all of them lived with 20 soles a day. The following themes regarding perceptions, aspirations, and challenges emerged: the ways of preparing food for preschool children showed a positive attitude towards the preparation methods and addressed the child's behavior at mealtime. The themes that emerged on the aspirations of the mothers were in relation to health and eating well. The challenges were to get to fulfill their aspirations were one of the major concerns faced was how to get them.

Conclusions: This finding increased our understanding of the perceptions, aspirations, and challenges faced by the mothers of preschoolers, and can help to inform more cultural aspects for effective nutrition interventions.

Keywords: Preschool, perceptions, aspirations, challenges, feeding.

144/2528

THE ASSOCIATION BETWEEN FOOD AND NUTRITION LITERACY AND DIETARY INTAKE IN ELEMENTARY SCHOOL CHILDREN

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Background and objectives: Food and nutrition literacy may be the underlying factor that protects nutritional quality during transitions. This study evaluates the association between Food and Nutrition Literacy (FNLIT) and dietary intake of elementary school children in Iran.

Methods: This cross-sectional study was undertaken on 803 students (419 boys and 384 girls) aged 10–12 years from 44 elementary schools in Tehran city, Iran. Demographic characteristics, socio-economic status, as well as three 24-hour dietary recalls (two week-days and one weekend) were collected through interviewing the students and their mothers and/or other caregivers. Food and nutrition literacy was measured by a locally designed and validated questionnaire consisted of 46 items in 7 subscales. Food group consumption was compared with recommendations. Dietary diversity score (DDS) was calculated as part of the pyramid serving database that was categorized into 23 broad food groups.

Results: Adjusted binary regression logistic showed that students with low food and nutrition knowledge were less likely to meet recommended portion of vegetable (OR=2.83, 95% CI=1.12-7.17) and meat (OR=2.37, 95% CI=1.01-5.55) groups. Those with low functional food nutrition literacy were less likely to meet recommended daily intake of fruits (OR=2.42, 95% CI=1.38-4.25). Mean diet diversity score (DDS) was significantly higher in children with high functional food and nutrition literacy and food label literacy (p=0.001 and p=0.04 respectively).

Conclusions: The findings suggest that improving food and nutrition literacy in children can serve as an appropriate mean to facilitate healthy dietary patterns of children.

Keywords: Food and nutrition literacy, elementary school children, dietary Intake, Iran

144/2557

PREDICTORS OF POOR NUTRITIONAL STATUS AMONG CHILDREN AGED 6–24 MONTHS IN AGRICULTURAL REGIONS OF MALI

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Background and objectives: Inadequate nutrition during the first two years of life has tremendous consequences on the health and growth of children. Understanding the magnitude and determinants of nutritional status can help to avert this problem. This study aimed to assess the prevalence and potential causes of undernutrition in children aged 6 - 24 months in poor rural regions of Mali.

Methods: A community based cross-sectional study was conducted in villages in Sikasso and Mopti regions from January to March 2016. A structured questionnaire was used to collect data and characteristics of 959 boys, 856 girls, and their mothers, living in 1764 households. Anthropometric measurements such as weight, height, and mid upper arm circumference (MUAC) were performed using standardized methods. Bivariate and multivariate logistic regression analyses were conducted to identify factors associated with nutritional status of the children.

Results: The prevalence of underweight, stunting and wasting was 23.9%, 28.4% and 13.9% respectively. MUAC also indicated that 16.5% of children were undernourished. Chronic malnutrition was significantly associated with the presence of diarrhea in the past two weeks (p<0.001), higher child age (p<0.001), male sex (p<0.001), households with lowest household amenity score (p<0.002) or fewest dietary diversity score (p<001). Likewise, acute malnutrition was associated with preterm birth (p<0.03), lower child age (0.001), high number of siblings (p<0.03) and living in a household with higher months of inadequate food provisioning (p<0.03). These factors should be considered for any intervention aiming to reduce undernutrition among children in this age group living in Sikasso and Mopti in Mali.

Conclusions: Future efforts should be directed at examining how families in very poor and food-insecure areas can be empowered to feed their children a more diverse diet. These interventions must increase the availability and sustainability of household food provisioning as well as take into account potential illnesses.

Keywords: Stunting, Wasting, underweight, children, Mali

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144/2559

URINARY PESTICIDE EXPOSURE IN FRENCH ADULTS WITH LOW AND HIGH ORGANIC FOOD CONSUMPTION FROM THE GENERAL POPULATION-BASED NUTRINET-SANTÉ

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Background and objectives: Food consumption is the primary route of exposure to pesticide residues in general population. Due to its strict regulation, organic farming may contribute to reduce dietary exposure to pesticides but findings based on observational data are scant. In a nested case-control study from the NutriNet-Santé study, we aimed to compare urinary pesticide residues between "organic" and "conventional" consumers.

Methods: Based on self-reported organic food consumption assessed through a food frequency questionnaire, 150 low and 150 high organic food consumers were selected with <10% or >50% of organic food in the diet respectively (expressed as the propor-

tion of organic food in the whole diet in g/d). Participants were matched using the propensity score method including sociodemographic, food intakes and health characteristics.

Urinary pesticide residues and metabolites (organophosphorus, pyrethroid and azole compounds) were assessed. The molar sum of diethyl (total DEPs), dimethyl (total DMPs) and total dialkylphosphates (total DAPs) were computed. Differences in distributions across groups were tested using Wilcoxon signed-rank test for matched data. Median concentrations (MD), expressed in µg/g creatinine, were provided.

Results: Mean age was 58.5y and 70% of participants were women. Significantly lower (p <0.05) urinary levels of DETP (MD: 0.196 versus 0.297), DMTP (MD: 0.620 versus 1.382), total DAPs (0.12 versus 0.16) and free 3-PBA (0.017 versus 0.021) were observed among organic consumers compared to conventional consumers.

Conclusions: Our findings suggest that dietary pesticide exposure in adults may be lowered by switching from conventional foods to organic foods. This is particularly of high interest among consumers of conventional fruits and vegetables, as their exposition may be the highest.

Keywords: organophosphates; organic diet; pesticides; observational study

Further collaborators:

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144/2567

NUTRITIONAL STATUS AT BIRTH AND BLOOD PRESSURE IN CHILEAN YOUNG ADULTS: TWO COHORTS, 15 YEARS APART

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Background and objectives: Hypertension is one of the main determinants of cardiovascular disease, so is important to identify risk factors of this condition. Birth weight (BW) has been mentioned as one of these factors especially in developed countries. The objective of this study was to assess the association between BW and blood pressure in a follow up of two cohorts in young adults from Valparaiso Region of Chile.

Methods: Two retrospective random samples born between 1974-1978 (cohort 1, n=999) and between 1988-1992 (cohort 2, n= 741), were assessed in 2000-2002 and 2014-2016, a t 24-28 years. BW was obtained from newborn records while blood pres-

sure was ascertained concurrently. Multiple linear regressions were built, adjusted by sex and BMI.

Results: In the cohort 1 the mean of BW was 3.17 Kg (±504), BMI was 25.8 (± 4.45), Systolic blood pressure (SBP) was 114.6 (±13.5) and DBP: 72.4 (±8.79). In cohort 2, BW was 3.33 (±488), BMI: 27.4 (±5.6), SBP 119.7 (±14.1) and DBP 72.5 (±9.8). There were significant differences in these means (cohort 2 versus 1) except in DBP.

In the cohort 1, for each Kg of BW increase, SBP decrease in 2.42 (95% CI=-3.74 to -1.10, p< 0.0001). In cohort 2, this figure was β -0.22 (95%=-2.18 to 1.72 p=0.82). For each Kg of BW increase, DBP decrease in -1.29 (95% CI= -2.26 to -0.33, p< 0.009) in the cohort 1 and β -0.49 (95% CI= -1.95 to 0.95, p=0.51) in cohort 2. These results are similar using BMI at birth instead of BW.

Conclusions: In the first cohort, born in the 1970's , an inverse association between BW and SBP and DBP were found. Fifteen years later, when low birth weight was lower and obesity is public health problem, we couldn't verify these associations. The possible explanation for these results are that better conditions at birth may reflect that there are no major fetal injury that have repercussions in adult life and that the risk of chronic diseases are determined later in life.

Keywords: Birth weight, blood pressure, adults
Conflict of Interest Disclosure: None

144/2568

EVALUATION OF THE INTENTION OF CONSUMPTION OF FRUITS, AND VEGETABLES OF THE EMPLOYEES OF AN EVENT SPACE IN THE CITY OF SÃO PAULO

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Background and objectives: Fruits and vegetables are essential components of a healthy diet. They have low energetic density, high fiber content, antioxidant components, besides being sources of micronutrients. The World Health Organization advocates consumption of at least 400 g / day. Studies indicate that fruit and vegetable consumption (FLV) is below recommended levels and is among the top ten factors in determining the global burden of disease in the last decade. The main objetive of this study was to evaluate the intention of FLV consumption of employees of a space of events.

Methods: This is a cross-sectional, non-directional, quantitative, descriptive and analytical study. We collected quantities of servings served by the employees, in four days of October / 2014 characterizing the consumption intention. It was stipulated as adequate consumption when the total amount of FLV / day was great-

er than or equal to 120 g. An average of sixty clients was evaluated, totaling an analysis of 240 meals.

Results: In the menu we observed the incidence of two types of salads daily, besides the presence of fruit in 75% of the days. The presence of tubers (mandioquinha and potato ball) was observed as salads in 50% of the days. 20.4% of the meals did not have any type of salad and the prevalence occurred in the male gender. In 41.8% of the meals people used only one of the salads. In relation to the intention of consumption of the two types of salads was observed 38.3%. Meals that had a salad and fruit, or two salads and fruit were around 14% each. In 4.4% of the meals no type of salad was chosen, only fruit. In 54.6% the fruit was not chosen. Meals without salad and without fruit totaled 12.2%. The quantities of FLV considering the presence or absence of tubers showed that the percentage of adequate consumption decreased from 44.6% to 34.2%. Thus, the proportion of underweight increased from 55.4% to 65.8%.

Conclusions: According to the literature, FLV consumption was low. The female gender had greater consumption than the male. The presentation of the meals, when attractive, can generate increase of the consumption.

Keywords: FLV consumption. Eating habits. Food behavior. Collective feeding.

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INFLUENCE OF INCOME ON THE HOUSEHOLD AVAILABILITY OF FRUITS AND VEGETABLES IN BRAZIL

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Background and objectives: The household availability of food is influenced by several factors, such as eating habits, beliefs and income. Investigating the influence of income on the purchase of fruits and vegetables can contribute to the identification of the household availability of these foods according to income classes and provide subsidies for a better targeting of public policies aimed at encouraging the purchase and consumption of fruits and vegetables. The objective of this study is to evaluate the association between household monetary availability (HMA) per capita of fruits and vegetables (FV) and the classes of monthly family income (MFI) in Brazil, in the years of 1987, 1995, 2002 and 2008.

Methods: Were used the microdata from Household Budget Survey (HBS) carried out in the years 1987-1988, 1995-1996, 2002-2003 and 2008-2009, conducted by the Brazilian Institute of Geography and Statistics. The data of the HMA per capita of each food were obtained through the Collective Acquisition Booklet (POF), registered daily, during the period of seven consecutive days. The MFI was evaluated using the Work and Individual Income Questionnaire and classified in MFI classes, according to the minimum wage amount.

Results: The annual HMA per capita of FV, considering all income classes, in the years 1987, 1995, 2002 and 2008 was 93.5, 74.8, 56.8 and 61.4 Kg, respectively. When the income classes are analyzed separately, an increase in annual HMA per capita of FV was verified in all classes of income analyzed, so that from the lowest (<2 minimum wages) to the highest (> 30 minimum wages) the difference was greater than 100 kg in 1987 (50,2 Kg [137,6 g/day] x 162,4 Kg [444,9 g/day] and 2008 (37.7 kg [103.3 g/day] X 146.1 kg [400.3 g / day]).

Conclusions: Income can influence the household availability of FV in Brazil, so that families with higher purchasing power acquire approximately three times more than those with lower purchasing power.

Keywords: Household availability, Income, Fruits, Vegetables, Brazil.

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GLOBAL NUTRITION IN THE MDG ERA (1990-2015): A SHRINKING HUNGRY, AND EXPANDING FAT WORLD (REVISED 144/298)

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Background and objectives: Following its publication in 2008, the global nutritional index (GNI) has been updated for the Millennium Development Goal (MDG) years (1990-2015), to show world trends in malnutrition, as it alone penalizes a country for over-nutrition.

Methods: We have re-calculated the GNI according to the methodology of the human development index, using geometric means, based on three indicators of nutritional status: macronutrient deficiency (DALY rates due to protein-energy malnutrition (PEM)), micronutrient deficiency (MID, DALY rates due to iron, vitamin A and iodine deficiency) and excess (prevalence of female obesity). The GNI (range 0-1) was calculated for 186 countries classified into seven groups according to the World Bank and WHO.

Results: The collective world GNI increased progressively from 0.433 for 1990 to 0.473 for 2015. Although high-income countries (n=52) remained the leading country group, their GNI worsened significantly from 0.657 (0.551-0.723) to 0.611 (0.536-0.675) (P<0.001). African low- and middle-income countries (LMIC)

(n=45) improved significantly from 0.301 (0.258-0.378) to 0.392 (0.372-0.417), (P<0.001) yet remained the lowest ranking group. South-East Asian LMIC (n=11) also improved significantly from 0.456 (0.408-0.522) to 0.564 (0.515-0.598), (P<0.001). The GNI for American LMIC (n=26) and European LMIC (n=20) increased from 1990-2005, but then dropped over the next ten years (both P<0.05). American LMIC, 0.459 (0.419-0.479) to 0.469 (0.444-0.490) to 0.457 (0.432-0.485); European LMIC, 0.571 (0.517-0.602) to 0.582 (0.526-0.606) to 0.575 (0.523-0.608) – values for 1990, 2005 and 2015, respectively, – showing no overall improvement. Eastern Mediterranean LMIC (n=16) 0.484 (0.414-0.525) to 0.483 (0.386-0.498) and Western Pacific LMIC (n=16) 0.433 (0.356-0.538) to 0.494 (0.262-0.604) remained stable across the MDG timespan (P>0.500). In nearly all 7 country groups, there was a decrease in PEM and MID (in high-income countries only PEM decreased), together with increased obesity. The different GNI trends among country groups were caused by the dynamic changes in these two opposing factors—decreased deficits and increased excess.

Conclusions: From 1990 to 2015, under-nutrition decreased, whereas over-nutrition increased steadily to become a major cause of malnutrition worldwide. The next Sustainable Development Goals should include alongside zero hunger – reduce obesity.

Keywords: global nutrition index, obesity, protein-energy malnutrition, micronutrient deficiency, Millennium Development Goal time trend (1990-2015)

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CHANGES IN COMPLEMENTARY FEEDING PRACTICES RESULTING FROM A COMMUNITY-BASED BEHAVIOR CHANGE COMMUNICATION PROGRAM IN VIETNAM: A REPEATED CROSS-SECTIONAL STUDY

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Background and objectives: Nutritionally balanced and safe complementary food greatly contributes to children's growth in the first two years of life. Community-based behavior change communication (BCC) programs are an effective strategy to improve complementary feeding practices, but little is known about the effects of BCC programs on entire communities. This study aimed to examine the changes of mothers' complementary feeding practices and hand hygiene practices before and after the implementation of a community-based BCC program.

Methods: This is a repeated cross-sectional study which involved 329 mother and child (6-23 months) - pairs in the 2015

July survey and 375 pairs in the 2016 September survey. The study took place in 10 communes across two provinces in Vietnam. The measurements were based on Infant and Young Child Feeding (IYCF) indicators, handwashing with soap at critical times, five keys to safer food, and exposure to BCC program. The changes between two surveys were examined using bivariate analysis.

Results: Most of the socio-demographic characteristics of the participants were similar between the two surveys except income level (higher income category: 36.0% vs 48.5%, P=0.001) and the mean age of children (13.1 months vs 14.6 months, P<0.001). The prevalence of stunting among children decreased from 20.1% in 2015 to 5.3% in 2016 (P<0.001). The percentage of children meeting minimum dietary diversity increased from 66.3% in 2015 to 86.3% in 2016 (P<0.001) and the percentage of children meeting minimum acceptable diet increased from 49.5% in 2015 to 70.0% in 2016 (P<0.001), but no significant changes were observed in the percentages of children meeting minimum meal frequency. The percentage of mothers who washed their hand with soap after using the toilet also increased from 44.4% in 2015 to 77.6% in 2016 (P<0.001). More participants were exposed to the BCC program in 2016 (98.7%) than in 2015 (77.9%, p<0.001).

Conclusions: This study demonstrates that a BCC program targeting entire communities may positively affect the percentages of children who meet minimum dietary diversity and minimum acceptable diet as well as the percentage of mothers practicing appropriate hand hygiene.

Keywords: Stunting, Complementary feeding, IYCF indicators, Behavior change communication, Vietnam

HOW CRITICAL WATER SECURITY IS TO ENSURE AN OPTIMAL NUTRITION AND GROWTH AMONG CHILDREN: RESULTS OF A CROSS-SECTIONAL STUDY CONDUCTED IN THE WEST REGION OF CAMEROON

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Background and objectives: Food security or consistent access to adequate and nutritious food is a significant and direct predictor of growth and development among children. However, very little is known about the role water security plays in predicting food security through its third and ultimate pillar of food utilization. The three main objectives of the study were to: 1) assess the prevalence and severity of water security; 2) examine the relationship between water and food security; 3) estimate the association between water security and growth among children through food utilization pathway, among the rural households in the West region of Cameroon

Methods: Based on the sample size estimation, 134 caretakers and children dyads were recruited in Bafou-- a village in the Menoua division- Cameroon (December 2016 – April 2017).

Female caretakers were selected for the interview, if they were: non-pregnant; > 18 years old; main meal preparer of the household; and, primary caretaker of children in the household. The participants were interviewed in French, English, or the local dialect (Yemba) to collect information on socio-demographics, food, water security and other water access and storage related practices. At the end of interview, one of the children in the household between 2 and 5 years was selected as an index child for anthropometric measurements of height and weight.

Results: Preliminary results indicate that the water insecurity is high in the study area due to poor quality and limited physical access to water. High water insecurity is associated with: a long distance of walking for water acquisition, paying money to get water, and rationing water use to last its storage for several days. The bivariate analysis indicated that poor water access is associated with limited dietary variety at the household level and underweight among children.

Conclusions: In conclusion, improvement in water security is critical in ensuring sustainable and long-term improvement in food security and optimal development for children.

Keywords: Water insecurity, food insecurity, growth, food utilization

THE RELATION BETWEEN JAMU (TRADITIONAL HERBS) CONSUMPTION AND FOOD RESTRICTION (TABOO) AGAINST HEMOGLOBIN LEVEL OF PRECONCEPTION WOMAN IN BANGGAI REGENCY, CENTRAL SULAWESI PROVINCE

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Background and objectives: Nutritional status during preconception period is an important determinant of pregnancy outcome. Cultural norms, taboo, and beliefs lie within the contextual

factors that could potentially affect nutritional status and health in preconception women

Methods: This study aims to identify relation between Jamu consumption (traditional herbs) and food restriction (taboo) against hemoglobin (Hb) value in preconception women in Banggai Regency in the year 2016-2017. This study used cross sectional design with saturated sampling technique. The population in this study were 53 preconceptional women that meet the inclusion and exclusion criteria to judge the several factors that affect the value of Hb. Bivariate analysis using unpaired t test.

Results: The result show that stated hemoglobin levels average is 12.76 g / dL and the mean value 13.0 g / dL with the lowest hemoglobin value of 7.3 g / dL and hemoglobin highest value 15.9 g / dL. The test results of bivariate showed no significant difference in mean hemoglobin values among women whose consume herbs and women who did not (p = 0.751), there was no significant difference in mean hemoglobin values between groups of women with certain food restriction (taboo) and those who do not have restriction on certain foods (p = 0.231), there are no significant differences in mean hemoglobin values among women who do not consume herbs and those who consume herbs (p = 0753)

Conclusions: It is important to be aware of the pharmacological content of the medication particularly when it is systemically administered. Food taboos influence the amount, frequency and quality of nutrients as contributing factor against hemoglobin level and nutritional status of women before pregnancy. Hence, we need integrated and comprehensive approaches, with interventions to improve the overall health of the preconception women in this specific cultural context.

Keywords: Preconception, traditional herbs, taboo, hemoglobin

Further collaborators: Adi Tube, Researcher. Banggai District Health Office

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GROWTH CHANGES FROM INFANCY TO CHILDHOOD AND GLUCOSE TOLERANCE IN LATE ADOLESCENCE: EVIDENCE FROM HONG KONG'S "CHILDREN OF 1997" BIRTH COHORT

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Background and objectives: Previous studies on the association of growth with glucose metabolism have yielded inconsistent findings. Also, the role of growth at different phases remain unclear. We investigated the associations of growth changes from infancy to childhood with glucose tolerance in late adolescence.

Methods: Singletons born in Hong Kong from April to May 1997 were recruited into a prospective population-based "Children of 1997" birth cohort (n=3276). Growth changes (weight-for-age z score (WAZ), length/height-for-age z score (LAZ) and body-mass-index-for-age z score (BAZ) based on the WHO growth charts) at different time intervals from infancy to late childhood were estimated using a spline model. Fasting plasma glucose (FPG) and glycated hemoglobin (HbA1C) concentrations at 16 to 18 years old were measured. Impaired glucose tolerance (IGT) was defined as FPG≥5.7 mmol/L or HbA1C≥5.6%. The multivariable linear and logistic regression models were adjusted for maternal characteristics (passive and active smoking status, migrant status, education, age, parity), infant characteristics (breastfeeding status, gestational age, WAZ at birth or LAZ or BAZ at 3 months), family history of diabetes and household income, while the second models were additionally adjusted for previous growth.

Results: Higher LAZ gain from 3 to 36 months (β=0.016mmol/L,95% confidence interval (CI)=0.001,0.030), WAZ gain from 36 to 108 months (β=0.032mmol/L,95% CI=0.019,0.044), LAZ (β=0.028mmol/L,95% CI=0.007,0.048) and BAZ (β=0.024mmol/L,95% CI=0.007,0.041) gains from 132 to 180 months were associated with higher FPG, while higher BAZ gain from 108 to 132 months was associated with lower HbA1C (β=-0.017mmol/L,95% CI=-0.017,0.000) and odds ratio (OR) of IGT (OR=0.68, 95% CI=0.54,0.86). The positive associations of BAZ from 36 to 108 months with FPG (β=0.013mmol/L,95% CI=0.002,0.025), WAZ gain from 36 to 108 months with HbA1C (β=0.009mmol/L,95% CI=0.000,0.019) and WAZ (OR=1.13,95% CI=1.00,1.27) and BAZ (OR=1.14,95% CI=1.03,1.25) gains from 36 to 108 months with IGT and the negative association of LAZ gain from 108 to 132 months with IGT (OR=0.73,95% CI=0.54,0.98) were more evident after additional adjustment for previous growth.

Conclusions: Our study demonstrated that there may be independent associations of growth across life stages with glucose metabolism. Further studies are warranted to improve understandings on the underlying mechanisms at different growth phases.

Keywords: growth, infancy, childhood, adolescence, glucose metabolism

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DIETARY CHANGES NEEDED TO IMPROVE DIET SUSTAINABILITY: ARE THEY SIMILAR ACROSS EUROPE?

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Background and objectives: It is not known whether the dietary changes needed to achieve nutritional adequacy while reducing diet-related greenhouse gas emissions (GHGE) are similar across Europe when cultural and gender specificities are taken into account.

Methods: Starting from each mean observed diet in five European countries (France, UK, Italy, Finland and Sweden) and for each gender, nutritionally-adequate diets departing the least from observed diet were designed with linear programming by applying stepwise 10% GHGE reductions. Other models directly minimized GHGE.

Results: For most countries and whatever the gender, achieving nutritional adequacy implied substituting sugared and fatty products by fruit, vegetables and starchy foods, but increased GHGE. Within-food-groups substitutions were reinforced when imposing a stepwise GHGE reductions while meeting nutritional adequacy. Changes in consumption of animal-based products occurred but differed according to country and gender, particularly for fish, poultry and non-liquid milk dairy. The maximal GHGE reductions achievable ranged from 62% to 78% but they induced large departures from observed diets (at least 2.8 kg/day) by modifying the quantity of at least 99% of food items.

Conclusions: Setting nutritional goals with no consideration for the environment may increase GHGE. However, diet sustainability can be improved by substituting sugared and fatty food products by fruit, vegetables and starches, which involves country-specific changes in consumption of animal-based products. Standardized surveys and individual diet modeling are promising tools for further exploring ways to achieve sustainable diets in Europe.

Keywords: Sustainability. Diet modelling. Europe. Greenhouse gas emissions. Nutrition.

144/2612

SPATIAL CORRELATION BETWEEN DIABETES MELLITUS AND FOOD INTAKE IN BRAZIL, 2013

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Background and objectives: The National Health Research (PNS, in Portuguese) conducted in Brazil in 2013, identified that 6. 2% of the adult population (9 million people) had diabetes. Eating habits and life style may be related to this prevalence. Therefore, this study aimed to analyze the spatial correlation between diabetes and food intake in the Brazil adult population in 2013.

Methods: Ecologic study of spatial analysis, using data from the PNS, by the Brazilian Institute of Geography and Statistics, representing the 27 federative units (UF) of Brazil, in 2013. The dependent variable was diabetes prevalence in adults. The independent variables were the regular intake of vegetables, fruits and fruit juice (minimum of 5 servings/day); Soft drinks (> 5 days/week); Sweets (> 5 days/week); Replacement of meals by sandwiches, savory pastries or pizzas (> 5 days/week). Spatial analysis was conducted to verify the univariate and bivariate spatial correlations using the GeoDa software, through which thematic maps were built and the Local Moran's I (LMI) was calculated. This index presents results exclusively for significant spatial statistic correlations.

Results: It was found a significant and positive spatial correlation ($p < 0.05$) between diabetes prevalence and the consumption of sweets (LMI = 0.5878); soft drinks (LMI = 0.2056); vegetables, fruits and fruit juice (LMI = 0.1082); and, replacement of meals (LMI = 0.4561). High/High Clusters were identified between diabetes prevalence and all the independent variables in the Southeast, South and Midwest states. Low/Low Clusters between diabetes and consumption of sweets in states of the North, and for vegetables, fruits and fruit juice in states of the Northeast. These findings suggest spatial coexistence of a higher diabetes prevalence in UF where the adult populations have a higher intake of ultra-processed foods, such as in South Central Brazil.

Conclusions: The results demonstrate that the ingestion of ultra-processed foods and diabetes prevalence are correlated and are different in Brazil's territory. The habitants of different UF have different eating habits that favors diabetes prevalence, possibly related to the development of those places. Health actions and the prevention of this NCD , considering eating habits and nutrition, should be strengthened in Brazil.

Keywords: Spatial analysis; Chronic Disease; Noncommunicable diseases; Food habits; Food consumption.

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WHICH DIETARY CHANGES TO MOVE TOWARDS NUTRITIONALLY ADEQUATE DIETS WITHOUT INCREASING THEIR IMPACT ON BIODIVERSITY, WATER AND LAND-USE? THE CASE OF TUNISIA

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Background and objectives: As several Mediterranean countries, Tunisia has experienced an epidemiological and nutritional transition resulting in an increase in overweight, obesity and co-morbidities. In the last decades, food consumption departed from traditional diets towards higher consumption of animal-based and sweet products. Tunisia also faces environmental issues such as water scarcity, soil erosion and biodiversity loss. This growing concern for health issues and climate change has emphasized the need to promote sustainable diets, i.e. nutritionally adequate, affordable, culturally acceptable, and with low environmental impact. The objective was to identify dietary changes needed to move towards nutritionally adequate diets without increasing their environmental impact.

Methods: Nutrient intakes were estimated using dietary data from the nationally representative Tunisian study on food consumption (n=7209, 35-70y), and food composition from a Tunisian database and the Food Processor software. Environmental impact of diets was assessed through 6 indicators - water scarcity, biodiversity, and 4 indicators for land-use (erosion resistance, mechanical filtration, groundwater replenishment, biotic production) – estimated for 161 foods. For each gender, two optimized diets respecting all nutritional recommendations from WHO and with minimized departure from the mean observed diet were designed with linear programming under 2 scenarios to fulfill: i) all nutritional constraints (NUTRI) and ii) all nutritional constraints without exceeding observed levels for the 6 environmental indicators (NUTRIENV).

Results: Calcium, copper, iron (for women), magnesium and potassium intakes were below their recommendations in the mean observed diets, while sodium and fats exceeded them. Under the NUTRI scenario, i.e. reaching nutritional adequacy without controlling for the environmental impacts, the main dietary changes were the increases of vegetables, starchy foods, fish and dairy products, and decreases of fats and sweet products. All the environmental indicators were impaired, except erosion resistance and biotic production. Under the NUTRIENV scenario, i.e. when environmental indicators were limited to their observed levels, changes in dairy and starchy products quantities were lower than in the NUTRI scenario. In addition, fruits increased and meat decreased.

Conclusions: Environmental impacts should be assessed when identifying food consumption changes to reach nutritional adequacy. Dietary changes identified to move towards more sustainable diets in Tunisia will be translated into action proposals.

Keywords: Sustainable diet; Nutritional adequacy; Environmental impact; Tunisia; Diet modeling

Further collaborators:
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ANALYSIS OF THE USAGE AND CHARACTERISTICS OF DIETARY SUPPLEMENT CONSUMERS OF URBAN COSTA RICAN POPULATION

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Background and objectives: Previous studies reveal that dietary supplement (DS) consumption has increased in the Western world in all ages groups and is influenced by gender, age, educational level, socioeconomic status and other factors. In Costa Rica there is no information regarding DS use in the general population. The present study was focused on assessing the prevalence of use and determining the socio-demographic, anthropometric and nutritional characteristics of urban Costa Rican DS consumers, and to explore the reasons for their consumption.

Methods: Data were obtained from Latin American Nutrition and Health Study (ELANS), is a cross-sectional study including a representative sample of urban population from eight LA countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela). In Costa Rica 798 participants were asked about DS use, and six months after the first contact a second questionnaire was applied by telephone to subjects who had previously reported DS use, in order to delve on the characteristics and perceptions involved in DS consumption. Chi-square test was used to compare observed and expected frequencies

Results: Approximately 6% (n=48) of the population surveyed reported the use of DS, mainly in the form of multivitamins. No significant differences for sex, age, socioeconomic status (SES), educational level and body mass index (BMI) were found for DS intake. DS consumers reflected significantly higher intakes of dietary calcium in both sexes, and dietary vitamins C and vitamin E in women, compared to nonusers. Reasons for consumption of DS focused on health benefits, prevention of illness, improved immunity, and energy boost. Although perceived as beneficial for 58% of the cases, the use was discontinued after six months.

Conclusions: The prevalence of DS usage was lower than reported by other studies in the field. A pattern similar to that described in the literature (BMI <25 kg/m2, physically active, healthy lifestyles and favorable socio-demographic backgrounds) was not found in this study.

Keywords: dietary supplements; consumers; perceptions, Costa Rica

Further collaborators: On behalf of ELANS Study Group

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SELF-REPORTED ADVERSE EVENTS DURING LONG-TERM VITAMIN D SUPPLEMENTATION: DATA FROM A RANDOMIZED CONTROLLED TRIAL (VITAMIN D ASSESSMENT STUDY)

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Background and objectives: Many randomized controlled trials (RCTs) are examining the health effects of long-term vitamin D supplementation. To date, there are limited data on long-term adverse events (AEs); recently published RCTs briefly reported on AEs, without undertaking a detailed assessment. Many earlier studies of vitamin D supplementation had small sample sizes and/ or short follow-up periods.The main purpose of this study was to assess self-reported non-serious AEs during long-term monthly 100,000 IU vitamin D3 supplementation in 2558 participants in the vitamin D arm, compared to 2550 participants in the placebo arm.

Methods: We analysed data from the vitamin D assessment study (ViDA) trial's monthly-to-4monthly questionnaire over four years of follow-up to assess the incidence rate of the first reported AE, and first event in each category of the AE, including pain, respiratory illnesses and infection, gastrointestinal problems, tiredness, dizziness, skin-related symptoms and complications related to other health conditions. SAS package 9.4 was used for data analysis.

Results: There was no significant difference between the treatment arms for the first reported AE. 358 (14.0%) participants from vitamin D arm versus 337 (13.2%) participants from the placebo arm said they had AEs after taking the assigned capsule. Including repeated events by the same individuals, there were a total of 1153 AEs (627 and 526 in the vitamin D and placebo arms, respectively). However, only 559 participants (288 in the vitamin D and 271 in the placebo arm) explained the type of event. The incidence rate of any first event in participants of vitamin D arm was 5.1 versus 4.9 in the placebo arm with an attributable risk of 0.23 (P=0.56). Further regression analysis showed that being from minority ethnic groups (Māori, Pacific, South Asian; p<0.0001), a non-drinker or monthly drinker (p=0.011), or being a non- or ex-smoker (0.004) were associated with more AE reporting.

Conclusions: Monthly supplementation of 100,000 IU vitamin D3 did not increase participants' self-reported AEs in the ViDA study.

Keywords: Vitamin D3, supplementation, RCTs, adverse-events

THE IMPORTANCE OF THE EVALUATION OF COMPETENCES OF A COOK OF A FOOD AND NUTRITION UNIT OF A CANCER HOSPITAL

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Background and objectives: The hospital is an organization specialized in prevention, recovery and maintenance of the health of the community. Understanding hospital activity as a business and balancing with its mission requires business management. The food service indirectly constructs and maintains the positive or negative image of the hospital, becoming the indicator of the service provided. Given this, food workers are required not only to prepare quality meals, but to develop their cognitive potential and the fundamental role of communication, participation and leadership in order to achieve the proposed objectives, increase productivity, minimize Efforts and costs. It is fundamental that the cook for the exercise of his activities present competences according to the requirements of the position. To evaluate the competences of the cook within a Food and Nutrition Unit of a cancer hospital.

Methods: This is a cross-sectional observational descriptive study with primary data collection. It was performed in March 2017 in a hospital UAN, administered by self-management located in the eastern region of the city of São Paulo. The study was carried out with a collaborator, the cook, who was responsible for the meals of the patients, and the data collection took place during three days from the observation of the daily routine by means of a check list elaborated on the basis of the literature and the internal rules of the hospital Containing 26 competencies required for that position. An unstructured interview was conducted in order to contribute to the data collection.

Results: The cook presented a 70% adequacy, being a responsible and attentive professional with the team and the patients, but was verified 30% of inadequacy, mainly in relation to the leadership, demonstrating difficulty in conducting the team in an efficient and satisfactory way.

Conclusions: The employee does not present all the competencies required for the position, mainly in relation to the leadership in relation to the team, being necessary to implement training program in order to promote the development and potentialization of its leadership spirit, contributing to personal and professional growth And therefore improvement in interpersonal relationships, with positive results for the UAN hospital and for the patients attended.

Keywords: Competencies. UAN Hospitalar. Cook.

AN EXPLORATION OF CHINESE CONSUMERS UNDERSTANDING OF EARLY AGE NUTRITION

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Background and objectives: China is potentially a large export market for New Zealand, particularly for milk products, yet little is understood about the Chinese consumer's understanding of nutrition. Most insight to date has been gained by taking a product focused perspective, but such research has yielded many failures and few successes for New Zealand companies trying to gain traction in the Chinese market. Consequently, this research has a different aim. It focuses on exploring the consumers' understanding, knowledge, attitudes, emotions and cognitive reactions regarding a general category, and the nutritional benefits sought from this category, rather than a specific product. Importantly, the research also includes an exploration of the environment, culture and political scape in which consumer understanding is derived and purchase decisions are made. The category for this project is supplementary infant and toddler foods. By supplementary foods we mean foods which are fed to a child either to support breast milk or instead of breast milk, weaning foods, and foods given to a child in addition to regular, shared family foods.

Methods: 14 in-home interviews were conducted in Shanghai, China. Participants were parents of infants between 2 months and 12 months of age. The interviews were conducted in Mandarin and an instantaneous translator was present to translate. 4 focus groups were also undertaken with mothers of toddlers ranging from 2 years to 5 years. A thematic analysis was undertaken utilising NVivo and a complimentary corpus analysis was also conducted.

Results: Emergent themes revealed a serious lack of basic understanding of nutrition, together with enormous trust in overseas milk powders and weaning food, and a total lack of trust in any Chinese products.

Conclusions: Policy makers in China have significant work to do to engage the trust of citizens and protect their dairy industry.

For NZ exporters insight into trust of foreign brands and the need for simple, clear labeling will be of benefit, together with insight into promotion

Keywords: Chinese consumers, early age nutrition
Further collaborators:
Funded by NZ Government project High Value Nutrition

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STRUCTURE AND NUTRITIONAL QUALITY OF FRENCH ADULT DIETS ACCORDING TO THEIR GREENHOUSE GAS EMISSIONS – FINDINGS FROM THE BIONUTRINET PROJECT

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Background and objectives: Substantial climate change mitigation will not happen without a drastic reduction of greenhouse gas emissions (GHGEs). This involves important shifts in dietary patterns by a large proportion of the world's population.

The aim of this observational study was to compare and characterize diets with various levels of GHGEs from participants of the French NutriNet-Santé study.

Methods: Food consumption of 34,193 French adults included in the NutriNet-Santé cohort was assessed using an organic food frequency questionnaire. Dietary GHGEs (expressed in kg-CO_2eq/year) of participants were computed, taking into account farming practices (organic or conventional production). Adjusted means of contribution of food groups to the diet (in percentage), percentage of organic food as well as compliance with the nutritional guidelines (reflected by the modified Programme National Nutrition Santé Guidelines Score, mPNNNSGS) were compared between weighted quintiles of GHGEs, using ANCOVA models.

Results: Dietary GHGEs ranged from 677 kgCO2eq/year (Q1) to 2954 kgCO2eq/year (Q5), after adjustment for sex, age and energy intake. Contribution of meat to the diet increased along GHGEs (ranging from 2.6% (Q1) to 11.5% (Q5)) while an inverse trend was observed for fruit and vegetables. Concerning dairy products, the lowest contribution was found in the most climate-friendly diet (Q1).

After adjustment for age and sex, daily energy intake significantly increased along GHGEs (Q1: 1580 kcal/d (95%CI=1569-1592) versus Q5: 2647 kcal/d (95%CI=2633-2662), (p-trend<0.0001)). Percentage of organic food in the diet decreased along with GHGEs (from Q1: 43.4% (95%CI=42.8-44.0) to Q5: 15.4% (95%CI=14.6-16.2)), as well as the adherence to the nutritional recommendations (mPNNSGS ranged from 8.34/13.5 (95%CI=8.30-8.38) in Q1 versus 7.95/13.5 (95%CI=7.90-7.80) in Q5).

Conclusions: Based on observational data, our study provides new arguments concerning the potential of actual healthy and alternative diets, with low environmental impact. Participants with low GHGEs diets have the highest contribution of fruit and vegetables, and the lowest contribution of animal's origin products. Their diets are more organic, provide fewer calories, and their compliance with French guidelines are better.

Our results highlight the importance of promoting holistic changes in dietary patterns to meet future environmental challenges, including the mitigation of global warming.

Keywords: Climate change, Dietary pattern, greenhouse gas emissions

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COMBINED HEALTHY LIFESTYLES AND RISK OF DEPRESSIVE SYMPTOMS IN THE NUTRI-NET-SANTÉ COHORT

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Background and objectives: It is known that several modifiable lifestyle indicators, including diet quality, smoking status, alcohol consumption, weight and physical activity are independently associated with depression; however, their combined effects on depression risk is less studied. This study aimed to develop a Healthy Lifestyle Index (HLI) score composed of all of the above indicators and to investigate their association with the risk of incident depressive symptoms in a large French cohort.

Methods: The study sample consisted of 25,837 middle aged participants from the NutriNet-Santé study, initially free of depressive symptoms. The HLI was computed by assigning 1 point for each healthy behavior related to diet quality (measured by the modified French Programme National Nutrition Santé-Guideline

Score), smoking status, alcohol consumption, body mass index and physical activity. Incident cases of depressive symptoms were defined by a Center for Epidemiologic Studies Depression Scale (CES-D) score ≥17 for men and ≥23 for women at least once during the follow-up. Hazard Ratios (HR) and 95% confidence intervals (95% CI) were estimated using Cox proportional hazards models and population attributable risk (PAR) was calculated for each individual lifestyle indicator.

Results: A total of 2,112 first cases of incident depressive symptoms were identified over a mean follow-up of 6 years. In the adjusted models, compared with participants with a low score (0-2 healthy behaviors), participants with high and medium scores (4-5 and 3 healthy behaviors respectively) had a significantly lower risk of incident depressive symptoms (HR=0.75; 95% CI: 0.67-0.83) and (HR=0.84; 95% CI: 0.75-0.94) respectively, P-trend<0.0001. The estimated PAR representing the proportion of depressive symptoms cases in the population that are attributable to non-adherence to specific healthy lifestyle indicators were 8%, 5% and 5% for healthy diet, healthy weight and non-smoking respectively. The PAR was not estimated for physical activity and limited alcohol consumption because the estimated HR for these individual indicators was not statistically significant in multivariable models.

Conclusions: In this study, the combined healthy lifestyle behaviors were associated with a lower risk of incident depressive symptoms, indicating that modifying unhealthy lifestyles is of major interest in a context of prevention of depressive symptoms.

Keywords: Depressive symptoms; Lifestyle indicators; Population attributable risk

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IMPACTS OF USING AN INTEGRATED HOME-STEAD FOOD PRODUCTION AND NUTRITION PROGRAM PLATFORM TO PROMOTE UTILIZATION OF MULTIPLE MICRONUTRIENT POWDERS: A CLUSTER-RANDOMIZED CONTROLLED TRIAL

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Background and objectives: HKI's enhanced homestead food production (EHFP) model aims at improving maternal and child nutrition through food production, and nutrition, health and hygiene behavior change communication (NHH-BCC). In Tanzania, HKI also used the EHFP platform to promote utilization of multiple micronutrient powders (MNP) for young children.

We assessed the effectiveness of HKI's EHFP platform for increasing MNP knowledge and utilization and reducing anemia compared to a non-EHFP beneficiary group that received MNP at home.

Methods: We used a cluster-randomized, longitudinal design. We randomly allocated 30 wards to EHFP or the comparison group (n=~1,150 children aged 6-12 months at baseline/group), and followed-up after 3, 12, and 18-months. At baseline and 12-months, both groups received a 2-month supply of MNP at home with MNP-relevant BCC. Village-level MNP sensitization was conducted before the 12-month delivery. In addition, the EHFP group received agricultural training and inputs, NHH-BCC and monthly MNP-specific interpersonal counselling (MNP-IPC) between 12- and 18-months. We assessed program exposure and impacts on maternal knowledge of MNP benefits, MNP utilization, and child anemia. We used intent-to-treat, cluster-adjusted OLS regression and linear mixed models to identify differences between time points (p-change<0.05) and study groups (p-group<0.05).

Results: MNP-IPC was higher (by design) in the EHFP compared to the comparison group (64% versus 5%, p-group<0.001); attendance at the MNP community sensitization was also higher (64% versus 29%, p-group<0.001). Between 3- and 18-months, knowledge of MNP benefits increased more in the EHFP group (+16pp versus +6pp, p-group=0.006); however, adequate MNP preparation increased in both groups (+20-21pp/group, p-change<0.001) and daily MNP consumption remained high in both groups (+8-11pp/group, p-change>0.05), with no group-wise differences. Similarly, anemia decreased between baseline and 3-months (-9-10pp/group, p-change<0.001) and between 12- and 18-months (-8pp/group, p-change<0.02) in both groups, with no differential decline between groups.

Conclusions: Promotion of MNP through EHFP increased exposure to MNP sensitization and MNP knowledge, but not utilization or effectiveness. However, given the effectiveness of EHFP in mobilizing communities for MNP sensitization events, community intervention platforms such as these may be a more viable delivery channel for distribution and promotion of MNP and other nutrition-specific interventions than possibly more costly and logistically challenging individual approaches.

Keywords: Community intervention platform; Anemia; Delivery; Micronutrient powder; Promotion

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COMPARISON OF TWO PREGNANCY NUTRITIONAL EVALUATION STANDARDS IN ADOLESCENT CHILEAN PREGNANT WOMEN

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Background and objectives: There are no curves to assess nutritional status and weight gain during pregnancy for adolescent women. We aimed to compare the diagnostic ability of the so-called Rosso-Mardones (RM) and Atalah et al (AEA) curves to detect newborns at risk in pregnant adolescents.

Methods: A sample of 5554 adolescent pregnant women was selected. The mothers had their deliveries at the Sótero del Río Hospital in Santiago, Chile, between 2001 and 2004. They were nutritionally classified with both evaluation patterns at the beginning of gestation. The distribution of newborns at risk for each maternal nutritional status according to both curves was calculated for the following categories: birth weight < 3000 g, birth weight > 4250 g, and birth length < 50 cm. Sensitivity and specificity values of the RM and AEA charts were calculated to determine newborns at risk in both obese and underweight women.

Results: A higher proportion of obese and underweight women were diagnosed with the RM curve. Proportions of at risk newborns were similar for each maternal nutritional category according to both curves. However, absolute numbers for those live births were much higher in women classified by RM. This led to a greater sensitivity of the RM curve.

Conclusions: The higher RM sensitivity could support its use to improve preventive actions for pregnant women younger than 20 years of age.

Keywords: birth weight and length, body mass index, adolescent pregnancy.

Further collaborators: Health personnel from the public services

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THE EFFECT OF GENDER ON NUTRITION FACTS LABEL USAGE OF CERTAIN FOOD PRODUCTS

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Background and objectives: Gender is an important socio-demographic factor that might determine the nutrition facts label usage. This study aimed to describe the prevalence of nutrition facts label use on certain food products by gender.

Methods: The study sample comprised of 647 (67.5%) female and 311 (32.5%) male participants. The mean age of participants was 21.5±1.86 years. In order to determine participants' nutrition facts label usage about certain food products including dairy and dairy products, meat and meat products, egg, legumes, bread, grains, pastry products, cereals, snacks, packed vegetables and fruits, cans and olives, oils, breakfast food products, sauces, salt and spices, beverages, ready to serve foods, instant soups, ready to serve desserts, frozen foods and diet products for special occasions were asked to participants by nutritionists. The responses are measured on a 3-Likert scale ranging from 1 (never) to 3 (always). The questionnaires were analysed with the statistical programme SPSS 22.

Results: While 501 (77.4%) of women participants read the nutrition facts label, 170 (54.7%) of men participants read the nutrition facts label (p<0.05). The frequency of female participants who always read the nutrition facts label of meat and meat products (71.9%), egg (72.5%), bread (70.3%), pastry products (%75.1), cereals (78.0%), snacks (77.1%), canned products and olives (75.2%), oils (73.9%), breakfast food products (75.8%), sauces (73.6%), salts and spices (76.2%), beverages (73.5%), ready to eat foods (73.7%), instant soups (74.0%), ready to eat desserts (75.9%), frozen foods (73.9%) and diet products for special occasions (77.8%) were higher than men participants (p<0.05). In the case of dairy and dairy products, legumes, grains, packed vegetables and fruits, there was no difference related to reading the nutrition facts panel among gender (p>0.05).

Conclusions: Understanding of nutrition facts label might be an important strategy for nutrition education. This study showed that men should be focused to improve their usage of nutrition facts labels by increasing their awareness about food labels.

Keywords: nutrition facts label, gender, certain food groups

IS THERE ANY RELATIONSHIP BETWEEN BODY MASS INDEX AND NUTRITION FACTS LABEL USAGE IN CERTAIN SITUATIONS?

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Background and objectives: Information provided on nutrition facts label could assist consumers to make healthier food choices. It is suggested that some individual factors might be related with nutrition facts label usage and understanding. In this context, this study aimed to examine how nutrition facts label usage change by body mass index (BMI) in certain situations.

Methods: The face-to-face questionnaire was administered to participants (n=958), aged 18 -34 years, in order to compare their nutrition facts label reading in situations such as buying a product for the first time, buying an unknown brand product, comparing the similar products of two different firms, wondering about the nutritional content of the product and being careful about nutrition because of the health problems. The responses are measured on a 3-Likert scale ranging from 1 (never) to 3 (always). Anthropometrical measurements including weight and height of participants were taken by nutritionists. The participants were classified into four groups according to WHO BMI classification. The questionnaires were analysed with the statistical programme SPSS 22.

Results: Mean BMI of participants was 21.98±3.20 kg/m2. It was obtained that the percentage of participants with a normal BMI who always read the nutrition facts label were higher than obese individuals in each situations. Furthermore, participants with a normal BMI read the nutrition fact label more frequently than other BMI groups in that situations: buying an unknown brand product (74.9%), comparing the similar products of two different firms (74.7%), being careful about nutrition because of the health problems (74.6%) (p<0.05). In other situations such as buying a product for the first time and wondering about the nutritional content of the product there was no difference related to reading the nutrition facts panel among BMI groups (p>0.05).

Conclusions: It is crucial to identify the situations that people gives attention to the label of the products. Furthermore, understanding of nutrition fact label in obese individuals should be improved as a part of nutrition education.

Keywords: body mass index, nutrition facts label, certain situations

ACCELERATED SHELF LIFE STUDIES: TESTING MICRONUTRIENT STABILITY OF NEW AND UPGRADED FOOD AID PRODUCTS

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Background and objectives: Accelerated shelf life/stability studies are a critical part of product research and development and are being included as new/upgraded food aid products are introduced. Objective: determine the vitamin and mineral stability and integrity of U.S. products included in the Food Aid Quality Review (FAQR) Phase II food aid effectiveness trials. Tests were carried out on Corn-Soy Whey Blend (CSWB), Super Cereal Plus (SC Plus), Corn Soy Blend Plus (CSBP), and Ready-to-Use Supplementary Food (RUSF).

Methods: Samples were analyzed for vitamin A and mineral (iron, calcium and phosphorus) content, and organoleptic properties (appearance, odor, taste, packaging appearance). Testing followed certified methods of the Association of Official Analytical Chemists (now AOAC International). Products were stored at 40 degrees Centigrade (104 degrees Fahrenheit) and 75 percent relative humidity for 26 weeks to mimic 26 months in real time. Products were sampled/tested seven times.

Results: Vitamin A levels in all fortified blended foods (FBFs) degraded substantially during testing but remained stable in RUSF, a lipid-based product. Mineral levels varied among the FBFs, partially due to inherent micronutrient differences in product ingredients. Organoleptic characteristics: FBFs all developed a slight grainy odor over their shelf lives. Three of the four showed sparse black flecks at various points, likely due to the dark germ color and heat processing of the raw corn. RUSF odor, appearance, texture and packaging remained stable and normal.

Conclusions: Advances in micronutrients and ingredients can impact shelf life duration and organoleptic properties of FBFs through the supply chain. As innovation changes ingredients (e.g., amylase, probiotics, chemical forms), shelf life studies are crucial in verifying the stability and integrity of food aid products. Accelerated shelf life studies are industry standard for new product development and should become standard for all new or upgraded food aid products. Intrinsic micronutrient values of product ingredients, product packaging, and the product food matrix should be considered in determining product specifications, including shelf life.

Further research is needed to: 1) improve vitamin A stability in dry premixes for FBFs, 2) determine the most appropriate delivery

mechanism, 3) develop packaging materials that reduce vitamin degradation.

Keywords: food aid, product, stability, micronutrient, shelf life

Further collaborators:

Funding Information

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ASSESSMENT OF THE FITNESS CENTERS USERS PROFILE ON THE CONSUMPTION OF NUTRITIONAL SUPPLEMENTS IN THE CITY OF ALFENAS, BRAZIL

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Background and objectives: The fitness center is the place to go for workout. In this context, there is a lack of information and guidance regarding proper nutrition and, thus, the exercise practitioner may erroneously consume dietary supplements, impairing the achievement of their goals, as well as health damage. The objective of this study was to evaluate the profile of the fitness centers users and the use of nutritional supplements, in Alfenas, Minas Gerais.

Methods: A survey of information about the consumption of supplements by the general public was made, focusing on the use and knowledge of nutritional supplements, through a structured script.

Results: We interviewed 152 people with an average age of 24; of these, 71,05% (n= 108) attended or had completed college education. The most practiced physical activity was bodybuilding 85,18% (n= 138), so, 42,1% (n= 64) of the interviewees declared that they did use nutritional supplements. About the profile of supplementary consumers: 57,81% (n= 37) consumed one type of food supplement and were predominantly male 65,63% (n= 42); 56,76% (n= 42) were used without the advice of a specialist and the most cited reason for consumption was to increase muscle mass by 31,25% (n= 30).The most widely consumed supplement was Whey Protein 34,50% (n= 40). The data obtained from this sample point to the desire to achieve muscular hypertrophy.

Conclusions: There wasn't association between the use of nutritional supplements and factors such as sex, age, education level and type of sports practiced, which indicates the need for continuation and development of studies of this nature.

Keywords: Fitness center, gym, sporting performance, food supplements.

144/2653

BRINGING K-12 NUTRITION EDUCATION INTO THE DIGITAL AGE: RESEARCH AND RESOURCES FROM THE UNITED STATES DEPARTMENT OF AGRICULTURE

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Background and objectives: The U.S. Department of Agriculture (USDA), Food and Nutrition Service (FNS) Agency is on the forefront of Federal efforts to develop evidence and technology-based nutrition education for more than 50,000 schools across the U.S. through its Team Nutrition initiative. In 2016, an environmental scan was conducted to evaluate the current state of educational technology and discuss future implications for the development of nutrition education for schools. The digital revolution is characterized by the expansion of internet access, mobile connectivity and the use of digital technology to develop nutrition education materials. Educators should be aware of the ways that technology can be used to deliver effective nutrition education programs that can support lifelong healthy eating and physical activity behaviors.

The environmental scan is designed to collect comprehensive information about the use of technology in U.S. public schools and to identify the technology-based methods effective in increasing children's nutrition knowledge, healthy eating and physical activity. The identification of the educational technology tools and approaches that best support children's healthy behaviors and physical activity provides FNS with a valuable resource for future planning.

Methods: To evaluate educational technology opportunities in schools, an Environmental Scan was conducted that included a literature review, formative research, and input from technology and health educators.

Results: Findings from the formative research confirm that technology is an integral part of students' and teachers' daily classroom experiences. Teachers support the use of technology to provide classroom instruction and students are more engaged when technological enhancements are integrated into curricula. Teachers agreed that using technology increases student engagement, enabling children to become active participants in their learning. Teachers reported using a variety of technologies – including interactive whiteboards, laptop, desktops, tablets, and game-based learning platforms. Digital materials can integrate a variety of instructional strategies to support different learning needs and provides flexibility for educators.

Conclusions: This research will inform the developmental of nutrition educational technology initiatives and assist nutrition and health educators to design and deliver effective technology-based nutrition education.

Keywords: Nutrition education; Educational Technology; Environmental Scan; School Nutrition; Child Nutrition

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144/2654

SUPPORTING CHILD NUTRITION PROGRAMS WHEN SCHOOL IS OUT OF SESSION - USING EVIDENCE-BASED NUTRITION EDUCATION IN THE SUMMER FOOD SERVICE PROGRAM FOR CHILDREN IN THE UNITED STATES OF AMERICA

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Background and objectives: When the school year ends, food insecurity becomes more prevalent among 35 million school-aged children and many experience declines in diet quality over the summer. The U.S. Department of Agriculture (USDA), Food and Nutrition Service (FNS) Agency administers the Summer Food Service Program to help alleviate nutrition gaps by offering healthy meals and nutrition education at summer meal sites. In 2016, FNS conducted pilot testing and formative research to inform the development of effective nutrition education aimed at promoting summer meals sites and healthy eating behaviors among children.

This research assesses summer program site operator's perceptions of the usability of nutrition education materials and activities and their impact on children's knowledge and attitudes related to key nutrition messages (fruits and vegetables, sugar-sweetened beverages) and physical activity. Parent perceptions of program participation and nutrition promotional materials were also examined.

Methods: To evaluate nutrition education and promotion materials, pilot research was conducted with summer meal site operators, children who attended program and their parents. Additional formative research was conducted with parents to inform the development of nutrition education materials to promote healthy eating behaviors for families during the summer.

Results: Parents reported that children consumed a greater quantity of lower quality meals and snacks during the summer months when compared to the school year. Parents were receptive to nutrition promotional materials and reported a greater likelihood to engage children in summer meals if other activities, like nutrition education, were offered.

Summer meals site operators responded favorably to the materials' usability and feasibility and noted they filled two needs – educating children about nutrition and making sites more appealing to families. Children demonstrated statistically significant gains in their knowledge of the five food groups. There was also a statistically significant increase in children's self-efficacy for snacking on fruits instead of cake or cookies. Additionally, children reported consumption of soda decreased significantly after attending summer meal programs.

Conclusions: Materials developed to promote summer meals sites and engage children in nutrition education are effective and should include concrete ideas to help families and students achieve nutrition and health goals.

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DIETARY SOURCES AND INTAKE OF ADDED SUGAR AMONG COLOMBIAN POPULATION: RESULTS FROM ELANS STUDY

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Background and objectives: Over the past 30 years, total calorie intake has increased by an average of 150 to 300 calories per day, approximately 50% of this increase comes from added sugar (AS). This study aimed to identify the dietary intake and sources of AS among Colombian population.

Methods: Data was obtained from 1230 Colombians (15-65 years old) participating in Latin American Health and Nutrition Study (ELANS), a multicenter study of urban areas of 8 Latin-American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela). The intake information was collected using two 24 hours' dietary recall, following the multiple pass methodology and analyzed with the NDS- Software. To identify the intake of AS and the major food items accounting for AS, the weighed-proportions formula developed by Block et al (1985) was used. Median intake and sources of AS were performed by age group, gender and socioeconomic level (SEL).

Results: Median AS was 59.5g/day and 11% of total energy (11.8% females and 11% males). The main source of AS for the whole population was carbonated soft drinks (CSDs) 21.4% and Infusions were the second source (18.5%), the first one was higher in the youngers 32.1% (15-19 y.o.) and 23.6% (20-34 y.o.) and the infusions in the older groups 20.7% (35-49 y.o.) and 26.6% (50-65 y.o.). CSDs were the main source of AS in high and medium SEL (20.4 and 25.7%) and infusions on low SEL (20.6%), due to the high consumption of "panela" (unrefined sugar used to prepare infusions and as sugar substitute, source of low cost energy). Within the total AS intake, sugar sweetened beverages (SSBs) represented 71% and other sources as foods 29%.

Conclusions: Colombians are consuming 1% of AS above the level recommended by the World Health Organization (10%). The main source of AS was SSBs independent of gender, age group and SES, being CSDs and infusions the two mains sources depending on the age group. This results reinforce the high intake of AS as a source of energy and shows the importance of public health programs focusing on strategies to reduce the quantity and frequency AS sources on the diet.

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FACTORS AFFECTING HOUSEHOLDS FOOD INSECURITY AND ITS ASSOCIATION WITH UNDERNUTRITION AMONG UNDER 5 CHILDREN IN NORTH EASTERN STATE OF MEGHALAYA

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Background and objectives: The World Food Summit of 1996 defined food security as existing "when all people at all times have access to sufficient, safe, nutritious food to maintain a healthy and active life". The study was undertaken to assess household's food insecurity and undernutrition among under 5 year children in West Khasi district of Meghalaya, India.

Methods: A community based cross sectional study was undertaken. The FAO Voices of the Hungry (VOH) project has developed an experience-based measure called the Food Insecurity Experience Scale (FIES), which consists of a set of eight questions that focus on reported food-related behaviors associated with difficulties in accessing food during the previous 12 months period. Food insecurity was analysed using Rasch model and RAW score. Prevalence rates was computed using raw scores taking into account of equal weights for each individual in the sample whereas Rasch model takes into account of the sampling weights for each individual in the sample proportional to the original population in the district.

Results: A total of 621 children from 500 households (HHs) were covered. Food insecurity was observed among 80% of HHs using RAW score and 81% by RASCH model, of which 4% had severe food insecurity. Food insecurity was observed to be associated with type of house, sanitary latrine, monthly per capita income, education of father, and occupation of parents.

The prevalence of underweight, stunting and wasting was 30%, 57% and 10% respectively. The prevalence of underweight was significantly higher among children from HHs with food insecurity (34%) as compared to those with food security (24.8%), while stunting & wasting although higher among children with food insecurity (59% & 12% respectively) as compared to secured HHs (52% & 6.6% respectively), but was not significant.

Conclusions: Food insecurity was observed in 80% of HHs and is associated with type of house, income, literacy of father, per capita income and occupation of parents. The prevalence of undernutrition was also higher among children from HHs having food insecurity. Appropriate measure such as employment opportunity, food for work program, strengthening of public distribution system should be taken to meet HHs food security.

Keywords: HHs Food Insecurity, Undernutrition, RAW score, RASCH model, FAO Voices of the Hungry

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COMPARISON OF DIETARY BEHAVIOR AND NUTRITIONAL STATUS BY MILK INTAKE

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Background and objectives: Average milk intake of Korean is very low and it was about a half cup a day (111.4g) in 2013. For Koreans, milk is consumed mainly as a snack, so milk intake may be related to people's dietary behavior.Therefore, the purpose of this study was to compare the dietary behavior and nutritional status according to milk intake of Koreans.

Methods: A total of 1,043 subjects (219 in primary school students, 209 adolescents, 355 adults and 260 elderly) were included in the study. According to milk intake guideline of the Korean DRI, school-aged children are required to drink two cups (400g) of milk per day and adults and elderly are required to drink one cup (200g) per day. The subjects were divided into milk-adequate or milk-deficient groups by the milk guideline of the specific age. 24-hour dietary record and food behaviors of the subjects were compared between the milk-adequate and milk-deficient groups.

Results: Milk-adequate groups had significantly higher intake of essential nutrients, including calcium, phosphorus and vitamin B2 than milk-deficient groups. Milk-adequate groups also had higher intake frequency of fruit and vegetables than milk-deficient

groups. In addition, milk-adequate elderly group had higher intake of whole grain, meat, soybean, egg, fish and nut intakes than milk-deficient elderly group. In case of primary school students, milk-adequate group had higher intakes of processed milk and dairy products, but lower intake of pizza compared to the milk-deficient group. Milk-adequate groups had better dietary behaviors than milk-deficient groups. In detail, milk-adequate primary school students checked nutrition labelling more frequently and milk-adequate school-aged children exercised more frequently than their counterparts. Milk-adequate adults tried to avoid overeating and milk-adequate elderly tried to eat more regularly and had more frequent snacks than their counterparts.

Conclusions: When the milk was consumed at the level recommended by the dietary guidelines, the intake of various food groups showed a better direction, especially in the elderly, and various dietary behaviors were found to be more desirable. More active nutrition education would be needed to consume milk as recommended by the dietary guidelines.

Keywords: milk, dietary guideline, dietary behavior, nutritional status

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ADDED SUGAR INTAKE AND SOURCES AMONG URBAN COSTA RICAN POPULATION: RESULTS FROM ELANS STUDY

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Background and objectives: Added sugar (AS) intake has been associated with the increasing prevalence of obesity. The objective of this study was to estimate added sugar intake and main sources of AS among urban Costa Rican population.

Methods: Data were obtained from the Latin American Health and Nutrition Study (ELANS), a multicenter study developed in urban areas of 8 Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. Dietary intake among 798 Costa Rican participants (15-65 y) was assed using two 24-hour recall. Usual AS intake was estimated using the Multiple Source Method. The major food items accounting for AS was assessed using the weighed-proportions formula developed by Block (1985) in which the relative contribution (RC) of a given food item/food group is defined as: RC= [(Total AS grams from a food item x 100)/Total AS grams from all food items]. Median intake, expressed as grams per day (g/d), and sources of AS were performed by age group, gender, socioeconomic level and nutritional status.

Results: Median AS consumption for overall Costa Rican population was 64.6g/d, accounting for 14.7% of total energy intake. Sugar sweetened beverages accounts for 71.3% of total added sugar intake in urban Costa Rican population. The highest intake was reported by male adolescents (75.8g/d) and male of low socioeconomic level (73.4g/d). Infusions (coffee or tea) are the main source of added sugar among urban Costa Ricans, followed by carbonated soft drinks (20.7% and 18.1% respectively). For adolescents and young adults (20-34 y) carbonated soft drinks are the higher contributor of AS intake, while for adults >35 y or older are infusions, followed by sweetened fruit juices. The main AS sources were infusion, natural juice (with sugar) and carbonated soft drinks for both in people with and without excess weight.

Conclusions: Added sugar intake among Costa Rican population is above the World Health Organization recommendation (10%). Infusions represent the main source of AS, followed by carbonated soft drinks and sweetened fruit juices. To decrease sugar intake, it is important to rice awareness about the quantity of sugar added to infusions and to reduce sugar content in manufactured foods.

Keywords: Food source, Added sugar, Costa Rica, multicenter study.

Conflict of Interest Disclosure: The ELANS is supported by a scientific grant from the Coca Cola Company and support from the Instituto Pensi / Hospital Infantil Sabara, International Life Science Institute of Argentina, Universidad de Costa Rica, Pontificia Universidad Católica de Chile, Pontificia Universidad Javeriana, Universidad Central de Venezuela (CENDES- UCV)/ Fundación Bengoa, Universidad San Francisco de Quito, and Instituto de Investigación Nutricional de Peru. The funders had no role in study design, data collection and analysis, the decision to publish, or the preparation of this manuscript.

Further collaborators: On behalf of ELANS Study Group

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A NUTRITION SURVEILLANCE CASE-STUDY FROM GUATEMALA

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Background and objectives: Malnutrition is a public health priority in Guatemala. Stunting is 47% among children <5 y, therefore Guatemala is the Latin American country with highest stunting and is 6th in the world. Guatemala faces a double burden of malnutrition showing a rate of overweight/obesity of 52% among non-pregnant women of reproductive age (WRA). In order to measure progress in achieving international targets - the 2025 Global Nutrition Targets and the 2030 SDG´s - and domestic ones, authorities need to monitor changes to support national decisions to implement strategies toward those goals. For that purpose, national and international institutions set out to design and implement a surveillance system that would supply accurate, reliable, representative and timely data.

Methods: The National Malnutrition System, and recently the Epidemiological Surveillance System in Health and Nutrition (SIVESNU), has undergone various phases of development: in 2010, negotiations and preparation; in 2011, prototype development and testing; and from 2013 onwards, institutionalization and technological transfer. In this last phase, the national institutions: Food and Nutrition Security Secretariat and Ministry of Health became involved in system operations and decisions to include the system in the central government annual budgeting and planning processes.

Results: In 2013 and in 2015 nationally representative data were collected in a sample of 2,700 and 2,800 households. Stunting in 3-59 month-olds showed a non-significant decline from 47.5% to 44.9%; overweight and obesity in WRA remained at 52%; and no significant changes were observed in iron deficiency in WRA and children. Data also showed a non-significant decline of exclusive breastfeeding (from 58.4% to 50.5% in 0-5 month-olds) and a significant reduction in coverage of micronutrient powders in

children (from 79.6% to 56.0 %). Micronutrient supplementation (iron and folic acid) during last pregnancy among WRA remained above 80% in both years.

Conclusions: By generating national estimates on nutrition indicators, the SIVESNU demonstrated its feasibility. Sharing results has increased policy makers' awareness that the system can contribute to policy making with reliable evidence, but that there is a need to strengthen their capacity to use data.

Keywords: nutrition surveillance, monitoring, institutionalization, decision-making

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BECOMING BREASTFEEDING FRIENDLY IN GHANA: OPPORTUNITIES FOR SCALING-UP EFFECTIVE ACTIONS

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Background and objectives: Over the past two decades, Ghana has achieved significant progress in optimal breastfeeding practice. Currently, 56% of mothers initiate breastfeeding within one hour of delivery and 52% of infants <6 months are exclusively breastfed. However the challenge remains how to further improve optimal breastfeeding practice with limited government funding and declining donor support for breastfeeding programs.

Methods: Between April 2016 and March 2017, a 12-person expert committee representing government, United Nations, academia, and donor agencies within Ghana applied the Becoming Breastfeeding Friendly (BBF) process to assess the enabling environment for scaling-up effective actions for breastfeeding nationally. The BBF process is grounded in the Breastfeeding Gear Model which stipulates that eight 'gears' must work harmoniously to achieve country-level scale-up of breastfeeding. The BBF assesses each gear using specific benchmarks: advocacy (4 benchmarks); political will (3 benchmarks); legislation and policy (10 benchmarks); funding and resources (3 benchmarks); training and program delivery (17 benchmarks); promotion (3 benchmarks); research and evaluation (10 benchmarks); and coordination, goals and monitoring (3 benchmarks). Over a series of 4 meetings across 7 months, the committee used available evidence (document reviews and stakeholder interviews) to score each benchmark, identify gaps, and provide recommendations to improve the breastfeeding national program.

Results: The committee reached consensus on the individual benchmark scores, which ranged from 0 (no progress) to 3 (major progress). Benchmark scores for each gear were aggregated as a

weighted average to estimate the final gear scores, ranging from the gear not being present (0 score) to strong gear strength (3.0). Four gear scores reflected strong gear strength: advocacy (2.25); political will (2.3); legislation and policy (2.3); and coordination, goals and monitoring (2.7). The rest reflected moderate gear strength: funding and resources (1.25); training and program delivery (1.94); promotion (2.0); and research and evaluation (1.3). The overall BBF score was 1.99, indicating moderate scale-up environment for breastfeeding in Ghana.

Conclusions: Consequently, stakeholders prioritized four actions for scale-up: 1) strengthen advocacy by enlisting and empowering breastfeeding champions, 2) strengthen maternity protection, 3) strengthen capacity for delivering services, and 4) expand and sustain breastfeeding awareness initiatives.

Keywords: scaling-up, breastfeeding, assessment, enabling environment, Ghana

Further collaborators:

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A NEW METHOD TO MONITOR THE PERFORMANCE OF COMPANIES IN RELATION TO NUTRITIONAL TARGETS

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Background and objectives: Public health recommendations encourage industry to reformulate its products to reduce sugar, saturated fat and salt and to encourage the development of healthier options, yet there is no systematic method to monitor progress. The aim of this study is to utilise 'big data' on the composition of foods and drinks to monitor the nutritional quality of the food supply and to combine with sales data to examine the

changes by category, brand and company. Here we use soft drinks in the UK in 2015 as an example of the method.

Methods: Nutrition composition data were collected online using a novel tool, 'foodDB', which collects date-stamped nutrition information directly from supermarket websites. A score based on the UK FSA/Ofcom nutrient profile model was ascribed to each product (NP) and for each category; bottled waters, carbonated drinks, dilutables, flavoured waters, juices, ready-to-drink tea and coffees and sports and energy drinks. A NP score >70 is classified as 'healthy'. Sales data for soft drinks were obtained from a commercial source, Euromonitor (n=193), and combined with the composition data to calculate a sales-weighted NP score. NP scores were calculated at a category, brand and company level to create an index, which can be used as an indicator of the overall 'healthiness' of the products.

Results: Results showed the average sales-weighted score (SD) for total soft drinks in the UK was 68.8 (4.8). The category with the highest score was juice (72.7 2.3) and the lowest was sports and energy drinks (67.55.7). The biggest overall contributor to sugar intake was carbonated drinks (43%) followed by juice (27%). Three of the top five scoring companies were retailers, while energy drink companies scored the lowest on the index.

Conclusions: Combining purchase data with nutrition composition data is potentially a valuable approach to track the impact of reformulation and to benchmark companies. This method provides new opportunities to evaluate the impact of food policies, including both legislative and voluntary measures.

Keywords: Reformulation, nutrient composition, monitoring, policy

Further collaborators: NIHR Oxford Biomedical Research Centre

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144/2692

EFFECT OF A PEER SUPPORT INTERVENTION TO ENCOURAGE ADOPTION AND MAINTENANCE OF A MEDITERRANEAN DIET IN ESTABLISHED COMMUNITY GROUPS: A CLUSTER RANDOMISED TRIAL

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Background and objectives: Peer support offers a potential alternative, low cost social support approach to encouraging lifestyle behaviour change. The Trial to Encourage Adoption and Mainte-

nance of a MEditerranean Diet (TEAM-MED) was designed to pilot test a peer support (PS) programme and compare this to a proven intensive Mediterranean Diet (MD) intervention and a minimal MD education intervention for encouraging adoption of the MD in adults at high CVD risk in Northern Ireland (NI).

TEAM-MED PS groups were newly formed, however, research suggests that leveraging existing social networks in established groups can enhance the effectiveness of peer support strategies and further encourage behaviour change. This study is an extension of TEAM-MED aiming to explore the effect of the PS intervention when compared to a minimal education intervention in already established community groups.

Methods: NI based community groups were recruited through established community links and randomised to receive a PS intervention or a minimal education intervention. Trained peer supporters delivered the PS intervention over a 12-month period; this consisted of 11 group-based sessions each lasting 2 hours. The minimal intervention group received written educational literature focusing on the MD.

Mediterranean Diet Score (MDS) was assessed at baseline, 3, 6 and 12 months. The primary outcome was change in habitual MDS at 6 months from baseline (adoption). Change in MDS at 12 months from 6 months (maintenance) is a secondary outcome.

Results: Four community groups recruited: n=2 randomised to the PS intervention and n=2 to the minimal education intervention, with n=8 participants per group. At 6 months, MDS increased by 2.6±2.7 in the PS intervention and 3.3±2.2 in the education group, from baseline; the between group difference was non-significant after adjusting for baseline scores (-0.9 (95%CI -2.9, 1.2)) (p=0.39).

Conclusions: It is possible that the true effect of the peer support intervention may be underestimated due to the comparison with a minimal education intervention. One year follow-up results (June 2017) will allow the evaluation of whether the PS intervention encourages the maintenance of a MD longer term. Findings will inform a future large-scale RCT where the efficacy and cost-effectiveness of the peer support MD intervention will be tested.

Keywords: Peer Support, Intervention, Mediterranean Diet

FOOD CONSUMPTION PATTERN IN THE AVERAGE SPANISH DIET: THE ENPE STUDY

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Background and objectives: In this paper we describe the food consumption pattern and adherence to recommendations in a random sample of the Spanish population.

Methods: Data drawn from a cross-sectional study conducted on a representative random sample of the Spanish population > 3 years (n = 6,800). The protocol included socio-demographic data, diet assessment by means of 24 hours-recall (2 days), food frequency questionnaire and questionnaire on food habits and food preferences. Information was collected in household face-to-face interviews and self-administered questionnaire. The protocol was in accordance with the Declaration of Helsinki for human studies of the World Medical Association and was approved by the ethics committee of clinical research of the Basque Country. Fieldwork: May 2014- May 2015, four seasonal waves.

Results: On the average Spanish food pattern, the cereal group (28%), meat and meat products (16%), oils and fats (14%) and milk and dairy products (12%) contribute most to daily energy intake. Some 92,7% of the sample usually consume food in three eating occasions during the day, namely breakfast (16,5% of daily energy intake), main meal (42% of daily energy intake) and evening meal (30% of daily energy intake). In addition, 36,8% reported a mid-morning snack and 40,8% a mid-afternoon snack. Some 98% of men and women usually consume meat or processed meats, poultry 2,1 portions/week and red and processed meats 7,5 portions/week. On average 97% consume fish (2,1 portions/week), eggs (3,1 portions/week) and 95% consume legumes (2,1 portions/week). 99% consume foods from the cereal group (2,4 portions/day), potatoes (2,5 portions /week) as well as milk and dairies (2,7 portions/day). 93% usually consume vegetables (1,7 portions/day) and 96,3% fruit (2,2 portions/day). Consumption of sugary foods and beverages as well as red and processed meats is above recommendations, while that of vegetables and fruit is below recommendation.

Conclusions: Consumption of sugary foods is above recommendations while consumption of fruit and particularly vegetables is below recommended levels.

Keywords: Food consumption. Food patterns. Dietary survey. Dietary guidelines

no role in the design of the study, in the collection, analyses, interpretation of the data or in the decision to publish the results. The authors declare no conflict of interest.

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EFFECT OF DIETARY AND EXERCISE INTERVENTIONS IN SARCOPENIC, PRE-FRAIL AND FRAIL OLDER ADULTS

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Background and objectives: Sarcopenia is a debilitating condition that involves loss of muscle mass and function, which affects virtually everyone as they age, and can lead to frailty and ultimately disability. It is well known that diet and exercise training is important to increase muscle mass and strength in young persons, but the effect of these intervention in improving function in sarcopenic and frail older persons is not well understood. The purpose of this review was to summarize the strength of evidence from human clinical trials on the effects of dietary was to identify clinical trials that tested the effects and exercise intervention on changes in muscle mass and strength in sarcopenic and frail older adults.

Methods: We searched PubMed for the years of 1980 to May 2016. Filters were set to allow only "clinical trials," "human" studies, and "English" studies. Our preset inclusion criteria were the following: (1) interventional controlled clinical trials, clinical trials, and randomized controlled trials, with orally administered nutritional supplementation and/or exercise training, (2) sample size of at least 15 participants, (3) intervention period of 12 weeks or longer, (4) inclusion of older adults (age ≥ 60 years) who met criterial for pre-defined criteria for sarcopenia and/or frailty.

Results: We identified 19 clinical trials and there were a few key findings. First, dietary interventions involving protein supplementation improved functional and/or strength outcomes in a few trials, however, these interventions had less consistent effects on walking speed and grip strength. Lifestyle interventions not involving calorie restriction generally did not induce significant changes in body composition.

Conclusions: These results suggest that dietary interventions alone are not enough to improve sarcopenic and frail conditions, but the combination of dietary and exercise intervention was effective in improving some aspects of physical function. There were a limited number of trials in which participants with sarcopenia were specifically targeted, and thus there is an important need for

more research to determine the appropriate types of intervention approaches for the high risk population of sarcopenic and frail older adults.

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FACTORS ASSOCIATED TO PHYSICAL ACTIVITY IN PERUVIAN ADOLESCENTS AND ADULTS: RESULTS FROM THE ELANS STUDY

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Background and objectives: Physical activity is an important component of lifestyle which determines the state of health and nutrition of an individual and population. In Peru, recent surveys show that overweight and obesity are widespread problems with higher rates in urban areas of large cities. The objective of this study was to determine the factors associated with physical activity in Peruvian population.

Methods: Data were obtained from the Latin American Health and Nutrition Study (ELANS), a multicenter tansversal study conducted in urban areas of 8 Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. METS from a modified long-IPAQ were calculated in 1113 Peruvians using the time in minutes, times a week (for at least 10 minutes of the following activities: walking, cycling, moderate and intense physical activity) and, multiplying factors suggested by IPAQ (3.3, 4.0, 4.0 and 8.0, respectively). METS are expressed in METS/min/week. A multiple regression model was used to determine the variables associated with METS at a 95% confidence level.

Results: The results of METS/min/week showed: (i) by sex: men spend more than women (2632 vs 1950 METS/min/week, p <0.000), (ii) by city: Pucallpa showed higher expenditure (3697 METS/min/week, 0=0.001) in contrast with other cities (1248-2680 METS/min/week), except for Iquitos (3102 METS/min/week); in contrast Piura showed lower expenditure (1258 METS/min/week, p <0.000) than the other cities (1858-3697 METS/min/week), except for Chiclayo (1562 METS/min/week, p = 0.423); (iii) labor status: housewives spend less than students (1930 vs 2660 METS/min/week, p = 0.008) and dependent workers (2369 METS/min/week, p = 0.043); and students spend marginally more than independent workers (2159 METS/min/week, p = 0.065) and that the unemployed, retired or living on their incomes (1987 METS/min/week, p = 0.062); (iv) socioeconomic status: low socioeconomic status tend to spend less than high (2125 vs 2511 METS/min/week, p = 0.058, respectively). No differences were found in the variables: age, nutritional status and educational level.

Conclusions: Physical activity was associated with sex, labor activity, socioeconomic level and city. Research on the motivations for physical activity is required in order to propose strategies that increase this in all population groups.

only domestic consumption. Restrictions on storage time as well as the need for careful handling of non-aggregated data needed, in order to avoid identification of specific enterprises or individuals are potential challenges. Data providers may not be able to disclose the full details of the household panelists to the proposed future European RI, unless active consent

Conclusions: Data generate new potentials, potentially leading to new methods of analysing population nutrition behavior. Data owners see benefits sharing data with science in a multi stakeholder operated data platform on certain conditions, including fair exchange mechanisms to avoid clients/competitors potentially benefitting from such data while not sharing own data.

Keywords: Big Nutrition data, EU Richfields, digital consumer behavioral patterns, digitalization, data philanthropy

Further collaborators:

The study was part of the EU Richfields Big Nutrition Data program and data was collected and analyzed by Research Institutes of Sweden (RISE) and Aalborg University (AAU) by Haris Hondo, Eik Kaunisto and Kwabena Titi Ofei

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CAN BUSINESS GENERATED BIG FOOD DATA HELP NUTRITION SCIENCE –   CASE INSIGHTS FROM INTERVIEWS WITH COMMERCIAL BIG DATA OWNERS IN THE RICHFIELD DESIGN STUDY

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Background and objectives: Rapid digitalization create new digital images of consumer food behavior and new potentials of analyzing population behavior in nutrition science. However, data is created in many different settings, with many different technologies, has many different owners and is often fragmented and in complete. As a result, the utility of the big food data has so far been limited. Aim: investigate to what extent different sources of data on food behavior created by businesses can be shared among stakeholders for the purpose of policymaking and research

Methods: Data was collected through interviews with big 4 food dataproviders in DK/SE covering procurement and domestic consumer purchasing. An exploratory qualitative approach was adopted. Inclusion: informants having insight, in control of relevant data, interest in the project, willing to give an interview and willing to provide data probes for the analysis. The transcripts were coded independently by 2 researchers assigning relevant names to highlight the relevance of text, using QSRNvivo11.

Results: Commercial big data owners see clear potentials in sharing data from different sources for the purpose of societal/scientific enquiry. Large data diversity is viewed as an asset since data is collected to suite different data needs. Potential sharing benefits is valuable since commercial data owners can benefit from scientific cooperation. Data providers see potential benefits in sharing data for data philanthropic reasons as a type of CSR. Interviewees see limitations since data might cover only out of home eating or

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ALCOHOL CONSUMPTION AND HYPERTENSION IN YOUNG ADULTS

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Background and objectives: It has been pointed out that excessive alcohol consumption is detrimental to health, increasing the risk of various health problems, while it is not yet fully accepted that consumption in low quantity would play a protective role for cardiovascular diseases. The objective of this study was to determine the association between mild to moderate consumption and also high alcohol intake with hypertension (HT) in young adults.

Methods: Cross-sectional study in people born in Limache, Region of Valparaíso, Chile between 1974-78 who were evaluated between 2010-12. Blood pressure was taken and intake of alcohol was assessed by AUDIT questionnaire (and then classified as low risk, risk, harmful or probable dependence) and by a food frequency questionnaire (FFQ), with the following categories: mild, moderate and high consumption.

Results: The prevalence of HT was 13% (95% CI=11.0-15.7), higher in men (19.7 % vs 10.2 % in women). 71% (95% CI =37.8-74.2) of the participants consumed alcohol according to AUDIT. Only 12% had an intake of risk, harmful or probable dependence. 30% (95% CI = 26.7-33.3) consumed alcohol the previous month according to the FFQ, only 10% reported moderate or high intake. The alcohol more frequently consumed was beer and wine, the higher intake was in men. High consumption of alcohol in FFQ was associated with HT, with an OR = 3.271 (95% CI: 1.045-10.240). Mild to moderate alcohol consumption wasn't associated with HT.

Conclusions: Alcohol intake was between 30 and 70% according to the survey used. Consumption was characterized by low quantity and was more frequent in men. This study confirms that high alcohol intake is a risk factor for HT but it was not possible to verify that low or moderate alcohol intake constituted a protective factor. This may be because the protective effect is probably due to a sum of factors, making it difficult to find this association. Educational campaigns aimed at reducing alcohol intake will help to prevent or manage hypertension.

Keywords: Alcohol intake, risk factor, hypertension

144/2740

ACUTE OR LONG TERM CONSUMPTION OF BEVERAGES CONTAINING LOW CALORIE SWEETENERS DO NOT ALTER APPETITE, ENERGY INTAKE OR MACRONUTRIENT SELECTION IN HEALTHY ADULTS: A NON-INFERIORITY COMPARISON WITH WATER

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Background and objectives: Background: The substitution of intense sweeteners (LCS) for caloric sugars is currently recommended to reduce energy intake and fight obesity. Conversely it is often claimed that the use of LCS would rather increase energy intake (EI) and enhance the appetite for sweetness. In this context, the effects of LCS in beverages have often been compared to sugar but have rarely been tested against water.

Objective: To test the hypothesis that LCS beverages and water, when consumed with meals, do not affect appetite differently in healthy adults before and after habituation to daily intake of LCS beverages.

Methods: The food consumption of 80 female and 86 male LCS-naïve healthy adults was measured on three 2-day measurement sessions performed one week apart (sessions 1, 2, 3) and again after a 4-week habituation to daily consumption of LCS or water at mealtimes. 1) In the early phase of the study, LCS-naïve participants were required to drink either 330 ml water or commercial LCS lemonade with each meal, in a randomized cross-over design. Their ad lib intakes were recorded on two successive days. 2) Participants were then randomly assigned to either the LCS-habituated group (2 x 330 ml/d for 4 wks), or to a control LCS-naïve group (2 x 330 ml/d water for 4 wks). Ad libitum intakes before and after the habituation period were measured in similar conditions. Energy and macronutrient intake, selection and consumption of sweet and savory foods were measured; appetite ratings (VAS) assessed huger, gastric fullness and desire-to-eat. The hypothesis was tested using equivalence/ non-inferiority statistics.

Results: LCS beverage consumption at mealtime did not increase energy/ macronutrient intakes or selection of sweet foods, either in LCS-naïve male and female subjects, or after the 4-week habituation period to daily LCS consumption.

Conclusions: LCS use does not disrupt eating behaviour, and does not affect appetite or energy intake in LCS-naïve or LCS-habituated adults, when compared with water.

Keywords: Human subjects, Low calories sweeteners (LCS), Energy intake, Sugar intake, Sweet/savory food choices

Conflict of Interest Disclosure: This study was sponsored by the Coca Cola company (Atlanta, USA, and Brussels, Belgium).

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WHAT ARE THE FOODS THAT CONTRIBUTES (TOTAL ENERGY CONSUMPTION) TO THE MEXICAN DIET?

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Background and objectives: In México and Latin-American the non-communicable diseases (NCDs) has become the principal public health problems. Diet influences on health and contribute to NCDs such cancer, diabetes and cardiovascular diseases. Studies on burden of diseases and risk factors attempt to quantify the magnitude of health losses due to illness, injury and risk factors including dietary risks. Risk factors related to diet include diets low in fruits, vegetables, whole grains, nuts and seeds, fiber, milk; and high in sodium read meat, sweetened beverages, and others. It is important to know what the population is eating; therefore, the objective of this study is to describe the foods that contributes, to the total energy consumption, to the Mexican diet.

Methods: Dietary information was obtained through the 24-hour recall (multi-step method) of 7,983 subjects older than 5 years of the National Health and Nutrition Survey (ENSANUT) 2012. Reported foods were classified according to their nutritional characteristics in 49 food groups. We estimated the mean contribution percentage of the food groups at national level and sociodemographic variables (population group: schoolchildren, adolescents, adults; region: north, center, south; area of residence: rural and urban; and socioeconomic level: high, medium and low). To determine level of significance, a regression was performed adjusting the model by sociodemographic variables, and using Bonferroni method for multiple comparisons.

Results: The main foods that contribute to the total energy intake in the Mexican population for each age group are "Tortilla and corn products" (16.5%, 18.5% and 22% respectively), followed by "Mexican sweet bread" (6.2%, 5.9% and 7% respectively); whole milk (5.9%) in schoolchildren, and "Soda drinks" for adolescents and adults (5.3% and 5% respectively). The food group "Orange and other citrus" was the principal contributor of fruits; nevertheless the contribution is very low along with any kind of vegetables.

Conclusions: Changes in food consumption are necessary to improve diet quality in mexican population. It is necessary to support this with changes in food policy as taxation to help fomentation of healthy environments.

Keywords: Diet, food contribution, energy intake, public health nutrition

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A SYSTEMATIC REVIEW OF REVIEWS ON EFFECTIVE HOME, FAMILY AND COMMUNITY BASED INTERVENTIONS FROM LOW- AND MIDDLE-INCOME COUNTRIES TO INFORM THE BREASTFEEDING ACTION PLAN FOR SOUTH AFRICA

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Background and objectives: South Africa has one of the lowest breastfeeding rates globally and an exclusive breastfeeding (EBF) rate below 10%. If South Africa is to to reach the World Health Assembly target of 50% EBF rate by 2025 and reap the full benefits of breastfeeding, South Africa would need an evidence-informed action plan. We undertook a systematic review of reviews to i) summarise the evidence on the various community-based interventions for breastfeeding of infants aged 6-24 weeks in low- and middle-income countries (LMICs) and ii) produce an evidence-informed recommendation on the most appropriate interventions for South Africa.

Methods: We searched six electronic databases for peer-reviewed reviews published between 2001 and 2017. To be included, systematic reviews had to: at least have 60% of their primary studies conducted in LMICs, report on community-based interventions compared to routine care, be aimed at pregnant or breastfeeding women and/or their families, and report on exclusive or any breastfeeding rates between 6 and 24 weeks as the primary outcome. Quality of the studies included for data extraction was appraised independently by two author pairs using the AMSTAR

checklist. To assess quality of each study, we used the Cochrane risk of bias tool.

Results: Title and abstract screening of 1037 references resulted in retaining three eligible systematic reviews, from which six primary studies in LMICs emerged. These six primary studies represented data collected from 1996 to 2008. To bridge this data and publication gap, citation searches of the six primary studies were performed which rendered four additional studies. Combined, these ten studies now presented data from 1996 to 2015 and the publication date ranged from 2005 to 2016. The evidence suggests that breastfeeding counselling, despite the wide range in number and frequency of breastfeeding counselling contact sessions, had a positive impact on breastfeeding duration and exclusivity at 24 weeks.

Conclusions: There is a paucity of studies in LMICs. While our review of reviews suggests that breastfeeding counselling has the potential to improve EBF rates, scale-up and rigorous evaluation of community-based interventions to identify the pathways through which these effects can be sustained must be explored.

Keywords: Review of reviews, exclusive breastfeeding, community-based

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BLOOD GLUCOSE IN SEDENTARY OLDER ADULTS DURING PROLONGED SITTING TIME VERSUS INTERMITTENT SITTING TIME

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Background and objectives: In adults, sedentary behavior is related to cardiovascular risk markers, independent of physical activity (PA) level. Besides this, interruption of prolonged sitting time (PST) has shown positive results, even when performed in low intensity and duration. The aim of this study was to analyse the influence of PST, as well as different forms of PST breaks in relation to the glycaemic curve.

Methods: controlled clinical study in women from the community (≥ 65 years) of the city of Ribeirão Preto/ Brazil. Volun-

teers with BMI ≥ 30 kg/m2, diabetics or in use of glycemic control medication, or who present absolute or relative contraindications to practice PA were excluded. Volunteers performed 4 phases of intervention: (1) PST: seated posture for 5 uninterrupted hours; (2) PA Low Intensity and Short Duration (LiSd): 2 min of PA breaks (50-60% of maximum heart rate - HRmax) every 20 min of PST; (3) Moderate Intensity and Short Duration (MiSd): 2 min of PA breaks (65-75% HRmax) every 20 min of PST; (4) Moderate Intensity and Long Duration (MiLd) in which PST was interrupted every 75 min for 10 min breaks (65-75% HRmax). Breaks were performed by walking in a hallway and monitored by a heart rate monitor. The glycaemic curve (AUC) was analysed by blood samples collected serially (Basal) and after eating a standard mixed meal (30min, 1h, 2h, 3h, 4h and 5h). For data analysis, a linear regression for mixed effects was performed and data were adjusted for age, weight and PA.

Results: 16 women, mean age 69.2 ± 4.1 years, participated in this study. The highest values of glycaemic curve were found in the PST phase (AUC 555.9 ± 75.4 mg/dl) in relation to breaks phases (AUC LiSd: 514.0 ± 55.1, AUC MiSd: 531.7 ± 69.1 and AUC MiLd: 530.0 ± 45.5) (p≤0.05). No differences were observed when the 3 phases of breaks were compared between them (p> 0.05).

Conclusions: PST is related to higher blood glucose levels, while PST breaks, even with light intensity, seems to promote benefits in reducing blood glucose levels.

Keywords: sedentary behaviour, glycemic curve, older adults

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ASSESSMENT OF FOLATE INSUFFICIENCY IN WOMEN OF REPRODUCTIVE AGE AS THE BASIS OF NTD RISK ASSESSMENT IN LOW- AND MIDDLE-INCOME COUNTRIES: INTERDISCIPLINARY COMMITTEE GUIDANCE

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Background and objectives: This folate status presentation represents one section of a more comprehensive report from an interdisciplinary technical consultation coordinated by the Micronutrient Forum and supported by the Bill & Melinda Gates Foundation encompassing issues related to prevention of folic acid responsive neural tube defects (NTDs) in low- and middle-income (LMI) populations. The objective is to present a description of how to define folate insufficiency as the basis of characterizing NTD risk by the application of the new WHO guideline in population groups of women of reproductive age (WRA) in LMI countries.

Methods: The evidence basis for the selection of red blood cell (RBC) folate concentration as the key folate status biomark-

er to define folate insufficiency and NTD risk within population groups will be critiqued. The issue of whether serum/plasma folate concentration may also be used to assess NTD risk will also be addressed. The importance of using the most appropriate analytical method to measure RBC folate concentration will be presented with a focus on the microbiological assay (MBA) which is considered the most reliable assay to use to assess RBC folate. The importance of using assay-adjusted cut-offs to define folate insufficiency and NTD risk will be presented. To utilize the WHO guideline to estimate NTD risk globally, the ideal scenario would be to have country-specific population-based RBC folate concentrations determined microbiologically and data harmonized to account for assay differences.

Results: Select examples of studies conducted in Guatemala and Belize will be highlighted to illustrate how the WHO guideline can be appropriately applied to assess NTD risk based on RBC folate concentration in the most vulnerable population groups of WRA.

Conclusions: In conclusion, folate status data will be used as a basis for the design, implementation and evaluation of sustainable folate interventions in vulnerable populations to reduce the prevalence of NTDs globally.

Keywords: Folate status neural tube defects

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THE INVESTMENT CASE FOR FOLIC ACID FORTIFICATION TO REDUCE NTD RISK IN LOW- AND MIDDLE-INCOME COUNTRIES

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Background and objectives: Folic acid fortification has proved to be effective in reducing mortality associated with neural tube defects (NTDs). However, when a government has limited resources on which there are many competing claims, it has to decide what intervention may save the most lives. An "investment case" requires information on the benefits of folic acid fortification, the costs associated with implementing fortification and a means of bringing the two together in such a way that it is possible to compare these against alternative interventions.

Methods: Costs associated with folic acid fortification can be grouped in: 1) "upfront" costs associated with the introduction of folic acid fortification; and 2) on-going or recurrent costs. We compare the benefits and costs of folic acid fortification using the cost of averting deaths or the costs of averted DALYs, over a period of 10 years.

Results: Using data from two African countries, we estimate that the cost per death averted by folic acid fortification varies be-

tween $957-319. In comparison, it is estimated that cost per death averted for the rotavirus vaccine is $3,015, and that the scale-up of insecticide treated bed nets and other malaria prevention activities in sub-Saharan Africa between 2000 and 2010 cost $2,770 per death averted. As for DALY, we estimate that the averted DALY per dollar spent on folic acid fortification is $14.90. This is lower than nearly all other forms of fortification and lower than two other widespread interventions aimed at averted infant and child mortality, i.e., insecticide treated bed nets or treatment for severe acute malnutrition.

Conclusions: Even under our most conservative assumption, mandatory folic acid fortification compares favorably against these other widely adopted life saving interventions, and the cost per averted DALY from mandatory folic acid fortification is low compared to other widely adopted life savings interventions.

Keywords: Folate fortification, neural tube defects, investment case

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THE ASSESSMENT OF NUTRITIONAL STATUS OF CHILDREN BELOW FIVE YEARS IN HOUSEHOLDS WHICH PARTICIPATED IN FOOD AND LIVELI- HOOD SECURITY (FLS) PROJECT IN RAJSHAHI DIVISION – BANGLADESH

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Background and objectives: Food and Livelihood Security (FLS) project aimed to improve food security of rural ultra-poor households (HH) in 3 districts of Rajshahi division, Bangladesh through the promotion of improved vegetable production, food preparation, health and nutrition status of 50,000 ultra-poor women headed HHs and 30,000 marginal farmers HHs. The objective of this study was to assess the nutrition status of the under-fives, their mothers/caretakers and women who participated in the project and determine how FLS interventions impacted their nutrition status and diet intake

Methods: No baseline information on the nutrition status of the target population was available, hence the study included non-beneficiary HHs with same socio economic characteristics as controls. Both target and control HH were surveyed simultaneously in the same randomly selected unions in 3 districts. Weights and heights of the under-fives and MUAC of mothers/care takers and women who participated in the project were measured. Information on child feeding and caring practices, morbidity and mortality, household food availability, dietary intake, income generating activities and hygienic practices was also recorded

Results: Wasting was more prevalent among the non-beneficiary children while stunting and underweight were higher among

the beneficiary under-fives. Under-fives in farmers HH were better off nutritionally than women's under-fives. Both morbidity (diarrhoea, cold, fever) and mortality were reported to be higher in non-beneficiary children compared to beneficiaries. Dietary intake evaluated by diet diversity scores (DDS) was higher in both beneficiary under-fives and HHs. Additionally; beneficiary children consumed more vegetable and meat/fish than non-beneficiary under-fives. Results: **Conclusions:** Participation of beneficiary HHs in agriculture and livelihood activities increased by almost 90%. The project was found to be effective for the improvement of dietary and nutritional status of beneficiary groups in Rajshahi. Future food security projects should include more nutrition expertise and nutrition specific/ relevant objective(s) and nutrition status baseline, midterm and end project indicators in the logical framework and with budgetary allocation for situation analysis, skilled personnel, training, survey tools and adequate training materials.

Keywords: Food security interventions, nutritional status, underfives

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EVALUATING PRE-PREGNANCY DIETARY DIVER- SITY VS. DIETARY QUALITY SCORES AS PREDIC- TORS OF GESTATIONAL DIABETES AND HYPER- TENSIVE DISORDERS OF PREGNANCY

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Background and objectives: Dietary diversity scores (DDS) are considered as potential metrics for monitoring the implementation of the Sustainable Development Goals. However, if these scores are to be used as global measures of efforts to improve health outcomes, they must be rigorously tested. This study aims to evaluate the relation of two pre-pregnancy DDS, the Food Groups Index (FGI), and the Minimum Dietary Diversity for Women (MDD-W), and two pre-pregnancy dietary quality scores, the Alternate Healthy Eating Index (AHEI-2010) and the Prime Diet Quality Score (PDQS), with risks of gestational diabetes mellitus (GDM) and hypertensive disorders of pregnancy (HDPs).

Methods: The analysis included 21,334 (GDM) and 19,943 (HDPs) singleton live births reported from 15,232 (GDM) and 14,359 (HDPs) women in the Nurses' Health Study II cohort (1991-

2001), without previous chronic disease or GDM/HDPs. Data collected by a comprehensive food frequency questionnaire were used to derive the four scores. Multivariable log-binomial regression models with generalized estimating equations were used to calculate adjusted relative risks (aRR) and 95% confidence intervals (CIs).

Results: Incident cases of GDM (917) and HDPs (1,427) were reported. While the MDD-W and the FGI were unrelated to risk of GDM or HDPs, the AHEI-2010 and PDQS were related to significantly lower risk of GDM and marginally lower risk of HDP. The aRR's of GDM comparing the highest (Q5) vs. lowest (Q1) quintiles were 0.65 (95%CI:0.50, 0.80; p-trend <0.001) for the AHEI-2010, 0.69 (95%CI:0.56, 0.86; p-trend=0.002) for the PDQS, 0.99 (95%CI:0.80,1.23; p-trend=0.71) for MDD-W and 0.95 (95%CI:0.76,1.18; p-trend=0.76) for FGI. Similarly, the aRR's of HDPs were 0.85 (95%CI: 0.72, 1.01; p-trend=0.07) for AHEI-2010, 0.91 (95%CI:0.76,1.07; p-trend=0.05) for PDQS, 0.91 (95%CI:0.76,1.09, p-trend=0.93) for MDD-W, and 0.96 (95%CI:0.81,1.14; p-trend=0.91) for FGI.

Conclusions: Dietary diversity scores did not predict risk of GDM or HDPs, yet both dietary quality scores were associated with a substantially lower risk of GDM. The food-based Prime Diet Quality Score is a promising candidate for measuring a sustainable and healthy diet on a global scale and warrants further testing. Our research suggests that DDS should not be widely used as measures of dietary quality in their present form.

Keywords: Dietary diversity, dietary quality, gestational diabetes, gestational hypertension, Sustainable Development Goals

144/2780

FOOD ENVIRONMENT CHARACTERIZATION OF A PUBLIC UNIVERSITY IN RIO DE JANEIRO

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Background and objectives: Food environment analysis helps to identify factors that can influence food behavior and is considered a promising strategy to promote healthy eating habits. Thus, the objective of this study was to describe the food environment of a public university in Rio de Janeiro, Brazil.

Methods: The data collection was performed during the second semester of 2016 in establishments located inside the university campuses, totalizing 1 snack bar and 4 establishments with mixed service (snack and lunch or dinner). The instrument used for the data collection was proposed and validated by Franco (2016) to analyze the university food environment. The study was approved by the Ethics Committee and with the consent of all establishments involved.

Results: In all establishments analyzed there was no nutritional information for the clients. Considering the disponibility of healthy foods only the fresh fruit was sold at all establishment, raw and cooked vegetables and veggies was offered by 80% and 60%, respectively, and 75% offered leguminous; a 100% of snack bars offered pastry and sandwiches. The products with the highest different types disponibility averages were candy or chewing gum (8±7.1), soft drinks (9±3.7), chocolates and chocolates bar (8 ± 7.1), crackers (8 ± 12.3) and cookies (7±9.1). Sandwiches, snacks and other products with low nutritional value, had lower average price than fruits or fruit salads; and sweetened drinks (like soda and natural guarana) also presented average price lower than fresh fruit juice.

Conclusions: The university's food environment seems to hamper access to healthy feeding during the period students use its environment, presenting several barriers to a healthy eating habits.

Keywords: Food environment. University. Beverages. Foods. Price.

144/2783

EVALUATION OF THE QUALITY OF LIFE OF HYPERTENSES IN AMBULATORIAL TREATMENT

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Background and objectives: Hypertension is a clinical condition and is considered one of the most important modifiable risk factors for cardiovascular disease. The perception of the disease and its risks, the development of target organ damage, adverse effects of drug therapy and the difficulty faced in changing the lifestyle of this condition are significant determinants of life quality. Objective: To evaluate the life quality and how it is associated with socioeconomic profile.

Methods: Descriptive cross-sectional study of individuals in ambulatory treatment with systemic hypertension. The Minichal questionnaire was used to evaluate the life quality and the questionnaire of the Brazilian Institute of Geography and Statistics (BIGS) to assess the socioeconomic level.

Results: The sample consisted of 51 individuals (59% female). The mean age was 61.10±10.60 years, no statistical difference between the sexes; p=0.25. The mean time of diagnosis of systemic arterial hypertension was 11±8.84 years. The mean systolic blood pressure was 143±21.66 mmHg and the mean diastolic blood pressure was 88±12.44 mmHg. The mean arterial pressure was

106±14.69 mmHg. Of the total sample, 25 (49%) never smoked, 20 (39.2%) were smokers and 6 (11.8%) were still smokers. The mean time of smoking was 4.33 ± 12.84 years and the mean time that ex-smokers quit smoking was 6.95±11.56 years. Only 23 (45%) reported physical activitypracticing on a regular basis, and the average frequency in the week were 1±1.91 times. Regarding the Minichal questionnaire on life quality, the mean scores of the responses on the mental state was 6.8±4.99 (0-27), the average scores on the somatic manifestations were 7.2±4.3 (1-17), and the mean total score, summing up the state of mind with somatic manifestations, were 14±8.48 (3-42). Regarding the socioeconomic profile of the sample, according to the BIGS census questionnaire, 38 (74.5%) were classified as low-income senior, 5 (9.8%) low-income and lower 8 (15.7%) lower middle-income.

Conclusions: Women showed a worse life quality in relation to the somatic manifestations, compared to men. The lower the individual was classified by the BIGS survey, the worse was the life quality. Those who engage in physical activity had a better quality of life.

Keywords: Hypertension, ambulatory treatment, socioeconomic level, quality of life.

144/2804

A NOVEL PROCESSED FOOD CLASSIFICATION SYSTEM APPLIED TO DISAGGREGATED FOOD CODES IN THE AUSTRALIAN FOOD NUTRIENT DATABASE 2011-13

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Background and objectives: Evidence that the degree of food processing effectively addresses the quality of diets and their impact on all forms of malnutrition has been documented in several countries. Categorizing foods by the level of processing and by disaggregating both composite and single-ingredient food codes provide more accurate consumption data. The objectives of the study are to disaggregate composite food codes used in the Australian food composition database in order to provide a more precise estimate of intake at the individual level and categorize food components according to the level of food processing.

Methods: We identified composite food codes from the Australian Food Nutrient Database (AUSNUT) 2011-13 that were subject to disaggregation. For all those food items judged to be a handmade recipe, food recipes provided by AUSNUT were applied to disaggregate. We classified food items and/or the underlying ingredients into four groups according to NOVA, a new food classification system based on the extent and purpose of industrial food processing. Food item classification was accomplished by taking into account food descriptions in document provided

by AUSNUT, the source of food (e.g. homemade, fast food, takeaway) and the ingredient list of food items sold in Australia. The proportion of NOVA food groups by AUSNUT food group and underlying ingredients were calculated.

Results: A total of 3701 food codes (67% of the total) from the AUSNUT 2011-13 were subject to disaggregation. Less than 1% of the food codes that were supposed to be disaggregated was classified in the food code level. Across the food composition database, the overall proportion of unprocessed and minimally processed foods was 34%, culinary ingredients was 3%, processed foods was 12%, and ultra-processed products was 51%.

Conclusions: By incorporating disaggregated data combined with the application of the classification system based on the degree of food processing into AUSNUT food composition database, variations can be seen in the proportion of some food groups whose consumption used to be underestimated. This strategy will allow researchers to quantify properly the contribution of the food groups in order to assist in assessing the nutritional quality of the dietary intake of population.

Keywords: Food Processing; Classification; Disaggregation; Food composition database

Further collaborators:

Professor Timothy Gill and PhD Zhixian Sui from University of Sydney have been collaborated in the application and revision of the NOVA usage in the AUSNUT database.

144/2809

RELATIONSHIP BETWEEN KNOWLEDGE, BELIEFS AND PRACTICES IN BREASTFEEDING OF NURSING MOTHERS AND THE HEALTH TEAM OF THE BARRIO ALTOS DE LA REJA, MORENO, PROVINCE OF BUENOS AIRES. ARGENTINA. 2014

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Background and objectives: This research consisted in identifying knowledges, beliefs and practices (KBP) in breastfeeding (BF) of mothers and local health team members of the Health Unit Nº 39, Barrio Altos de la Reja, Moreno, Province of Buenos Aires, Argentina and the relations between this KBP during 2014.

Methods: Qualitative approach favored by semi-structured interviews, participant observation, in situ photographs and notes. Convenience sample of 15 nursing mothers borned in the Province of Buenos Aires, BF or not, and 9 members of the local health team. Categories of analysis: knowledge, beliefs and practices.

Results: The majority of the nursing mothers was deprived of BF in the first hour of life. Mothers and health workers known official guidance on exclusive breastfeeding (EBF), but dominated the early introduction of foods/drinks. Both groups doubt about duration of BF and extend it for one year. The main reason for discontinuation of EBF is mothers perception of "my milk is not enough / not fed" . The local health team believes is due to lack

of containment of mothers in their environment. The main difficulty linked to the BF according mothers are complications with their breast care and their main preparations for enhanced BF is to modify their diet to produce more and better quality of milk. Knowledge of both groups about benefits of BF focus on nutritional and immunological properties, others are almost unknown to the mothers. Among the disadvantages of BF, some mothers raise their body image, cause leading to interrupt BF, while the health team imaginary supposed to belong this to upper-class levels. Some mothers expressed "shyness" about BF in public spaces. Some males breastfeed longer than women, while health personal ignored BF in terms of gender. BF training aimed at health team is negligible, circumscribing BF promotion activities to nursing mothers in the consulting room.

Conclusions: Tensions between KBP regarding BF between the two study groups, mainly in relation to the official recommendations of BF, maternal nutrition during lactation, female and BF aesthetics, gender and BF and the need to strength training BF and promotion in community and primary care health.

Keywords: Breastfeeding, health promotion, nutrition, childhood, weaning.

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144/2811

SODIUM CONSUMPTION PATTERNS ACCORDING TO SOCIODEMOGRAPHIC CHARACTERISTICS IN AN ECUADORIAN POPULATION: RESULTS FROM THE LATIN AMERICAN STUDY OF NUTRITION AND HEALTH (ELANS)

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Background and objectives: The World Health Organization (WHO), states that one of the most important risk factors in the emergence of chronic non communicable diseases (NCDs), is the high consumption of sodium and salt in the diet. Due to this, the average of sodium intake in an Ecuadorian population was assessed according to sociodemographic characteristics.

Methods: Sample study compris 800 Ecuadorian participants between 15 and 65 years old, living in the urban area of different cities of the Coast and Sierra. This data was from LANS study (Latin American Study of Nutrition and Health). Two 24-hour recall surveys were performed according to the multi-step methodology on non-consecutive days, so it may be determined the relationship of usual sodium intake and total caloric intake per day. Sodium intake was analyzed according to the different sociodemographic

characteristics (sex, age, region of residence and socioeconomic level) by applying statistical tests T-student, one-way ANOVA and Post Hoc Bonferroni.

Results: The average sodium intake was 4901.9 mg per day in the entire sample. Men consume more sodium than women (5387.4 mg and 4423.7 mg, respectively, p= 0.00). There is no significant difference in average sodium intake between the Coast and Sierra of Ecuador, as well as the socioeconomic level. A positive correlation coefficient of 0.73 was found between the consumption of calories and sodium. The foods that contribute most to the diet are popcorn, bacon, pork rind, olives, cheeses, ham and different types of sausages, although not necessarily the most consumed.

Conclusions: The average sodium intake found exceeds the amount of sodium recommended by the World Health Organization (up to 2300 mg) by 113%. There is a positive correlation coefficient between the caloric and sodium intake. Foods that contribute the most sodium consumption in Ecuadorians´ diet (popcorn, bacon, pork rind) are not necessarily the most frequently consumed.

Keywords: Sodium, chronic non communicable diseases, consumption pattern, sociodemographic.

Conflict of Interest Disclosure: The ELANS is supported by a scientific grant from the Coca Cola Company and support from the Instituto Pensi / Hospital Infantil Sabara, International Life Science Institute of Argentina, Universidad de Costa Rica, Pontificia Universidad Católica de Chile,Pontificia Universidad Javeriana, Universidad Central de Venezuela (CENDES-UCV)/ Fundación Bengoa, Universidad San Francisco de Quito, and Instituto de Investigación Nutricional de Peru. The funders had no role in study design, data collection and analysis, the decision to publish, or the preparation of this manuscript.

Further collaborators: On behalf of ELANS Study Group

144/2819

EXECUTING A TECHNICAL CONSULTATION ON FOLATE STATUS IN WOMEN AND NEURAL TUBE DEFECTS RISK-REDUCTION TO PRIORITIZE INVESTMENTS AND ACCELERATE FEASIBLE AND EFFECTIVE INTERVENTIONS

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Background and objectives: Reducing the risk of neural tube defects (NTDs) represents a significant and feasible opportunity to decrease the toll of birth defects globally. A large fraction of NTDs are preventable through relatively simple nutritional interventions, based on improving folate status in the population. Yet, many challenges remain including lack of global data on folate sta-

tus and NTDs, implementing sustainable folic acid interventions at scale, and identifying better low-cost, field friendly methods and innovations to assess folate status, deliver interventions for NTD risk-reduction, and monitor outcomes. The objective is to present the development and execution of a technical consultation utilizing an accelerated and directed integrated process, to define the burden of folate inadequacy in women of reproductive age as a basis of assessing NTD risk, to characterize NTD prevalence, and to recommend feasible intervention approaches in low- and middle-income countries.

Methods: A multi- and inter-disciplinary committee was established to develop a roadmap that considered the magnitude of the problem, identified knowledge gaps in research and practice, identified feasible opportunities to implement and accelerate interventions, and reflected on the challenges of methodological approaches to risk-reduction. The committee was composed of global experts in nutrition, epidemiology, policy translation, public health program implementation, foalte biomarker assessment, economics, and private industry.

Results: An independent, knowledgeable and unbiased committee was formed and a roadmap for action in low- and middle-income countries was developed that includes key scientific and technical contributions to the fields of nutrition and birth defects risk-reduction.

Conclusions: A structured, integrated, multi-disciplinary approach to address long-standing gaps in folate assessment and NTD burden yielded long-considered advances in the fields of nutrition and birth defects risk-reduction. Further, the roadmap developed through the consultation is just one part of the necessary equation to amplify prevention globally, as it is imperative to engage collectively and directly with those working at national and sub national levels. This approach harmonized efforts to realize an untapped and significant opportunity to reduce the risk of NTDs through nutritional interventions.

Keywords: Folate, neural tube defects, development

144/2820

EFFECTS OF ASTRAGALUS EXTRACT MIXTURE ON BONE GROWTH RATE IN STUNTING-INDUCED ANIMAL MODEL

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Background and objectives: Globally, more than one fourth of children under 5 years of age were stunted. Three quarters of total stunted children are from sub-Saharan Africa and South Asia,

where aflatoxin exposure is common through contaminated maize and groundnuts. Previous studies have demonstrated a correlation between aflatoxin-exposure and stunting. HT042 is a standardized functional food ingredient approved by Korean FDA with a claim "height growth of children". We evaluated efficacy of HT042 on bone growth rate in dietary aflatoxin-induced stunting animal model.

Methods: Newly weaned animals were given aflatoxin contained diets with or without HT042 supplementation from 21-42 day old. Tibial length, bone mineral content and bone microstructure were measured at baseline and endpoint by micro CT. Serum or hepatic gene and protein expressions of growth hormone signaling were determined using established methodologies.

Results: Aflatoxin-exposed animals exhibited stunted growth, liver pathology and suppression of gene expressions of growth hormone signaling. HT042 supplementation significantly reduced stunted bone growth, bone mineral content compared with a control group. HT042 also attenuated aflatoxin-induced suppression of growth hormone signaling.

Conclusions: HT042 protects normal bone growth and bone formation against the experimental stunting induced by dietary aflatoxin. The effects of HT042 may be attributable to its growth hormone stimulating properties. Based on these findings, it is tempting to speculate that HT042 may be a therapeutic candidate for stunted children with aflatoxin exposure.

Keywords: stunting, children, HT042, Astragalus extract mixture

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144/2821

OPTIMIZATION OF NUTRITIONAL MONITORING OF SCHOOLCHILDREN, JOIN ACTIONS FROM THE MINISTRIES OF EDUCATION AND HEALTH. JUJUY, ARGENTINA

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Background and objectives: Background: In the Province of Jujuy, north of Argentina, the ministries of education and health have taken on the responsibility of developing procedures for nutritional monitoring and follow-up with schoolchildren since 2011 using the WHO Reference 2007, and through conducting a census on paper with manual entry of data. In 2016, they added the anthropometric fields of the software WHO AnthroPlus to the Student Unique File (Legajo Único del Alumno, LUA) of the Student Management Computer System, to use twice yearly in student assessment.

Objective: Use WHO AnthroPlus to describe the nutritional status of schoolchildren. Promote, monitor, and evaluate interventions from an inter sectional approach

Methods: We used the WHO BMI/Age indicators, which provides differentiated standard deviations (SD): risk of being underweight (-1.9 SD, -1 SD), underweight (<-2 SD), Normal (-0,9 SD, 1 SD), overweight (>1 SD, 1,9 SD), obese (>2 SD). Measurements of weight and height are taken by physical education teachers, and these measurements are then loaded into the LUA system in nominalized form. These results are shared with the primary health care system (Atención Primaria de la Salud; APS) to facilitate any necessary interventions.

530 schools and a total of 120,000 children were projected to participate in this monitoring.

Results: In the first census in the year 2016, the monitoring system reached a total of 85473 students. Find that 48.6% of the students had a normal nutritional status, 5,2% presented a risk of being underweight, 1.4% were underweight, 24,3% were overweight and 20,5% were obese.

This allows knowing the prevalence of malnutrition in each region of the province

Conclusions: The incorporation of the WHO AnthroPlus software in the LUA system has allowed for the collection of timely indicators for an integral approach to the school-age population through the primary health care system (APS). It has also proved to be an adequate system for epidemiology nutritional monitoring in schools and in primary health care centers at the different geographic areas of Jujuy.

Keywords: Nutrition- Schools –Monitoring, WHO AnthroPlus - PRIMARY HEALTH, CARE

Further collaborators: Ariel Villalba. Emiliana Garzón. Veronica Serra. Jorge Yurquina .Federico Liquin. Viviana Levin. Susana Galo

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144/2827

FOOD CONSUMPTION AND PHYSICAL ACTIVITY IN ADOLESCENT OBESE WOMEN WITH INSULIN RESISTANCE

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Background and objectives: The prevalence of obesity concerns for its close relationship with metabolic disorders and even

more when it occurs in adolescents. The objective was to determine the food consumption and physical activity of a group of obese adolescents with insulin resistance.

Methods: After an anthropometric census to 1,206 high school adolescents, it was detected that 25.1% (n = 303) were obese. With the obese adolescents who agreed to participate (n = 246), insulin resistance (IR) was determined using HOMA-I, with a cutoff value >=3.16, to define IR. We interviewed 59 adolescents with two questionnaires. One was a Food Frequency which included ten food groups: Whole dairy products, Integral cereals, Legumes, Fruits, Vegetables, Added Sugar, Fatty foods, Confectionery, Salt added and Fried foods. For every food group consumed suitably a point was assigned. Two groups were formed "Adequate Consumption" with >= 7 points, and "Inconsistent Consumption" <7 points. Regarding the instrument on physical activity, a validated instrument was used (Godard et al., 2008). According to this questionnaire, "active" participants should have >=5 and "Inactive" less than 5 points.

Results: Seventy nine percent (n=47) presented an "Inadequate Consumption" of food groups. The most prevalent was the Sugar Candy and Soft Drinks with 94.9% (n = 57). Among the foods most consumed in this group were candies / chewing gum, sweet cookies and potato chips with a frequency greater than 3-4 times/week in more than 20% of the respondents. The next group of foods with a high percentage of "Inadequate Consumption" was whole dairy products, 57.6%   (n=34). Fifty five percent (n=33) of the adolescents was in the 'Active' category. Finally, it was found that in the 'Active' group as well as in the 'Inactive' one, more than 70% of the participants had "Inadequate Consumption".

Conclusions: There is a high prevalence of inadequate food consumption, especially from the Sugar Candy and Soft Drinks group. Although more than half of the adolescents were considered as physically "Active" however 70% of them had inadequate food consumption.

Keywords: obesity, adolescents, physical activity,diet

144/2828

SEDENTARY BEHAVIOR AND ITS ASSOCIATION WITH UNIVERSITY STUDENTS' NUTRITIONAL STATUS

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Background and objectives: Sedentary behavior is an important factor influencing students' weight. Therefore, the purpose

of this study was to evaluate the sedentary behavior and its association with the nutritional status of university students.

Methods: The present study consisted of a cross-sectional cut-out of the baseline of the "Longitudinal Study of Nutrition and Health in University Students (NUTSAU)", with students enrolled in the second period of UFRJ-Campus Macaé. The instrument used for data collection was a structured self-completion questionnaire. The anthropometric evaluation consisted in the measurementof body mass and height, and later the body mass index was estimated. Sedentary behavior was estimated based on responses to sitting time, time spent watching television and time spent using consumer electronics daily. It was considered sedentary behavior more than 6 hours per day sitting (Craig et al, 2003), more than two hours watching television or using electronics (Strasburger et., 2013). Statistical analysis was performed using the SPSS application version 19.0. The project was approved by the Research Ethics committee of UFRJ-Campus Macaé.

Results: The sample consisted of 147 university students, of whom 22.6% of the women and 26.2% of the men were overweight. Regarding the sitting time, in the use of electronics and watching TV, it was observed that 75%, 92.1% and 38.6% of the students, respectively, performed such activities above the recommended time. There was a higher time of excessive use of electronic devices among women (66.4%, p = 0.02), totaling 396.3 ± 322.2 min / week among non-overweight university students compared to 413.3 ± 318.5 min / week in college students with excess weight (p = 0.79).

Conclusions: There was a high prevalence of excessive time in sedentary behavioral activities, with a greater association of the use of electronic devices among the female sex.

Keywords: Sedentary behaviors, Nutritional status, University

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144/2835

SOCIODEMOGRAPHIC AND NUTRITIONAL RISK FACTORS ASSOCIATED WITH MALNUTRITION DUE TO EXCESS AND DEFICIENCY IN CHILDREN AGED 3 TO 9 YEARS IN RURAL COMMUNITIES OF GUATEMALA

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Background and objectives: In Guatemala, 49% of children have chronic malnutrition. A state of malnutrition, both in excess and deficiency, is associated with several health problems. Low weight can affect proper growth and development and obesity during childhood is related to chronic diseases in the adult stage. The objective was to identify children with malnutrition as well as their associated risk factors.

Methods: A descriptive cross-sectional study was carried out in six rural communities of Guatemala. The study included 538 children of both genders three to nine years and 1,060 parents. The instrument included sociodemographic, anthropometric (BMI/age), dietary and environmental aspects. The analysis used regression and multivariate models.

Results: 49% of children in the study had some type of malnutrition due to excess or deficiency. In children under five, 8% presented mild undernutrition, 2% moderate undernutrition, 76% normal nutritional status, 9% overweight and 5% obesity. In children 5 to 9 years old, 1% showed underweight, 84% normal nutritional status, 13% overweight and 2% obesity. An increased risk for chronic malnutrition was found in children under 5 (OR 2.35), male (OR 1.40), children of illiterate mothers (OR 1.41), children with extended family (OR 1.93), and children with hemoglobin levels lower than 11 g/dl (OR 2.93). The risk for acute malnutrition and anemia increases with the number of children in the family (OR 1.50 and 20.56 for each additional child respectively). Western children under five, male, of families with two children had a 19.29 times higher risk of acute malnutrition than children from the East. Two percent of the children showed coexistence of malnutrition, stunting along with overweight or obesity. The dietary pattern identified was low in protein and fiber and high in sugars, salt and fat.

Conclusions: The study identified a higher prevalence of malnutrition due to excess than to deficiency in the group of children from rural communities in Guatemala. The study identified risk factors for malnutrition due to deficiency such as being a child under five, male, child of an illiterate mother, be part of an extended family, have two or more siblings, well water use and ground floor.

Keywords: malnutrition, children, sociodemographic risk factors, nutritional risk factors

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EATING HABITS OF BREAKFAST AND LUNCH IN MEXICAN CHILDREN

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Background and objectives: Children's obesity is a global nutritional issue with an increasing prevalence. In 2012, the prevalence of overweight and obesity in Mexico was 34.4% in school-aged children. There is evidence that processed food and sweetened beverages are main contributors to obesity epidemic in children. The objective to this study was to describe eating habits of breakfast and lunch in Mexican children.

Methods: Descriptive observational study. The data were obtained from a current participatory intervention study in 330 school-aged children at six public schools from Acatlán de Juárez, Jalisco, Mexico. These are descriptive baseline results were obtained by an interview about breakfast eating habits and observation of food consumption in lunch. We analyzed food and beverages available at schools and surroundings. Food intake at lunch was observed and analyzed with National Health and Nutrition Survey 2012 database.

Results: More than half of the children did not eat breakfast before school (54.4%). 55% of the children brought lunch from home, the rest bought in school. The main reason because they didn't brought it was because the parents did not have time to prepare lunch. The person who decides what to take with snacks in all the subjects who do it is the mother or the father (62.6%), followed by the same child (30.7%), grandparents (5%) and others %). Of the schoolchildren who carry home snacks in total, only 21.1% carry between 0-3 times a week fruit and 7.8% vegetables. The percentage of children who had an adequate energy intake at lunch was only 5.2%. On average, lunch provided 314.4 kcal (±246.6 SD), 9.7 g (±9.7 SD) of protein, 43.8 g (±35 SD) of carbohydrates ad 11.7 g (±12.7 SD) of lipids. Sugar provided more than recommended daily (20.9 g). The percentages of daily recommendation were 10.3 for calcium, 21.9 for iron, 15 for zinc, 14.6 for vitamin A, 76.7 for vitamin C. Percentage of school children who were higher than the sodium recommendation for lunch was 57.6.

Conclusions: Eating habits of breakfast and lunch in Mexican children found to be inadequate. Advice is required on the sale and preparations of snacks according to the recommendations.

Keywords: eating habits, breakfast, lunch, obesity

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DETERMINANTS OF FOOD CHOICES AND ITS ASSOCIATION WITH UNIVERSITY STUDENTS' NUTRITIONAL STATUS

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Background and objectives: Food choices are one of the most important factor influencing students' weight. Therefore, the purpose of this study was to evaluate the context of determinants of food choices and its association with the nutritional status of university students.

Methods: Cross-sectional analysis of data derived from the baseline of the "Longitudinal Study of Nutrition and Health in University Students (NUTSAU)", conducted in second-semester students of Rio de Janeiro Federal University–Macaé Campus. The instrument used for data collection was a structured self-completion questionnaire. The anthropometric evaluation consisted of body mass and height measurements, and thus body mass index was calculated. The determinant choice pattern was estimated based on nine questions with three response options.Statistical analysis was performed using the SPSS program, version 19.0. The project was approved by the Research Ethics Committee of UFRJ-Macaé Campus.

Results: The sample consisted of 62 university students. In relation to BMI, 21% overweight. It was observed that the motivation for food choices in relation to the natural content (n = 50), 60% of the students indicated natural ingredients, of which 73.3% were classified as adequate, 26% indicated that they did not contain artificial ingredients, of these 92.3% classified as adequate and 14% without additives, 57.1% with excess (p = 0.055). Regarding ethics (n = 48), 72.9% of students preferred foods with packaging that did not harm the environment, of which 80% were classified as adequate (p = 0.047). W eight control (n = 50), 50% indicated foods that are low in fat, 84% rated as adequate, 40% assist in weight control, 70% as appropriate, 10% foods with low calories, 60% in excess P = 0.107). Considering the price (n = 53), it was observed that 60.4% indicated a fair price, 22.6% cheap and 17% not expensive (p = 0.294).

Conclusions: The present study showed that the determinants of "natural content" and "ethics" may be a protective factor for overweight in university students.

Keywords: Food choice. Nutritional status. University.

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FACTORS ASSOCIATED WITH ENERGY ADEQUACY IN PERUVIAN ADOLESCENTS AND ADULTS: RESULTS FROM THE ELANS STUDY

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Background and objectives: The adequacy of energy intake is associated with nutritional requirements and therefore nutritional status. The aim of this study is to determine the factors associated to energy adequacy in Peruvian adolescents and adults.

Methods: Data were obtained from the Latin American Health and Nutrition Study of Peru (ELANS-Peru), a multicenter study conducted in urban areas of 8 Latin American countries. Two 24 hour dietary recall were conducted in 1113 Peruvians (15 to 65 years old) and processed using the Nutritional Data System for Research (NDS-R) software. Multiple Source Method was applied to estimate the usual intake (kcal). For energy adequacy (EA), basal energy expenditure-BEE was calculated according to age, sex and physical activity level-PAL proposed by Gerrior et al (2006), using the long IPAQ. A multiple regression analysis was conducted to estimate the associated factors at 95% confidence level.

Results: Associated factors with EA were: (i) by age: adolescents had higher percentage of energy adequacy than the 20 to 49 years old population (106% vs 99% p=0.006), (ii) by sex: women showed greater EA than men (104% vs 94%, p<0.000), (iii) by PAL:

as the level of physical activity (PA) decreases, EA increases (active-very active 82%, low active 94%, sedentary: 106%, p<0.000 between each PA category, (iv) by region, the adequacy found was as follow: Lima city and Callao 101%, Coast 97%, Mountain 100% and Forrest 108%, where the Forrest had significantly higher adequacy than the others (p=0.015), (v) by socioeconomic level: an inverse association was found between socioeconomic level and EA (low 103%, middle 100% and high 95%), significant differences were found between low vs high level (p<0.000) and middle vs high (p=0.021), (vi) by BMI: people with higher BMI had lower EA (normal 127%, overweight 107%, obese: 95%, p<0.000).

Conclusions: The inverse association found between BMI and EA could be due to an overestimation of energy requirements and/or underreporting of overweight and obese people.

EA is higher in young boys and girls, in woman, in poor and in sedentary people. Developing strategies to adjust intake to recommendations should take into account the associated variables.

Keywords: Energy, adequacy, ELANS,

144/2844

COOKING SKILLS INDEX - BRAZIL: DEVELOPMENT AND RELIABILITY ASSESSMENT

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Background and objectives: Despite the importance of the cooking skills for healthy eating, this subject has hardly been explored scientifically in Brazil. The lack of an instrument for measure those skills and adapted to the Brazilian reality may be one of the reasons for the scarcity of these studies. This work describes the development and the reliability assessment of an index to evaluate cooking skills in Brazil.

Methods: The Cooking Skills Index - Brazil (CSI-Brazil) is a 0-100 index specially designed for this research, which was based on the Brazilian's Dietary Guidelines (2014), and results from the application of ten questions about the confidence regarding cooking skills considered relevant in Brazil. The reliability assessment was conducted with the repeated application (test-retest) of the questions to 51 parents of school-age children residing in São Paulo, SP, Brazil. Internal consistency was assessed by the Cronbach's alpha. Reproducibility was assessed by the quadratic weight kappa (95% CI) and the prevalence and bias adjusted kappa (PABAK).

Results: The participants (n=51) were mostly mothers (92.2%), aged between 30 and 39 years (64.7%), white (67.4%), married (84.3%), employed (80.4%) and with complete secondary education (44%). According to the Cooking Skills Index – Brazil, these participants reached similar average points on test-retest interviews (71.3 points -range 46.7-93.3; 71.8 points - range 50-96.7, respectively). The Cronbach's alpha of the instrument (0.75) indicated good internal consistency. The weighted quadratic kappa for the total of the items indicated moderate instrument reproducibility (0.55), while the PABAK showed almost perfect reproducibility (0.89).

Conclusions: As advantages, the developed instrument is short and simple, has easy, fast and standardized application, and synthesizes skills in a scale from zero to 100, which facilitates their interpretation. In this first evaluation, the CSI-Brazil showed good internal consistency (Cronbach's alpha> 0.70) and acceptable reproducibility (weighted kappa 0.55; adjusted kappa 0.89), recommending its use in studies to evaluate cooking skills in Brazil.

Keywords: Cooking. Surveys and Questionnaires. Reproducibility of Results:

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BODY MASS INDEX AND INTRAMUSCULAR FAT INFILTRATION IN FRAIL AND NON-FRAIL ELDERLY

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Background and objectives: Aging determines several changes in body composition, and is associated with increased fat

mass and changes in its distribution pattern. All changes in body composition have importance in the functionality of the elderly, as they culminate in a reduction of muscle with the increase of total body fat, making the elderly more susceptible to a limitation of mobility. The purposes of this study were: To compare the intramuscular fat infiltration in frail and non-frail elderly and to verify its association with muscle mass and body mass index.

Methods: Cross-sectional exploratory study. A total of 40 elderly people (10 non-frail men and 10 non-frail women, 10 frail men and 10 frail women) selected at the Geriatrics Outpatient Clinic of the Hospital das Clínicas de Ribeirão Preto. Body weight and height were measured and body mass index (BMI) calculated. Thigh muscle volume (MV) and intramuscular fat infiltration (IMAT) were assessed by nuclear magnetic resonance.

Results: The mean BMI, IMAT and MV of the groups were: non-frail women: 28.8±5.5kg.m-²; 6,84±2,4 % and 150,0±19,2cm3; Frail women: 31.75 ± 5.8 kg.m-²; 11.16±3.5% and 130.8±28.6cm3; Non-frail men: 26.8±5.1 kg.m-²; 5.75±1.77% and 223.7±15.8 cm3; Frail men: 24.3±5.3kg.m-², 7.55±2.3% and 237.2±26.8 cm3. In the frail elderly group IMAT had a moderate positive association with BMI (r=0.57, p<0.05). In the non-frail elderly group, IMAT presented a strong negative association with muscle volume (r= -0.62, p<0.05).

Conclusions: Increase in total body fat, as assessed by the BMI, was associated with increased fat infiltration in muscle, which seems to influence negatively muscle volume.

Keywords: intramuscular fat infiltration, body composition, aging

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PROVISION OF LIPID-BASED NUTRIENT SUPPLEMENTS AND INFANT AND YOUNG CHILD FEEDING PRACTICES IN HUÁNUCO, PERU

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Background and objectives: The use of small-quantity lipid-based nutrient supplement (SQ-LNS), a food-based home fortification product, may be an effective strategy to prevent undernutrition, however there are concerns about the possibility of affecting infant and young children feeding (IYCF) practices.

We aimed to examine the effects of providing SQ-LNS to children from 6 to 12 months on their IYCF practices.

Methods: In a two-arm randomized effectiveness trial conducted in Huánuco (Peru), children were enrolled at 6 months of age (n=422) and received either SQ-LNS or multiple micronutrient powders (MNP) from 6-12 months. Supplements were distributed during their monthly child well-being appointments at Ministry of Health (MOH)-run health centers. Baseline information included infant, maternal and sociodemographic data. In addition of the primary (growth and anemia) and secondary (child development) study outcomes, information on breastfeeding, dietary diversity and meal frequency during the previous 24-h were collected at 12

months of age. The proportions of children meeting the minimum dietary diversity (MDD), minimum meal frequency (MMF) and minimum acceptable diet (MAD) were calculated.

Results: At 12 months, the proportion of children who were breastfed (97.5% in the SQ-LNS vs. 95.0% in the MNP group, p=0.238), received food from a 4 or more food groups (93.6% in the SQ-LNS vs. 94.9% in the MNP group, p=0.590), received solid, semi-solid, or soft foods the minimum number of times or more (86.8% in the SQ-LNS vs. 91.9% in the MNP group, p=0.118), received a MAD (87.0% in the SQ-LNS vs. 91.2% in the MNP group, p=0.149) did not differed by group. When season was taken into account (which differed between groups at baseline), provision of SQ-LNS was associated with higher odds of meeting the MMF (Odds Ratio [OR] =2.7, 95% CI: 1.3-5.9) and MAD (OR=2.7, 95% CI: 1.2-5.8) indicators. Further adjustment for food insecurity, maternal education and child's age did not further change these results.

Conclusions: Provision of SQ-LNS to infants receiving regular preventive care services did not reduce breastfeeding rates, or the proportion of them meting the MDD, MMF or MAD indicators, while it may positively affect meal frequency and acceptable diet in this population.

Keywords: lipid-based nutrient supplements, breastfeeding, dietary diversity, minimum meal frequency, minimum acceptable diet

Further collaborators:

SERUM/PLASMA LEVELS OF ZINC IN TYPE 2 DIABETIC SUBJECTS VERSUS HEALTHY SUBJECTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: Type 2 diabetes mellitus (T2DM) is one of the leading chronic diseases worldwide. Zinc

plays an important role in glucose metabolism, joining in the synthesis, storage, secretion and action of insulin. A large number of studies have compared serum/plasma levels of zinc in subjects with T2DM vs. nondiabetic subjects, but their results are inconclusive. This systematic review and meta-analysis aimed to compare serum/plasma levels of zinc in type 2 diabetic subjects without complications vs. healthy subjects.

Methods: This study has been registered in Prospero (2015: CRD42015020178). A robust search developed in the EURRECA Network was performed at Embase, Pubmed/Medline, and The Cochrane Library until March 16, 2016. Studies were selected if a) they had an observational design, b) were performed on subjects >18 years, c) had data on the mean and standard deviation of serum/plasma levels of zinc in both type 2 diabetic subjects without complications and nondiabetic subjects. Animal/lab studies, studies with diabetic participants other than T2DM, and study designs other than cross-sectional, case-control and prospective cohort studies were excluded. Potentially relevant articles for the systematic review and meta-analysis were selected for full exploration. Data are expressed as mean differences (MD) with 95% CIs, using the generic inverse-variance random-effects model. Heterogeneity was assessed by the Cochran Q-statistic and quantified by the I2 statistic (significance P<0.100). Publication bias was investigated by visual inspection of funnel plots and quantitatively assessed using Egger's and Begg's tests. All analyzes were performed using STATA 12.

Results: The search strategy initially yielded 12,044 publications, of which 29 were initially selected. Finally, 19 studies were included in the final meta-analysis after excluding poor quality studies according the STROBE checklist. Pooled analysis showed that MD for serum/plasma levels of zinc was -11.82mg/dL (95% CI: -18.86, -4.78). There was no evidence of publication bias (P = 0.723), but heterogeneity was high (I2 = 97.7%, P <0.001).

Conclusions: In this systematic review and meta-analysis we observed lower serum/plasma levels of zinc in subjects with T2DM than in healthy subjects. However, given the high heterogeneity, further studies would be necessary to confirm this result.

Keywords: Zinc, type 2 diabetes mellitus, systematic review and meta-analysis,

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READING HABITS OF FOOD LABELS BY PROFESSORS OF A PRIVATE UNIVERSITY IN SÃO PAULO-BRAZIL

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Background and objectives: Food labels allow for consumers choosing food products according to their characteristics, es-
pecially those one regarding the nutrition facts label (NFL). However, the comprehension of the food labels remains inadequate for most of consumers. In this context, the aim of this study was to report the reading habits of food labels and NFL by professors of a private university in São Paulo-Brazil.

Methods: A descriptive study was performed through a cross-sectional approach. A structured questionnaire with 29 questions was applied addressing socio-demographic features and food labels-related variables, such as, reading habits and reading motivations. The nutritional characteristics most observed in the NFL were identified as well as its possible influence in the purchase intention. A group of 38 professors from a private University in São Paulo-Brazil, from both gender, was randomly interviewed. The exclusion criterion was professors graduated in Nutrition.

Results: The mean age of the interviewed was 43.0 years (±10.9) and the average household income was greater than 10 minimum wages (68.4%). Regarding the food label, the expiration date was the item most observed (27.2%). Most of interviewed (70.6%) reported reading the NFL frequently. The main reason for using NFL was the consumer's concern for a healthy diet (21.2%). The other reasons were the fat, cholesterol and sodium content. The information most and less read were quilocalories content and daily value percentage, respectively. About 92% of the interviewed reported NFL content influence in their purchase intention.

Conclusions: It was observed that most of the interviewed was concerned about NFL content to keep a healthy diet, which influence their purchase intention.

Keywords: food label; nutrition facts label; purchase intention.

144/2906

READING HABITS OF FOOD LABELS BY STUDENTS OF A PRIVATE UNIVERSITY IN SÃO PAULO-BRAZIL

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Background and objectives: Food labels allow for consumers choosing food products according to their characteristics, especially those one regarding the nutrition facts label (NFL). However, the comprehension of the food labels remains inadequate for most of consumers. In this context, the aim of this study was to report the reading habits of food labels and NFL by students of a private university in São Paulo-Brazil.

Methods: A descriptive study was performed through a cross-sectional approach. A structured questionnaire with 29 questions was applied addressing socio-demographic features and food labels-related variables, such as, reading habits and reading motivations. The nutritional characteristics most observed in the NFL were identified as well as its possible influence in the pur-

chase intention. A group of 53 students from a private University in São Paulo-Brazil, from both gender, was randomly interviewed. The exclusion criterion was students attending in Nutrition graduation course.

Results: The mean age of the interviewed was 21.93 years (±5.72) and the average household income was between 2 and 5 minimum wages (52.8%). Regarding the food label, the expiration date was the item most observed (42.5%). Minority of interviewed (28.3%) reported reading the NFL frequently. The main reason for using NFL was the consumer's concern for a healthy diet (33.8%). The other reason was the non-understanding of the food label (23.6%). The most and less familiar terms were quilocalories (19.2%) and daily value percentage (80%), respectively.

Conclusions: The minority of the interviewed was concerned about NFL content, mainly due to the non-understanding of the specific terms.

Keywords: food label; nutrition facts label; healthy diet.

144/2910

INTERNET BASED PRECISE INDIVIDUAL DIETARY INTERVENTION STRATEGY, A PILOT SCHEME FOR IODINE

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Background and objectives: Though the Universal Salt Iodization (USI) eliminated Iodine Deficiency Disorders in China, a number of people still remain iodine deficient or excessive. Single level of table salt iodization does not fit everyone as iodine content in diets and the environment varies dramatically, and dietary habits differ greatly among populations. Precise individual dietary intervention is essential to change this situation. Individual iodine status assessment is the prerequisite for iodine intervention but so far there is no acceptable biomarkers to reflect it. Meanwhile, individual dietary guidance requires food consumption assessment. Food Frequency Questionnaire (FFQ) is a good tool for individual nutrients intake calculation, but respondents need to be guided by professions when filling the paper-based questionnaire, and calculation and interpretation of the results is also nutritional specialists dependent, which precludes large-scale utilization.

Methods: To build up an internet-based iodine status evaluation and intervention system, the following work must be completed. Local optimized iodine-specific food frequency questionnaire (I-FFQ) is revised. Iodine content data of local food and drinking water is determined. An internet-based software is developed. By transforming the paper based I-FFQ into an Internet-based App that calculates precise iodine intake with a food composition database, an accurate, fast, free and convenient self-evaluation tool is made available to the public as a simple individual guidance to choose from multiple levels of iodization salt.

Results: To achieve an optimal iodine intake, a tailored diet guidance is constructed from user's physiological data and diet

trend as the feedback result, along with a table salt option suggestion. By prioritizing food with popularity and iodine concentration using data analyzed from thousands of I-FFQ surveys, we improved App usability.

Conclusions: Revising USI with the combined strategy of our App and multi-level salt iodization, optimal iodine intake can be easily achieved. On the basis of the above plan, other nutrients can be added so that the system will be applicable to all diet nutrients.

Keywords: iodine; internet; USI; individual; intervention

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ASSESSMENT OF SODIUM INTAKE IN SAMPLE OF MOROCCAN CHILDREN USING 24 H URINARY EXCRETIONS

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Background and objectives: Background: Worldwide, non-communicable diseases (NCDs) are the leading cause of mortality and morbidity accounting globally for 60% of all deaths and 43% of disease burden globally. Nowadays, it is widely accepted that an excessive intake of salt is associated with a broad range of NCDs, such as hypertension and cardiovascular diseases. The World Health Organization (WHO) recommendation outlines the importance of prioritizing sodium intake reduction, as a main approach to reduce blood pressure and to decrease the risk of CVDs and strokes. WHO recommends for adults, the consumption of less than 2 g of sodium / day (5g of salt / day). For children, the reduction of sodium intake prevents and decrease risk of hypertension during childhood. In fact, 33% of Moroccans suffer from hypertension, and 13% are obese. Aims: The present study was planned to assess the status of sodium in a Moroccan children living in Rabat region. This study takes place as part of the national action plan for the fight against non- communicable diseases (NCD) of 2014-2016.

Methods: The study was conducted on 131 children aged 6-18 years. Sodium excretion was measured by 24-h urinary collection by Inductively Coupled Plasma Mass Spectrometry and the creatinine excretion was used to validate completeness of urine collections.

Results: The average of urinary sodium was 2234 ± 824.15 mg/day (equivalent to 5.7g/d of salt). In 94% cases, the sodium intake is higher than the recommended adequate intake, 40% of children have a sodium status exceeds the upper limit, as recommended.

Conclusions: The dietary sodium intake of children was Higher compared to the WHO recommended value. Thus, there's need to elaborate strategies at national levels to reduce salt intake and limit the associated diseases.

Keywords: Salt intake, 24h urine sodium excretion, ICP-AES, children, Rabat.

Further collaborators: Ministry of health, Morocco

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EVALUATION OF IRON STATUS IN CHINESE POPULATION IN POVERTY RURAL AREAS

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Background and objectives: To assess the iron status among populations by age and gender in poverty rural areas in China.

Methods: Sampling of participants was based on a large population sampling frame for 2010-2012 China National Nutrition and Health Survey by stratified multistage cluster sampling method. Serum ferritin (SF), serum soluble transferrin receptor (sTfR) and high sensitive C-reactive protein (hsCRP) were measured by the immunoturbidimetric assay. Body iron (BI) was calculated from sTfR and SF concentrations. Subjects with indication of inflammation (hsCRP>5 mg/L) were excluded from the analyses. A total of 4059 participants including 1983 males and 2076 nonpregnant females($\geq$6 years old)were involved.

Results: The average concentrations of SF, sTfR and BI for the whole population in poverty rural area were 103.1 ng/mL, 3.33 mg/L and 9.18$\pm$4.19 mg/kg, respectively. For males, the corresponding values were 140.0 ng/mL, 3.19 mg/L and 10.42$\pm$3.70 mg/kg, and for females, they were 77.0 ng/mL, 3.46 mg/L and 7.99$\pm$4.28 mg/kg. The difference of SF, sTfR and BI among different age and gender groups were statistically significant. Except 6-11-y subgroup, the lg(SF) was positively correlated with BI and Hb, and the lg(sTfR) was negatively correlated with lg(SF), BI and Hb (p<0.01). Depending on the iron status indicator applied, the prevalence of ID ranged from 1.2% to 7.5% among males and 5.0% to 19.0% among nonpregnant females. Comparison of the prevalence of ID by different iron indicators and cutoffs, the prevalence of defined ID by sTfR was the highest and the lowest by BI. In addition, the prevalence of ID for male is higher than for female, and for 18-44-y female is the highest.

Conclusions: The observed iron status of Chinese populations in poverty rural areas suggested females aged 12-17-y and 18-44-y

suffered ID at high risk. Male were at low risk for ID. It supports the program planning for iron nutrition promotion on females.

Keywords: China Nutrition and Health Survey, iron deficiency, serum ferritin, serum soluble transferrin receptor, body iron

Further collaborators:

144/2925

GOVERNANCE OF WATER, SANITATION AND HYGIENE (WASH) IN SUB-SAHARAN AFRICA AND ASSOCIATIONS WITH NUTRITIONAL STATUS IN CHILDREN UNDER FIVE YEARS OF AGE: A SYSTEMATIC REVIEW

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Background and objectives: In 2011 global estimates put the number of children in the developing world that were stunted at 165 million. African prevalences have stagnated since 1990 at about 40%, with little improvement expected. Stunting is a major public health concern because of associations with adult health and disease risk later in life. The realisation that physical growth cannot completely be improved by optimized diet and reduced diarrhoea has led to the hypothesis that another underlying cause of stunting is early exposure to poor WASH and recurrent infectious episodes leading to immune impairment across the lifecourse.

Methods: A systematic review is underway to examine the governance of WASH in sub-Saharan settings and associations with nutritional status in children under five years of age. Articles are selected from PubMed Central, Science Direct, and ProQuest Social Science databases published between 1990 and 2017. The PRISMA Statement, evidence-based guidelines that provide a set of items to report in systematic reviews and meta-analyses, is

being utilised while this systematic review will also be registered with PROSPERO.

Results: Initial searches and preliminary results have yielded <50 items per search-string indicating a limited body of knowledge on the nexus between governance, water, sanitation, hygiene, and nutritional status in children in the African context. Of importance are gaps in financing, with SSA countries on average committing a mere 0.52% GDP to WASH expenditure. While actors and stakeholders at various levels in the policy and governance arena advocate for multi- and inter-sectoral approaches, most indicators show disappointing results. Promotion of breastfeeding, food fortification, as well as micronutrient supplementation during pregnancy and infancy, has not been sufficient to shift the prevalence of stunting. Further analysis of the literature is being undertaken.

Conclusions: Undernutrition has a complex set of political, social, and economic causes, none of which are amenable to easy solutions. Important knowledge gaps still remain concerning critical aspects of child malnutrition, including environmental risks in the neonatal and infant periods, in the SSA context.

Keywords: WASH, Governance, Nutritional Status, Children Under Five

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144/2953

NUTRITIONAL STATUS OF RURAL SCHOOLCHILDREN IN TACUAREMBÓ/URUGUAY IN RELATION TO DIET CHARACTERISTICS AND ENVIRONMENTAL FACTORS

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Background and objectives: Information on nutrition and health conditions of rural school children in Uruguay is scarce. Our objective was to evaluate the nutritional status of children of a rural school in Tacuarembó/Uruguay during a 6 month period, in relation to characteristics of their diet at home and school and environmental factors known to affect the biological utilization of food.

Methods: This was a descriptive study with two components, one cross-sectional at baseline (November 2015) and a follow up (May 2016). The study population was composed by all children registered at School N°116 of Punta de Carretera, Tacuarembó (n=30; 5-12y; 50% girls). Information on sanitary conditions and on frequency of intake of specifics foods, food preparations and beverages, at home and at school, was obtained by direct ob-

servation and by semi-structured questionnaires directed to the families and the school teachers and assistants. Weight and height were measured by standard procedures and expressed as Z scores of weight for age (WAZ), height for age (HAZ) and BMI for age (BAZ). Associations between anthropometric Z scores and environmental factors were examined by ANOVA. Changes in Z scores over time were analyzed by paired t test.

Results: At baseline, mean anthropometric Z scores were adequate (0.01, -0.117, 0.100, for WAZ, HAZ and BAZ, respectively) irrespective of age and gender, and did not change significantly after 6 months. 10% of children were overweight at both study periods, whereas cases of obesity increased from 6.6% to 10% over time although not significantly. Meals consumed at home included foods rich in carbohydrate and saturated fat, and protein sources, mainly milk, meat and legumes. Meals provided at school appeared to be low in animal protein, iron, zinc, vitamin C, and fiber. The most critical environmental factors identified were the regular use of semi-surging water near dumps and the presence of domestic animals. There were no significant associations between these factors and the nutritional status of the schoolchildren.

Conclusions: Most schoolchildren presented adequate nutritional status, although inadequate dietary characteristics and environmental factors were observed, which should be corrected since they may result in hidden malnutrition.

Keywords: rural schoolchildren, anthropometry, diet, sanitary conditions.

144/2954

ASSESSMENT OF IODINE AND SODIUM INTAKE IN MOROCCAN CHILDREN BY 24-H URINARY EXCRETION

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Background and objectives: Iodine deficiency has several adverse effects on human growth and development, categorized collectively as iodine deficiency disorders (IDD). Among school-age children, it's estimated that 29.8% at the world level, had insufficient iodine intake. However iodization of salt is the preferred method of increasing iodine intake in a community, it's legally mandated in many countries. Thus Morocco where the IDD is considered as moderate, adopted the universal salt iodization strategy, in order to prevent and control (IDD). The aim of our study is to determine the consumption intake of supposed fortified salt by iodine, and to evaluate the iodine deficiency in sample of

school children, as a pilot study for the preparation of the future National Survey.

Methods: This transversal study is conducted on 280 children and adolescent aged 6 to 18 years. Anthropometrics data and clinical survey were collected. Urinary sodium and iodine excretion was measured on 24-h urinary collection assessed respectively, by Inductively Coupled Plasma Mass Spectrometry and spectrophotometrically using the Sandell-Kolthoff reaction, the creatinine excretion was used to validate completeness of urine collections

Results: The means were 2.2 ±0.08 g/day (equivalent 5.7±0.2g/day of salt) for daily urinary sodium, and 96 μg/l for iodine excretion. 70% of children presented iodine deficiency, and 50% consume more than recommended sodium intake, among which 62% presents IDD

Conclusions: Most of children consume more than recommended intake of supposed fortified salt by iodine, and children still suffer from iodine deficiency, so the Ministry of Health must consider other's alternatives than salt iodization in his future strategy of IDD reduction.

Keywords: Iodine, sodium, 24-h urinary excretion, children, adolescent, Morocco

Further collaborators: Ministry of health

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marinated egg on each school day for two years. No intervention was provided for 292 students in the control group. Height, weight and dietary intake were measured to assess their nutrition status, and body composition was measured by bioelectrical impedance method. The mixed linear model of repeated measurements was adopted for the comparison of each index.

Results: The lean body mass of boys in the intervention group increased by 0.5 kg, statistically higher than those in the control group after one year intervention (P=0.0007), which became no significant after two years. Boys in the intervention group showed more increase of body fat by 0.2 kg after one year (P=0.0343) and by 0.5 kg after two years (P=0.0013) , compared with those in the control group. Moreover, the difference between groups was significant in boys only in lowest and middle tertiles of body weight for lean body mass, and in highest tertile for body fat. However, no significant effect was observed in girls on body composition indices.

Conclusions: The two-year milk and egg supplementation could promote the increase of lean body mass and body fat in Chinese pre-pubertal boys in poor rural area, but not in girls.

Keywords: Body composition. Egg. Milk. Children. Poor Rural Area

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144/2964

THE EFFECT OF TWO YEARS MILK AND EGG SUPPLEMENTATION ON BODY COMPOSITION OF PRE-PUBERTAL CHILDREN IN CHINESE POOR RURAL AREA

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Background and objectives: Under-nutrition of children remains popular in Chinese poor rural area. It was due in part to their low protein intake and would affect growth and development. So a two-year milk and egg supplementation trial was conducted to evaluate the effect on the growth, especially on body composition of pre-pubertal children in Chinese poor rural area.

Methods: Four primary schools were recruited randomly in a poor rural county of Chinese southwest as the intervention group, and four compared schools with similar background as the control group. A total of 672 students were recruited aged 7 to 11yrs from the Grade 2nd to Grade 4th. About 380 students in the intervention group were supplied with 200 g of School Milk and 50 g of

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144/2973

DIETARY CHANGE AND LIFESTYLE DISEASES AMONG TIBETAN NOMADS : FIELD NUTRITION RESEARCH AT TIBETAN REFUGEE CAMPS IN LADAKH, INDIA

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Background and objectives: Highland is one of the most severe places to get enough foods in the world. However, our current study found relatively high prevalence of lifestyle diseases such as obesity, hypertension and diabetes even in such remote highland. Assessing dietary status is important to know one of the backgrounds of these lifestyle-related diseases. This study aims to reveal the nutritional intake of the Tibetan nomads living in Himalayan highland in Ladakh, India, and analyze the relation between nutritional intake and diabetes. It also introduces the lifestyle of Tibetan nomads who settled in town, with a special focus on dietary changes from their nomadic lifestyles to ones in the city.

Methods: Field nutrition research, the field work methodology with a combination of epidemiology, nutrition and anthropology, had carried out in 3 different settings; 1) Leh town (elevation approximately 3200–3600 m ASL), the central city of Ladakh, 2) Domkhar village, located in the mountains valley (3000–3800 m ASL), 3) Changtang plateau, nomadic highland (4200-4900m ASL). Health checkups in Leh have mainly covered ethnic Tibetans living in Tibetan refugee camps around Choglamsar. We car-

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ried out health checkups of local residents aged 40 or over who voluntary joined the check-up (Leh, n = 304; Domkhar, n = 208, Changtang, n=300) . Diabetic status was diagnosed by 75g oral glucoses tolerance test and total energy intake was estimated using 24h recall method.

Results: The incidence of diabetes and IGT among the study subjects were 33% in Leh, 30% in Domkhar village, and 17% in Changtang plateau. Total energy intake was lower in Changtang plateau and the food variety was poor compared to the Leh town. Through the interview, dietary changes were found especially among the former nomads who currently moved in the town from nomadic lifestyle.

Conclusions: Lifestyle diseases are higher among the subjects living in Leh town than those who living in nomadic area, Changtang plateau. For the former nomads, the lifestyle had changed a lot after they settled in town. It is important for healthcare workers to pay attention to those population as a high risk group of developing lifestyle diseases in the future.

Keywords: Dietary change, Lifestyle diseases, Tibetan, Nomad, Himalayan highland

Further collaborators: Research Institute for Humanity and Nature, Kyoto, Japan

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144/2980

CONSUMPTION OF NUTRIENT DENSE FOODS IN NORTHEAST CITIES OF ARGENTINA, RESISTENCIA AND CORRIENTES

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Background and objectives: Background

From year 2000 we have been monitoring the consumption of food in our region, noting that the intake of foods rich in fats, sugar and starch are the most used. The various dietary guidelines suggest eating nutrient-dense foods and reducing those rich in sugars and fats which does not really happen.

Objectives

To study the weekly frequency the consumption of various nutrient-dense foods in the cities of Resistencia and Corrientes in the northeast of Argentina.

Methods: With the Nutrition students of the Medicine School we surveyed in the year 2016, 5167 persons of the cities of Corrientes and Resistencia. The study population selected by convenience was 18 years or older. A weekly food consumption trend survey was conducted (daily, almost daily, infrequent and never). The total was divided into two groups: daily intake and non daily consumption

Results: We observed that the daily food consumptions in percents were: milk 71.47, various types of meats 81.81, green vegetables 60.47, non green vegetables, 45.62, fruits 61.29, oil 49.89, and the totality of the six groups of foods were 25.43

Conclusions: The daily consumption observed is far away from the recommended. 74,66 % didn't consume nutrient-dense foods on a daily basis, with a risk of poor nutrient intake. This iwas analyzed in context of overweight increase.

The consumption of food with high nutrient content was low. There must be taken public population measurements, especially education.

Keywords: Milk. Meats. Vegetables. Fruits. Oils

144/2981

KNOWLEDGE OF UNDERGRADUATE NUTRITION STUDENTS ABOUT THE NOVA FOOD CLASSIFICATION

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Background and objectives: The second edition of the Dietary Guidelines for the Brazilian Population, published in 2014, gained prominence in the national and international media because this document deploys a new food classification NOVA, that is based on the processing levels of foods. It is important, however, that NOVA food classification reaches its target audience, starting with undergraduate nutrition students. The aim of this study was to assess the knowledge of students entering and graduating nutrition school concerning the NOVA food classification.

Methods: It was performed a study of quantitative approach, transversal and descriptive carried out in a higher education in a public institution in the state of Mato Grosso do Sul, Brazil. A questionnaire was use with a list of 30 foods divided into four groups: natural or minimally processed foods (I), processed culinary ingredients (C), processed foods (P) and ultra-processed foods (U). The study was composed of 69 participants selected for convenience, and 64% of students entering and 36% graduating nutrition school, of these 96% female and 4% male.

Results: According to the U Mann-Whitney test, the score of correct classification in the overall analysis (C, I, P, U) was significantly higher (p = 0.000) between the group of graduating nutrition school (median = 17) that the group of students entering (median = 14).

Conclusions: Thus, there was the necessity to approach the content of the Guide from the first semester of graduation allowing students greater knowledge and performance on this subject.

Keywords: Students, Food processing, Dietary guidelines.

144/2982

FREQUENCY OF OBESITY IN CITIES OF THE AR-GENTINE NORTH-EAST, RESISTENCIA AND CORRIENTES

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Background and objectives: Introduction

Since 2.000 we study the frequency of overweight (OW) and obesity (O) in the region, with values between 48 and 55 %. In 2011, we find 70 % of OW and O, in persons of 40 years or older.

Objectives

To study the frequency of overweight and obesity in cities of Resistencia and Corrientes.

Methods: With the Nutrition students of the Medicine School we studied in the year 2017, 5167 persons of Resistencia and Corrientes. The studied population selected by convenience, was 18 years or order. The frequency of OW and O, according to BMI, was established in the whole population, and also by sex,and age

Results: OW O frequency in the total population was 34.71 % and in the group of 40 years or older was 60,95 %. The frecuency of OW O in males was 40. 28 % and in fameles 46.37.

Conclusions: The frecuency of OW O is biggest in the 40 years or older population, than the youngest group

The frecuency of OW O is biggest in females than males

Keywords: Overweight. Obesity. Index Corporal Mass. Sex. Age.

144/2984

EVOLUTION OF FOOD INSECURITY (INSAN) IN HOUSEHOLDS OF MONTEVIDEO DURING 2014-2016

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Background and objectives: Information regarding the distribution of food insecurity in the population and the location of those most affected can contribute to building political to counteract this phenomenon. Applying the Latin American and Caribbean Food Security Scale (ELCSA) complements the data from other indicators by including dimensions that underlie different issues that are affected against INSAN situations. The aim of the study was analyze in households of Montevideo the evolution of INSAN during 2014-2016.

Methods: Descriptive study, non-probabilistic annual sample of 1,500 households. The households were grouped in three zones: east, center and west according the Ministry of Social Development proposal. The ELCSA, which measures INSAN based on household experience, was applied.

Results: The INSAN situation in households was maintained during this period, 9% -10% INSAN moderate, 4% -3% INSAN severe. In households with children under 18 years old, the prevalence of INSAN moderate increased from 9% to 15% and INSAN severe from 3% to 5%, while the opposite occurred in households without children under 18 years old: INSAN moderate remained in 8% and the INSAN severe decreased (4% to 2%), which reaffirms poverty in childhood in Uruguay. The analysis by zone identified that the prevalence of households with INSAN moderate in the central area decreased (7% to 5%) and with INSAN severe remained at 2%. In households of the east and west of Montevideo, poverty levels range between 3.1 and 11.5%. When the ELCSA was applied it was detected in the eastern zone that INSAN moderate households increased (12% to 15%), the INSAN severe remained (6%). In the west, INSAN moderate and severe households increased by 4% and 1%, respectively; prevalences 3 and 2 times more than those observed in the central zone. The three most commonly cited reasons for INSAN moderate households were "to stop having a healthy diet" or "unvaried diet" "concern that they would run out of food". In INSAN severe households was added "having eaten less than they should".

Conclusions: The quantity and quality of food are presented as underlying dimensions in the INSAN households studied.

Keywords: Food Insecurity, households, ELCSA

144/2995

PATTERNS OF RISK AND PROTECTIVE BEHAVIORS RELATED TO NON-COMMUNICABLE DISEASES AMONG BRAZILIAN ADOLESCENTS

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Background and objectives: A small group of modifiable risk factors accounts for most of the disease burden and mortality due to non-communicable diseases (NCD). These risk behaviors frequently originate in adolescence and remain in adulthood with short-, medium- and long-term consequences. Currently, in addition to determining the prevalence of each of the risk factors, it is important to evaluate how they cluster among the population, since some of these behaviors might interact with each other, producing an even greater risk than the sheer sum of individual risks. We aim to identify patterns of risk and protection behaviors related to chronic diseases among Brazilian adolescents and

to verify their association with socioeconomic and demographic characteristics

Methods: Our data source was the Brazilian National Survey of School Health (Pesquisa Nacional de Saúde do Escolar – PeNSE) 2012, which collected data on adolescent health through a self-administered questionnaire in a representative sample of students enrolled in the 9th grade of elementary education in public and private Brazilian schools. We used data about diet, physical activity, smoking, alcohol consumption, socioeconomic and demographic characteristics. Factor analysis was used to identify patterns of behavior from a list of risk and protective factors for NCD. The association between the identified patterns and students' characteristics was evaluated using linear regression models.

Results: Four patterns of behavior were found: "unhealthy diet", "healthy diet", "physical activity" and "alcohol and cigarette use". In general, the groups that presented the worst profile of adherence to the behavioral patterns found were: girls, older adolescents, and those who did not live with their mother and their father.

Conclusions: Four behavioral patterns were found among Brazilian adolescents. The identification of more vulnerable groups can support strategies for health promotion and prevention of diseases related to the control of NCD even during adolescence.

Keywords: behavioral patterns; c; risk factors; adolescent; non-communicable diseases; epidemiological surveillance.

144/2998

REACH, EFFECTIVENESS, ADOPTION AND IMPLEMENTATION OF A NATIONAL HEALTHY EATING CAMPAIGN: A PROCESS AND IMPACT EVALUATION USING A MIXED-METHODS APPROACH

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Background and objectives: Evaluation ensures government accountability for spending, provides evidence of the impacts of an intervention and gives decision makers opportunities to improve subsequent initiatives. The Eat Well Campaign (EWC): Food Skills was a year-long national healthy eating initiative that Health Canada (HC) developed and disseminated with cross-sector partners to promote food skills to Canadian parents. The purpose of this study was to evaluate the reach, effectiveness, adoption and implementation of the EWC among Canadian parents and HC's cross-sector partners.

Methods: The reach and effectiveness of the EWC was evaluated among a representative sample of Canadian parents by using a series of web-based questionnaires that captured sociodemographic data, information of EWC exposure and the impacts of the campaign. A qualitative process evaluation was conducted

to describe the adoption and implementation of the EWC among HC's multi-sector partners using thematic analysis of telephone interviews.

Results: Reach was significantly greater among French-speaking parents, those with lower income and less education. The perceived effectiveness appeared to be greater for beliefs and knowledge components than for behaviors. The majority of parents were only exposed to one campaign element and exposed one or fewer times per month. Nevertheless, the perceived effectiveness of the campaign was significantly greater for each additional campaign element and for every additional time the campaign was viewed. The process evaluation revealed that compatibility between organizations and the campaign was a significant facilitator for EWC adoption, and there were relatively few barriers. Barriers were more prominent during implementation than adoption and included time, concerns over campaign strategy and financial resources. Compatibility during adoption was associated with partners' commitment, flexibility and understanding during implementation.

Conclusions: Early collaborative planning is recommended to anticipate and minimize potential barriers such as time and financial resources. Behavior change should be the primary focus of future initiatives. These initiatives should seek to include partners that have high compatibility with the initiative, as this is likely to result in improved implementation and greater engagement of partners.

Keywords: Cross-sector partners, food skills, impact evaluation, parents, process evaluation.

144/3012

COMPARISON OF NUTRITIONAL QUALITY OF SNACKS FOR CHILDREN AND NOT FOR CHILDREN

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Background and objectives: The aim of this study is to compare the nutritional quality of a snack individually packed with marketing techniques packaging for children, with those snacks whose packaging are not intended for children, at a supermarket chain in the city of Montevideo during 2014.

Methods: The universe was composed of the snacks available in the supermarket, that meet the Health Ministry of Uruguay (MSP) directives. The criteria for assessing advertising and promotion on the snacks packaging followed the ones of the INFORMAS project. Snacks were classified according to whether or not the snack packaging was intended to children (PITC) or not (PNITC). The criteria to assess nutritional content of snacks was the MSP one.

Results: The nutritional quality was classified as: do not meet the criteria of MSP, partially met (only for one serving size) or fully met; 13.3% of the snacks partially satisfied and 12.3% fully meet these criteria. Statistical analysis showed that PITC selected by packaging marketing techniques , have no nutritional quality difference with those not intended for children and both groups have the same nutritional quality (p = 0.201). Significant differences were found assessing food groups (cookies, alfajores, milk desserts and yogurt, cereal bars) by nutrient composition.

The PITC alfajores have lower caloric intake, lower fat content, and lower sodium intake.

In the case of cookies, PNITC have a higher caloric intake, total fat, saturated fat, and trans fat ,than PITC.

In the group of dairy yogurts and milk desserts, PNITC have lower intake of sodium, total fats, saturated fats compared to PITC.

Cereal bars intended for children have a greater contribution of calories and total fats than those that are not.

Conclusions: The nutritional quality of snacks aimed to children and those who are not, is the same. In the analysis by food groups there are differences that may be showing a tendency to improve the nutritional quality of food PITC in relation to the PNITC

Keywords: nutritional quality, children, food packaging, childhood obesity

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144/3570

EXPOSURE TO ADVERTISING AND FOOD INTAKE OF SCHOOL-AGE CHILDREN IN ARGENTINE PROVINCES

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Background and objectives: In a context of a worldwide growing concern about the advertising of food for kids it was proposed to study in school kids in Argentina the relationship between exposure to television, the remembrance of advertisements, the meaning, purchase intentions and consumption of ultra-processed products (UP) and non-processed o slightly processed products (NP).

Methods: Observational study in a non-probabilistic sample of 8 to 12 year old school kids and their parents from primary education schools from 6 Argentine districts. Structured questionnaires were applied to kids and parents. Additionally the school environment was observed and the faculty and personnel interviewed.

Results: 1261 school kids and 778 parents from 20 schools were evaluated. 48,4% of the school kids (n=610) watch television at least 30 hours per week. 69,9% remembered UP food advertising spots and 19,8% NP food advertising spots, similar ratios were identified for billboards, internet and promotions. Regarding credibility, 20% of the school kids and 35% of the parents expressed that advertisements either don´t lie or lie just a little.

The number of UP purchase requests from the kids to the parents showed a significant correlation with the amount of hours exposed to television, standing out a rho= 0.19 (p < 000).

An association between higher consumption of some processed foods and UP (solids and beverages) with higher exposure to TV (p=-0,03; p=-0,002), internet (p=-0,004; p=-0,004), billboards (p=-0,019; p=-0,01), and promotions (p=-0,006; p=-0,003) was found.

Conclusions: The frequency of exposure of school kids to advertisement is significantly related with their remembrance and purchase requests to their parents of all kinds of food, especially processed and UP. An association of higher consumption of some processed and ultra-processed foods with TV exposure has been detected. The evidenced influence of UP food advertising on children shows the need to adopt legislation to regulate it.

Keywords: Feeding Behavior, Food Publicity, Child Nutrition

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THERE IS LOW-HANGING FRUIT UP THERE: URBAN ACCESSIBILITY OF STREET MARKETS IN SANTIAGO, CHILE

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Background and objectives: To analyse how much of the urban grid is covered by street markets in each of the municipalities of Santiago, Chile, considering a 600 m threshold (roughly equivalent to a 10-minute walk).

Methods: All street markets of Santiago were mapped and geo-referenced. Then, an accessibility analysis of street markets within the urban grid was performed, including a socio-economic analysis of households living in the city.

Results: Street markets cover 52% of the city´s urban grid. It is also indicates that this percentage varies depending on people's in-

come, for However, while only 28.6% of the ABC1, the wealthiest group that represents nearly 15% of the population, have a street market within the 600 m radius, nearly 70% of all households belonging to the D and E groups, representing 35% and 20% of inhabitants of Santiago, can access a street market within the same distance.

Conclusions: The paper argues that Chile`s nutritional policies should incorporate street markets as key players in the fight against obesity and sedentary lifestyles. Conclusion: Street markers should be included as part of a national strategy to tackle the obesity problem.

Keywords: street markets, nutritional policies, lifestyles, people's income.

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PROFILE OF THE USERS OUTDOOR GYMS IN SANTIAGO DE CHILE

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Background and objectives: To put together a registry of the location of all existing outdoor gyms (OGs) in Santiago, 2 Chile, and establish a profile of the users of these gyms.

Methods: All OGs in Santiago located in public spaces were identified and geo-referenced, and 4 an accessibility analysis of them was carried out. A total of 1023 users of OGs were surveyed 5 (71% men, average age 31.5 years old, SD =16.6), about the frequency of use of OGs, amount of 6 time spent using them, transportation habits, motivation for usage, and their perceptions 7 regarding their own health, among other questions. In addition, each person's neck circumference 8 was measured.

Results: There are a total of 1981 OGs in the city squares, sidewalks and parks, mostly located in 10poorest areas of the city. Most OG users live less than one kilometer away from an OG.In line with international studies, this research demonstrates that OGs have positive 12collateral effects, as they not only contribute to an increment in the physical activity made by 13their users, but also because they attract people with sedentary lifestyles to make physical 14activity. This, in turn, might contribute to make urban areas more livable and safer, for they bring 15new "eyes to the street" and permit to use under-occupied public space of cities

Conclusions: The proliferation of outdoor gyms should be regarded as an opportunity for public health policies aimed at tackling the obesity problem and increasing the physical activity of 18people.

Keywords: outdoor gyms, public health policies

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BODY SHAPE QUESTIONNAIRE: APPLICATION IN BRAZILIAN AND PORTUGUESE WOMEN AND MEN

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Background and objectives: Body Shape Questionnaire (BSQ) was developed to assess the women's body shape concerns, which are different from those of men. Some studies have used the BSQ in women and men and the results in male samples show that men do not care about the issues related to body shape concern. The aim of this study was to assess the correlation of the BSQ with other instruments specific for women and men, and to discuss the theoretical approximation of scales.

Methods: A total of 2,484 Brazilian and Portuguese college students completed the BSQ. The Weight Concerns Scale (WCS) and the Male Body Dissatisfaction Scale (MBDS) also were completed by women (n=1,613) and men (n=871), respectively. Individuals' nutritional status was estimated by Body Mass Index (BMI) using the weight and height self-reported. The psychometric properties of all scales were assessed by confirmatory factor analysis. The scales' internal consistence was assessed by Cronbach's alpha coefficient (α). Structural equation modeling was used to assess the correlation of BSQ with WCS and MBDS.

Results: Among students, 64.9% were women and the average age was 21.0 (standard deviation=2.8) years old. 5.5% of the students were classified in underweight (men=2.8%, women=7.0%), 74.5% eutrophic (men=69.9%, women=77.0%), 16.2% overweight (men=21.9%, women=13.1%), and 3.8% in obesity (men=5.4%, women=2.9%). The BSQ and the WCS showed good fit to sample. The MBDS did not show good fit and was refined. Internal consistence was adequate for all scales (α=.73-.97). There was a significant and strong correlation between BSQ and WCS (r=.981, p<.001) and low correlation between BSQ and MBDS (r=.417, p<.001).

Conclusions: The BSQ presented strong correlation with the WCS showing that BSQ's items are more specific to assess the body concerns of female population. (Grant#2014/03093-2; FAPESP).

Keywords: Body shape concerns, men, women

Track 4: Nutrition and Management of Diseases

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NUTRITIONAL STATUS OF HIV SEROPOSITIVE VOLUNTEERS IN OYO STATE NIGERIA

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Background and objectives: Human Immunodeficiency Virus (HIV) infection is a global epidemic with long-term impact on nutrition and life expectancy of HIV-seropositive subjects. Nigeria has the second largest HIV epidemic globally and accounts for 180,000 deaths from HIV-related illness in 2015. Intervention strategies adopted to address the burden of HIV infection are mostly ART provision-based with less attention on the nutritional wellbeing of HIV-seropositive subjects. In this study, we evaluated the nutritional status of HIV-seropositive volunteers in Oyo State, Nigeria.

Methods: 200 HIV seropositive volunteers attending community-based support groups (CSGs) in two cities (Ibadan and Ogbomosho) of Oyo state, Nigeria participated in the study after duly informed consent. Information on socio-demographic status was assessed using interviewer-administered; semi-structured questionnaire, weight and height were evaluated using a standardised weighing scale and stadiometer to the nearest 0.1kg and 0.1cm respectively and body mass index (BMI) was categorised using WHO cut-off points. While 24hour recall of all food and drinks preceding the interview were queried and assessed using the adapted total dietary assessment (TDA) software, descriptive statistics and independent sample t-test was carried out at p<0.05.

Results: Most volunteers (55.0%) were from HIV-CSG in Ibadan, 16% were males, 50% were symptomatic and mean age was 38.1±9.7years. Also, 21% and 3.5% of volunteers were underweight and obese respectively. In addition, significantly lower (t=2.6, p=0.014) mean daily protein intake was observed among females (56.6±31.2g) compared to male volunteers (78.1±44.9g). While, mean BMI of symptomatic volunteers (20.6±3.6kg/m2) was significantly lower (t=4.5, p=0.000) compared with asymptomatic subjects (23.0±4.1 kg/m2), mean daily energy intake was insignificantly different (t=0.3, p=0.801) among symptomatic (2188.4±1114.1kcal) and asymptomatic (2228.3±1120.1kcal) volunteers.

Conclusions: Voluntary participation of HIV seropositive males in CBGs is low, under-nutrition is prevalent among HIV-seropositive subjects. Intervention strategies targeting the management of the HIV infections should be nutritionally inclusive to minimise the impact of the infection.

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SERUM ALBUMIN LEVELS AND ALL-CAUSE MORTALITY IN PREVALENT PERITONEAL DIALYSIS PATIENTS

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Background and objectives: There are few studies to examine the long-term effect of serum albumin levels on mortality in prevalent peritoneal dialysis (PD) patients. We investigated the association of serum albumin levels with mortality over a 5-year period.

Methods: This study included 302 patients who received maintenance PD in a hospital-facilitated PD center. Five-year medical records (2011–2015) were retrospectively reviewed, and the cut-off level for serum albumin level was set at 3.5 g/dL. To examine the association between serum albumin levels and mortality, we used time-averaged albumin level and serum albumin reach rate to 3.5 g/dL in the first 2 years (2011–2012) as the predictor variables and all-cause mortality in the subsequent 3 years (2013–2015) as outcome variables. Univariate and multivariate Cox proportional hazard regression models were used to examine the hazard function of the all-cause mortality of the study participants.

Results: Although the patients with 75–<100%, 50–<75%, and 1–<50% albumin reach rates exhibited non-significantly increased risk for all-cause mortality, patients with 0% albumin reach rate exhibited significantly increased risk for all-cause mortality (HR 7.59, 95% CI 2.38–24.21) by fully-adjusted analysis. A similar trend for all-cause mortality was demonstrated in patients with time-averaged albumin levels <3.5 g/dL (HR 15.49, 95% CI 1.74–137.72) exhibiting increased risk for all-cause mortality when compared to patients with serum albumin level ≥4.0 g/dL.

Conclusions: This long-term study demonstrated that higher reach rates of serum albumin levels and higher time-averaged serum albumin levels are associated with a lower mortality rate in patients undergoing maintenance PD.

Keywords: albumin, mortality, peritoneal dialysis

EFFECTIVENESS OF A DIETOTHERAPEUTIC IN-TERVENTION ON THE LIPIDS PROFILE AND THE NUTRITIONAL STATUS IN BREAST CANCER WOMEN

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Background and objectives: Women with Breast cancer (BC) present metabolic changes during cancer treatment as weight gain and abnormal serum lipids profile, which increase the risk of cancer recurrence and mortality. The aim of this study was to evaluate the effectiveness of a diet therapy intervention on serum lipid profile and nutritional status in BC woman.

Methods: This is a randomized experimental design. Were recruited 11 woman between 35 and 65 years with BC, randomized in intervention group (n=6) or control group (n=5). Subjects in the intervention group received a personalized diet therapy based on semi-vegetarian diet, adjusted to energy requirement. Control group received one session of nutritional counseling. Anthropometric measurements (weight, height, waist circumference, and body fat percentage) were performed, the serum lipid profile (TC, LDL, HDL and TAG) was measured and dietary surveys were applied (24-hour records and modified frequency survey consumption) to assess the diet of the participants. The statistical significance of the data was assessed by student's t test for unpaired data and two-way analysis of variance (ANOVA).

Results: The mean age was 52.1 ± 3.3 years, 54.5% of participants were overweight, 72.7% exceeded the limit of waist circumference and 54.5% excess body fat percentage, 34.6% had high levels of TC, TAG 45.5% and 18.2% LDL. No significant differences were found between pre- and post-intervention groups on nutritional status and lipid profile. The intervention group significantly increased consumption of vegetables (ANOVA 0.031) and fruit (ANOVA 0.043) and decreased consumption of cereals (ANOVA 0.001). A intervention effect was found on the distribution of protein (P%), lipids (L%) and carbohydrates (CHO%).

Conclusions: A diet therapy intervention can improve diet profile in BC women , however more studies are needed to see the effect it can have on the serum lipid profile and nutritional status.

Keywords: Breast cancer, triglycerides, total cholesterol, body fat, diet

DIETARY SUFFICIENCY IN MINERAL CONTRI-BUTION FROM AFRICAN YAM BEANS (SPHENO-STYLIS STENOCARPA) AND SOYA BEANS (GLY-CIN SP) SP) CONSUMED IN SOUTHERN NIGERIA

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Background and objectives: Our ancestors' foods are lacking in modern diets and human biology has not evolved significantly different (Broadhurst ,1994). Speculations are , plethora of diet related disorders could be linked to human gastrointestinal track evolutionary factors. Despite efficacy of supplements in treating degenerative diseases, minerals are absorbed more efficiently if supplied in foods rather than as supplements (British Nutrition Foundation 2015). Consequently, data driven promotion of minerals contribution from African yam beans, an indigenous crop that was in our ancestor's food, threaten with extinction (Porter, 1992; Amoatey, 2000) can foster nutrition security. The specific challenge is to generate data on African yam beans (AYB) mineral contribution in the dietary vis-a-vis the nutritionally dense soya beans.

Methods: About 3g of each were oven dried at 110O C, reduced to < 2µm diameter by crushing , pulverised because of inhomogeneity of samples and transferred to the sample compartment of an X-Ray Fluorescence (XRF) Spectro Xepos model 03STD Gas serial Spectro-11001700. Then, screened for their elemental composition.

Results: Fifty one (51) elements were quantified in each sample. Twenty five (25) in their free- state and 26 existed as oxides. These oxides, 16 were minerals and others in free state, 7 minerals. Therefore, 23 minerals from AYB. Soya beans had same complement of predominant elements ($\geq$ 100ppm), both contained all known essential minerals. Elements in trace amount($\leq$20ppm) for soya beans were at micro-levels ($\leq$100ppm) in AYB. Silicon, was significantly high in AYB to about (189.4ppm). Corollary, the naturally highly reactive chlorine and barium, detected in their free states. Sodium was not detected.

Conclusions: X-Ray Fluorescence Spectrometry analytical method gave a total profiling of all elements present in samples, thus total mineral composition of AYB as a legumes that can indeed be resource-efficient in mineral contribution to the diet and highly economical food source of minerals.

Keywords: Nutrition, Minerals profiling, Sphenostylis stenocarpa,Glycin sp

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DIETARY PATTERN AND DIETARY INTAKE AMONG CHINESE ADULTS WITH DIFFERENT SELF-AWARENESS AND MANAGEMENT STATUS OF HYPERTENSION -A CROSS-SECTIONAL STUDY IN SEVEN CITIES OF CHINA

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Background and objectives: Hypertension is one of the key risk factors for cardiovascular disease. The prevalence of hypertension in Chinese adult population was reported as high as around 30% and characterized by a low self-awareness rate. This study was conducted 1) to estimate the awareness rate and control rate of hypertension in Chinese adults, and 2) to explore the dietary pattern and intakes in participants with different awareness and management status of hypertension.

Methods: A multi-center study was conducted in seven cities of China. A total of 1704 adults aged 18-80 years were recruited. A three discrete times of 24h dietary records were used to obtain the data of dietary intake. Food Frequency questionnaire was used to obtain intake frequencies of 17 food categories in past one month and analyzed for the food pattern with Principal Component Analysis.

Results: A total of 26.1% of participants were showed an abnormal blood pressure (BP), however, only 12.7% of them had self-awareness. The control rate of hypertension was 40.5%. According to the self –awareness and management status of hypertension, we divided the participants to four groups which were healthy group, ignorant group, bad-controlled group, and well-controlled group. Overall, 87.6% of participants salt intake higher than 6g/d. The ignorant group had a significant higher salt intake(10.1±5.4 g/d), comparing with well-controlled group(8.9±4.1g/d), healthy group (9.4±4.6g/d) and the bad-controlled group(9.6±4.3g/d). For the nutrients intake, the well-controlled group had a lowest sodium intake, the median(25th,75 th) was 3665.4(2643.9,5019.1)mg/d, while sodium intake in bad-controlled group and ignorant group were 4093.8(2697.4,5200.7) mg/d and 4015.6(2892.2,5481.7.7) mg/d respectively. A significant higher intake of energy and carbohydrate were also found in ignorant group. There were no significant associations between dietary pattern's factor loading and self-awareness and management of hypertension. However, pickles had a significant higher intake frequencies in ignorant group (P=0.018).

Conclusions: The self-awareness of hypertension associated with dietary behaviors and might result in a different health outcome. A comprehensive dietary strategy should be conducted in Chinese population. To reduce sodium intake not only the salt intake should be emphasized to the public in China.

Keywords: Hypertension, Self-Awareness, Dietary intake, Dietary pattern

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PROMOTION OF HEALTHY EATING AND EXERCISES AT A WORKPLACE – TANZANIAN EXPERIENCE

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Background and objectives: Overnutrition is a growing problem in countries including Tanzania along with the existing undernutrition problem. The Tanzania Steps Survey in 2012 reported that 26% of adults over 25 were overweight and 8% obese. From 2005 to 2015 over nutrition increased among both rural and urban women aged 15-49(Demographic health survey). Workplaces are proven to be ideal settings for health promotion and disease prevention. A 3 month health promotion program intended to prevent and manage overweight and obesity was initiated at a food aid organization, in collaboration with the management.

Methods: The program, the first of its kind in Tanzania, was targeted at all 60 staff based in the head office in Dar es Salaam. Activities included orientation and advocacy workshops, baseline health assessment (anthropometry, fasting blood sugar, blood pressures measurements, and an interview to determine knowledge, attitude, and practices about weight, fruit and vegetable consumption, diet, and exercise. Individual counselling, education seminars, exercise sessions, and pop up health messages continued for 8 weeks. The menu at the staff canteen was changed. Evaluations, including a structured questionnaire for participants, examined the feasibility and sustainability of the interventions

Results: Of 55 staff assessed at baseline, 60% were obese or overweight; 2/3 hypertensive (diagnosed or undiagnosed). Few women engaged in regular exercise. Almost 60% reported consuming fruits and vegetables 4-7 times per week, and few reported 5 a day. Many had been or were on fad or crash diets. Workload and lack of time appeared to affect food consumption and exercise patterns.

By the end of 3 months, the participants were more conscious of their weight, healthy eating, and regular exercise. But, the impact on their BMIs was insignificant.

Conclusions: Extensive and varied interventions over 3 months sensitized the staff to healthy eating and the benefits of exercise, which they practiced. They understood the health risks of overnutrition, although their BMIs did not change much. A longer term program (atleast 9 months) is necessary.

Keywords: Workplace, Overnutrition, Interventions, Healthyeating, Exercises

Further collaborators:

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Other Work Places

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HIGH INTAKE OF SOY, FUNGUS AND VEGETABLES IN DIABETICS WITH RS37563 C ALLELE AND RS1801131 TT GENOTYPE REDUCE THE RISK OF CARDIOVASCULAR COMPLICATIONS: A CASE-CONTROL STUDY

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Background and objectives: Few study with large sample size has assess effects of dietary patterns, susceptibility genes and their interactions on the risk of cardiovascular complications among diabetic patients. This study aimed to examine the effects of dietary patterns, susceptibility genes, and their interactions on the risk of cardiovascular complications with diabetes.

Methods: We used a case-control design and diabetics were recruited in hospital. Cases were diabetics with new onset cardiovascular events including non-lethal myocardial infraction and stroke, and controls were diabetics. 20 polymorphisms within 11 candidate genes were measured. Dietary intake was assessed by a food frequency questionnaire through face-to-face interview. Factor analyses and dietary scoring methods were used to establish dietary patterns and dietary scores. Logistic regression analyses were used to analyze the effects of dietary patterns, polymorphisms, or their interaction on the risk of cardiovascular complications among diabetics.

Results: A total of 1005 participants included in the final analysis (543 cases, 461 controls). No significant results were observed for the distribution of 20 polymorphisms among cases and controls, and no polymorphism was significantly associated with the risk of the study disease. Dietary pattern typified by the consumption of soybeans and fungus (soybean and fungus pattern) and another pattern typified by the consumption of vegetables (vegetables pattern) were associated with a 38% (95%CI: 9%, 58%) and a 54% (95%CI: 32%, 69%) decrease risk of cardiovascular complications respectively. Dietary index of HEI2005 can also decrease risk of 35% (95%CI: 7%, 55%) at maximum. Analyses of interactions showed that, ADOIPOQ gene rs37563 polymorphism and soybean and fungus pattern had an interaction effect (P interaction = 0.007), and the inversely linear trend were among patients with C allele (GC + CC) (P trend = 0.013); MTHFR gene rs1801131 polymorphism and the vegetables pattern had an borderline interaction effect (P interaction = 0.053), and the strong inversely linear trend were found among patients with wild type TT (P trend <0.001).

Conclusions: Diabetics consumed more soybeans, fungus, vegetables, and a balanced diet are recommended to reduce risk of cardiovascular complications, and these effects were more effective among patients with rs37563 C allele and rs1801131 TT genotype.

Keywords: cardiovascular complications with diabetes; dietary patterns; susceptibility genes; interactions

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UREMIC TOXINS: IS THERE ANY RELATIONSHIP WITH PERSONAL, CLINICAL, OR NUTRITIONAL FACTORS?

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Background and objectives: Chronic renal patients may have high concentrations of uremic toxins, which when bound to protein become difficult to remove on dialysis. Some of these toxins originate from dietary protein and may have harmful effects, especially related to the cardiovascular system. The present study had as objective to evaluate the concentrations of two uremic toxins and to relate their values with personal, clinical and nutritional variables.

Methods: This study was performed with 39 patients older than 18 years on hemodialysis for at least 5 months. Personal and clinical data, such as: age, time of dialysis and biochemical tests (Kt/V, urea, creatinine and albumin) were obtained through interviews and medical records. The food consumption was assessed through a 3-day food diary and the nutritional status was investigated by the 7-point Global Subjective Assessment and the Body Mass Index (BMI). For the measurement of the uremic toxins p-cresyl sulfate (PCS) and indoxyl sulfate (IS) blood samples were collected, which were prepared and dosed by high performance liquid chromatography (HPLC). The data statistical analysis consisted of verifying the mean and standard deviation values and the application of the Spearman Correlation Coefficient. The level of significance was 5% (p <0.05).

Results: The mean and standard deviation of serum IS and PCS concentrations were 147.5 ± 71.6 μM and 279.9 ± 161.1 μM, respectively. There was an association between serum IS and creatinine (r = 0.49, p <0.01), but this was not observed with PCS concentrations. There was no correlation between the serum concentrations of IS and pCs with the values of protein intake, as well as with the other personal, clinical and nutritional variables.

Conclusions: Although admittedly derived from the metabolism of consumed proteins, uremic toxins showed no correlation with dietary intake and nutritional status of patients. It is believed that studies with a larger sample are necessary to investigate the effects of clinical and nutritional status, as well as food consumption in the production and, consequently, the concentrations of these toxins.

Keywords: uremic toxins, hemodialysis, nutritional assessment, chronic kidney disease.

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SENSORY PROPERTIES AND GLYCAEMIC EFFECT OF A FORMULATED 'ACHA' BASED BISCUIT IMPROVED WITH RED KIDNEY BEAN AND UNRIPE PLANTAIN

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Background and objectives: Diabetes mellitus (DM) is on the increase yearly. The increase in younger age group diagnosed with diabetes poses an economic threat over and above more direct disease cost to the public. The study evaluated the sensory properties and glycaemic effect of a formulated 'acha' based biscuit improved with red kidney bean and unripe plantain.

Methods: 'Acha' (Digitaria exilis), unripe plantain (Musa paradisiaca) and red kidney (Phaseolus vulgaris) bean flours were produced and blended in the ratio of 70:10:20 and 70:15:15 to obtain composite flour, 100% 'acha'were also produced. The blends were labelled thus, 100% 'acha' (AB1), 70% 'acha', 10% unripe plantain and 20% red kidney bean (AB2) and 70% 'acha', 15% unripe plantain and 15% red kidney bean (AB3), 100% wheat flour (WB) served as control. These composite flour blends were used with baking ingredients to produce biscuits. The biscuits were fed to normoglycemic adult human beings aged (20-25 years) to determine their effect on post prandial blood glucose. Glycemic control was carried using ACCU –CHEK, glucometer. Statistical Product for Service Solution (SPSS) version 20 was used to analyze for descriptive statistics (the mean, standard deviation) and the analysis of variance (ANOVA) was used to separate the means of the biscuits

Results: All the formulated products had good rating; however, the biscuit produced from 100% wheat (WB) and ratio of 70:15:15% acha, unripe plantain and red kidney bean (AB2) had the best scores. The glycemic indices (GI) were found to be 55.11%, 41.60% and 49.31% for AB1, AB2 and AB3 respectively

Conclusions: The values recorded scored well for low glycemic index which invariably posits that the biscuit would be a good diabetic snack.

Keywords: Diabetic, Snacks, glyceamic index, Sensory, Acha

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QUINOA CONSUMPTION REDUCES SERUM TRIGLYCERIDES IN OVERWEIGHT AND OBESE PEOPLE

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Background and objectives: Quinoa (Chenopodium quinoa) is a pseudocereal originally cultivated in the Andean region. The popularity of its seeds has increased in recent years due to the claims of health benefits and superfood qualities. Studies to date on health benefits of quinoa have been mostly restricted to animal models, with few human studies providing weak to moderate evidence to support improved lipid profiles. Clinical trials in humans to examine the claims of health benefits of quinoa in overweight and obese are lacking. The aim of this randomized clinical trial was to investigate the effect of quinoa consumption on body composition and serum lipid profile in overweight and obese humans

Methods: A total of 57 subjects with a body mass index of 25 or greater completed the 12-week intervention trial. Participants were randomly allocated to one of three different treatment groups: 0 (control), 25 or 50 g quinoa seeds per day. Measurements made at 0, 6 and 12 weeks ncluded body composition by Dual Energy X-ray Absorptiometry, serum concentration of total cholesterol, LDL, HDL and total triglycerides by enzymatic methods and nutrient intake (3-day food diary). At 0 and 12 weeks physical activity was monitored for 3 days by tri-axial accelerometry (ActiGraph wGT3X).

Results: Body composition, total cholesterol, LDL, HDL, nutrient intake, and activity were not significantly altered by quinoa consumption (P>0.05). Serum triglyceride concentration was reduced significantly in the 50 g quinoa group from 1.36 mmol /L to 0.83 mmol/L at 12 weeks (P<0.05). No significant changes in triglyceride levels were observed in the control and 25 g quinoa groups

Conclusions: Consumption of 50 g / d of quinoa consumption lowers serum triglyceride levels in overweight and obese subjects.

Keywords: Quinoa seeds, randomized controlled clinical trial, dose response, triglycerides

WHOLE MILK INCREASED HDL CHOLESTEROL COMPARED TO SKIMMED MILK WITHOUT ADVERSELY AFFECTING OTHER LIPIDS, GLUCOSE, AND INSULIN IN A 2X3 WEEK CROSSOVER STUDY

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Background and objectives: Dietary guidelines have for decades recommended to cut down on high-fat dairy products such as whole milk due to the high content of saturated fat which is known to increase LDL cholesterol concentrations in the blood. However, meta-analyses of prospective cohort studies have found no association between saturated fat or dairy intake and risk of cardiovascular disease (CVD) and even point to an inverse association with type 2 diabetes (T2D). Whole milk and skimmed milk contain almost the same food matrix except from the fat content (3.5 vs 0.1%). Therefore, it was possible to compare high-fat with low-fat milk and study the effect of milk fat on risk of CVD and T2D.

Methods: In a randomized, controlled, 2x3 week crossover intervention study we compared the effect of intake of 0.5 L of whole milk with skimmed milk on blood lipids, glucose, and insulin. Besides drinking milk the 17 men and women consumed their habitual diet.

Results: Subjects were 65 % women with a mean age of 25.7 y and a body mass index (in kg/m2) of 21.8. Whole milk increased HDL cholesterol significantly (P < 0.05) compared to skimmed milk. We found no significant differences between whole milk and skimmed milk in effect on total and LDL cholesterol, TAG, glucose and insulin. There was a tendency (P = 0.06) for total cholesterol to be higher with whole milk compared to skimmed milk.

Conclusions: Intake of 0.5 L/d of whole milk did not adversely affect risk markers of CVD and T2D compared to skimmed milk. Moreover, intake of whole milk increased HDL cholesterol concentration compared to skimmed milk. These findings suggest that it might be reasonable to include whole milk as part of a healthy diet.

Keywords: Dairy, milk, CVD, cholesterol, healthy adults

VITAMIN D DEFICIENCY IS ASSOCIATED WITH HIGH BLOOD PRESSURE IN 24-H AMBULATORY BLOOD PRESSURE MONITORING IN PATIENTS WITH TYPE 2 DIABETES

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Background and objectives: Plasma vitamin D measurements are negatively correlated with BMI and blood pressure (BP) in general population (1,2). Since most patients with type 2 diabetes (DM2) are obese and hypertensive, it is relevant to identify vitamin D status in this population. The aim of this study was to evaluate factors associated with vitamin D deficiency [25(OH)D<20 ng/ml] in patients with DM2 and hypertension.

Methods: In this cross-sectional study BP was assessed by office measurements (Omron HEM-705CP) and 24h ambulatory blood pressure monitoring (ABPM) - Spacelabs®. Physical activity was evaluated by steps count (pedometer – Yamax Digi-Walker). Clinical, nutritional, and laboratory parameters were evaluated by a standardized protocol. Body composition was determined by DXA-Lunar®. Exclusion criteria were: use of vitamin supplements, serum creatinine >2.0 mg/dl, BMI >40 kg/m , gastrointestinal diseases associated with malabsorption.

Results: A total of 116 patients (age 65±8.9 years; 43% males; BMI 30.3±4.1 kg/m², diabetes duration 12.3±8.3 years; HbA1c 7.6±1.4%) were included. Mean 25(OH)D was 20.1±9.1 ng/ml and 43% of patients were considered as deficients. Office systolic and diastolic BP were 150.7±20.9 and 83.5±11.0 mmHg, respectively. At ABPM, patients with hypovitaminosis D had higher systolic BP in 24h (135.7±10.2 vs 130.2±13.3 mmHg; P=0.016) and during daytime (138.1±11.3 vs 132.8±13.4 mmHg; P=0.026) than sufficient patients. Patients with vitamin D deficiency had also lower steps count [4350.0 (2647.8-6598.0) vs 6390.6 (4706.9-8081.1) steps/day] and urinary calcium [47.0 (32.0-141.2) vs 89.5 (67.7-152.5) mEq/24h) than sufficient patients. Regarding to dietary intake, patients with hypovitaminosis D consumed less milk (35.6 vs 64.4%; p =0.009) and less fish (31.2 vs 68.8%; p<0.001) than non-deficient patients. In multivariate logistic regression, steps count <5600 steps/day (OR=2.9, CI95% 1.1-7.6) and no milk (OR=3.9 IC95% 1.3–11.9) and no fish consumption (OR=3.4 IC95% 1.4–10.8), remained associated to vitamin D deficiency; fat mass was not associated with vitamin D deficiency.

Conclusions: Hypovitaminosis D is highly prevalent in patients with type 2 diabetes and hypertension. In this group of patients, vitamin D deficiency was associated with higher BP levels in 24h and daytime ABPM. In addition, less physical activity, milk and fish intakes were also associated with vitamin D deficiency.

Keywords: Hypertension, hypovitaminosis D, diabetes

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EFFECT OF PRE, CO AND POST LOAD OF DRIED STRIPPED RADISH WITH A RICE ON POSTPRANDIAL GLYCEMIA IN HEALTHY FEMALE SUDENTS

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Background and objectives: Fibre contribute glycaemic response. The present study aimed to compare the effect of Dried Stripped Radish (DSR) , when consumed before /co /after a rice, on postprandial blood glucose in healthy students.

Methods: Ten subjects were served the total 50g carbohydrate of the white rice alone, or together with 15g DSR. In experiment 1 (control meal), white rice (carbohydrate 50g) was provided. In experiment 2 (test meals), three 15g DSR with white rice (total carbohydrate 50g) were provided. Three studies were conducted, 1)15min before 2) together with, and 3) 15min after a white rice consumption, three 15g DSR were provided to the subjects. This was a randomized, cross over design study where subjects consumed test meals on separate occasion, followed by the measuring blood glucose (fasting (0) , 15, 30, 60 ,45, 60, 90 and 120 min). The area under the curves for glucose (GAUC) were calculated. Comparisons of blood glucose, GAUC among meals were analyzed based on paired t-test.

Results: 1) Compared with the rice only (control), the blood glucose of DSR before 15min was significantly high at 0min ,15min (both P< 0.05) and then it was low 45 min, 60min (both p<0.01). Compared with control, the blood glucose of DSR together with was significantly low 45 min, 60min (both p<0.01).   2) 15g DSR before 15min / together with had significantly lowered the GAUC values, compared to control (p<0.001, P<0.05, respectively). 3) There are no differences in GAUC among 3 DSR diets with different eating order of rice and DSR.

Conclusions: The loading of DSR, 15min before and together with a rice, lowers postprandial blood glucose concentrations, probably by slowing gastric emptying and intestinal absorption .

Keywords: postprandial blood glucose; rice ; dried stripped raddish ; preload

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RELATIONSHIP BETWEEN THE AGE OF INTRODUCTION OF THE EGG IN THE DIET AND THE DIAGNOSIS OF IGE MEDIATED EGG ALLERGY

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Background and objectives: Background: The prevalence of food allergy has increased, which represents a public health problem. Although egg allergy itself can be overcome, these children are at increased risk of other atopic diseases. The Dietary Guidelines for long recommended delaying the introduction of potential food allergens to prevent food allergies without real evidence. This study examined this issue with a focus on egg allergy, one of the most common IgE mediated food allergies.

Objectives: To analyze the relationship between age at first egg intake and the onset of IgE mediated egg allergy. To describe the presence of risk factors associated. To describe the profile of the patient with egg allergy.

Methods: Retrospective observational analytical study of cases and controls

Results: 116 patients allergic and no allergic to eggs were found in which no relationship between age at first egg intake (mean: cases 9,2 months, controls 9,8 months, median 9 month) and the onset of IgE mediated egg allergy (EA) was found. EA patients presented with a male predominance with positive personal history of atopy, normal weight and size, the average duration of breastfeeding of 10.5 months, mean introduction of solids to 5.7 months and respiratory symptoms predominantly. Similar characteristics are found in the control group. Age of diagnosis of EA: 41 months. Associated risk factors: Nutritional Status: Cases: Malnutrition 10.3% Risk of malnutrition. 22.4% Overweight 8.6% and Controls Malnutrition11.3%. Risk of Malnutrition 10.3 and Overweight: 11.3%, (p = ns). Ig E total 83% (Cases) and Control 48% (p = 0.0001). Symptoms in cases: Skin 60%, respiratory 70% and digestive 33% (p <0.04). Allergy to cow's milk protein: 72% (p <0.0001). Other food allergies 32%. (P <0.04)

Conclusions: There is no difference in the age of introduction of the egg and the occurrence of IgE mediated egg allergy .This lack of apparent relationship would support the new dietary guidelines where it is recommended not to delay the introduction of egg into the diet. There were found as factors associated with the egg allergy: allergy to other food allergens, digestive symptoms and the presence of elevated total IgE.

Keywords: Egg allergy
Further collaborators:
Prof Figueredo, Dr. M Bozzola

EFFECTS OF AVENA NUDA L. ON CHINESE PATIENTS WITH HYPERTENSION ASSOCIATED WITH TYPE 2 DIABETES MELLITUS: SECONDARY ANALYSIS OF A RANDOMIZED CLINICAL TRIAL

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Background and objectives: While China-original naked oat with whole germ (NOG, Avena nuda L.) is an excellent choice of whole grain for its higher soluble dietary fiber (beta-glucan), unsaturated fatty acid and lower slowly digestible starch than common oat (Avena sativa L.), there is limited information about the effect of NOG intake with structured dietary intervention on patients with hypertension associated with type 2 DM.

Methods: In a randomized, single-blinded, 28-day centralized trial in China, a total of 73 participants meeting the WHO/ISH hypertension guidelines (1999) diagnostic criteria were selected from 445 patients meeting the ADA standards of medical care in diabetes (2013) diagnostic criteria between 50 and 60 years of age, randomly assigned into one of the 3 groups: diet group (n=24, systematic diet plans and intensive health education), 50g-NOG group (n=25) and 100g NOG group (n=24). The composition of NOG has been determined. Subsequently NOG was daily boiled into porridge as replacement based on diet group. The relative changes in systolic blood pressure (SBP), diastolic blood pressure (DBP), fasting blood glucose (FBG), 2-hour postprandial blood glucose (PBG) measured respectively on day 0, 28 (SBP, DBP) and day 0, 7, 14, 21, 28 (FBP, PBG) were the primary outcomes. Data was analyzed by the SPSS 19.0 software package with descriptive analysis, one-way analysis of variance, and paired t test.

Results: The rate of adherence to a study diet was 100% at day 28. Among 3 groups above, SBP, DBP, FBG and PBG values declined significantly over the intervention period (P<0.05). The changes in SBP are more favorable for both 100g-NOG group and 50g-NOG group than the diet group (P<0.05). The improvements in FBG were better in 100g-NOG group than in diet group (P<0.05). The 100g-NOG group had the most significant reduction of PBG values (P<0.05 for all comparisons among 3 groups).

Conclusions: Comparison between 50-100g/day NOG replacement to structured diet and diet alone suggests that the former intervention (especially at a dose of 100g/day) provided better benefits to patients with hypertension associated with type 2 DM in their disease management and cardiovascular disease risk control.

Keywords: naked oat; structured diet; hypertension; type 2 diabetes mellitus

Further collaborators:
Some issue about the T2DM.

THE CONTROL OF BLOOD GLUCOSE AND COMPLICATIONS AMONG TYPE 2 DIABETES MELLITUS PATIENTS BASED ON THE DYNAMIC CHANGES OF DIETARY INTAKE DURING THE FOLLOW-UP SURVEY PERIOD

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Background and objectives: Centralized intervention can provide a balanced diet on glycemic control among patients with Type 2 diabetes mellitus (T2DM), but most individuals may not follow the recommended diet guidelines in the long run. The real dietary behavior and its outcomes during the follow-up periods are scarce. Therefore, how the dietary behavior changed and what were the outcomes brought during the follow-up survey were reported for the first time in this study.

Methods: One hundred and seventy-five elder participants with T2DM for more than 2 years who previously been randomized to receive centralized intervention were included. We analyzed the association between the blood glucose and each nutrients intake through logistic regression, the effects of dynamic changes of dietary intake had been evaluated based on glycemic control and complication prevalence in three years.

Results: The optimal diet assistant decreasing blood glucose characterized as low fat (<25%), standard-protein (25%), high complex carbohydrate and high fiber (>18 g/1000kcal). The participants adhering to this diet showed a satisfactory outcomes in three years. Compared with the baseline, Hemoglobin A1c (HbA1c), fasting plasma glucose (FPG) and 2h-plasma glucose (2h-PG) decreased from 8.3%, 9.62 mmol/L and 18.28 mmol/L to 7.3%, 7.81 mmol/L, and 11.3mmol/L, respectively. Additionally, they also exhibited a decrease in nephropathy prevalence, and their prevalence of diabetic foot ulcer and neuropathy remained unchanged.

Conclusions: The obviously control of blood glucose, HbA1c as well as the prevalence of complications occurred on those elder participants persisted in the optimal diet. Therefore, this study will provide strategies to guide clinicians with their dietary prescription to control complications and is promising with regard to further exploration of comprehensive diabetes care.

Keywords: Type 2 diabetes mellitus, complication, diet, glycemic control, HbA1c

Further collaborators:
Some issue about the T2DM.

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THE POSITIVE EFFECTS OF NAKED OAT ON GLYCEMIA AND BLOOD LIPID RISK FACTORS FOR CARDIOVASCULAR DISEASE IN PATIENTS WITH TYPE 2 DIABETES AND METABOLIC SYNDROME: ONE YEAR RESULTS OF A RCT

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Background and objectives: Patients with type 2 diabetes and metabolic syndrome are at increased risk for cardiovascular complications. Comprehensive cardiovascular risk reductions are critical for this high-risk population. The aim of this study was to evaluate the effects of long-term naked oat consumption on cardiovascular disease risks in patients with type 2 diabetes and metabolic syndrome.

Methods: 244 participants met type 2 diabetes and metabolic syndrome criteria were selected from a randomized clinical trial who completed the one year dietary program. They were randomly allocated to four groups: control group; diet group; 50g-NOG group and 100g-NOG group. Participants in the control group continued their usual diet. The diet group had structured diets. The participants in the 50g-NOG group received structured dietary intervention and replaced some of the staple foods with 50g NOG. And the 100g-NOG group also received structured dietary intervention while the daily substitute of staple foods was 100g NOG. At baseline and 12 months, physical examinations and blood tests were carried out and food-frequency questionnaires were administered to investigate changes from baseline and compliance with the dietary intervention.

Results: After 1 year intervention, HbA1c, FPG and PG were significantly decreased compared to the control group particularly at 100g-NOG group (-1.0±1.7%, -2.1±3.2mmol/l, and -6.9±5.9mmol/l, respectively, P<0.05). Reductions were also achieved in TG (-0.2±1.1mmol/l to -0.6±1.6mmol/l), TC (-0.2±1.1mmol/l to -0.5±1.2mmol/l), and LDL-c (-0.2±0.8mmol/l to -0.4±0.8mmol/l) in the intervention groups (P<0.05). The groups differed significantly with respect to the percent of patients who reached the treatment goals in glycosylated hemoglobin, cholesterol and triglycerides (P<0.05). Glycemic control was better in patients of 100g-NOG group with 23.8% having HbA1c below 6.5%. And more patients reached lipid goals in the NOG group. 44.4% of patients in the 100g-NOG group had cholesterol below 4.5mmol/l, and 57.1% had triglycerides below 1.7mmol /l. No adverse events were reported throughout the study period.

Conclusions: The results of the present study suggest the beneficial effects of naked oats on cardiovascular disease risk factors, especially on glycemic regulation and lipid metabolism in patients with type 2 diabetes and metabolic syndrome.

Keywords: naked oat; cardiovascular disease; diabetes mellitus, type 2; metabolic syndrome
Further collaborators: Some issue about the T2DM.

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EFFECTS OF MEAL INTERVENTION COMBINED WITH WALKING ON EXERCISE ABILITY AND PHYSIQUE OF MIDDLE - AGED AND OLD PEOPLE

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Background and objectives: To investigate the effects of vigorous walking and diet intervention on exercise capacity and physical fitness of middle-aged and elderly people.
Methods: According to the different physical condition of the middle - aged and old people, the data were divided into 93m / min, 100m / min, 107m / min, 110m / min, 114m / min 5 by comparing their own before and after the test. Blood pressure, heart rate, heart rate, body weight, waist circumference, hip circumference, systolic blood pressure, diastolic blood pressure, heart rate, BMI and other data were collected in the intervention group with the maximum exercise load of 50%.
Results: Compared with the baseline, the 6-min walking distance, cardiac recovery rate, systolic blood pressure, diastolic blood pressure, body weight, hip circumference and BMI of the subjects were significantly improved (P <0.05). Have different degrees of improvement.
Conclusions: Jianbu walking and take the joint dietary intervention in the exercise capacity of the elderly and physical fitness has significant effect, it is recommended to promote.
Keywords: vigorous walking; diet; 6min walking test; blood pressure; heart rate; circumference
Further collaborators:
Some issue about the T2DM.

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THE INTERPLAY BETWEEN MOTHER'S KNOWLEDGE, ATTITUDE AND PRACTICE , BMI AND INFANTS' NUTRITIONAL STATUS IN DELTA STATE, NIGERIA

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Background and objectives: The health and nutritional status of an infant is largely dependent on the mother's knowledge, attitude and practice (KAP) of certain widely researched guidelines such as GOBIFFF and the Essential Nutrition Actions (ENA). This report is from the baseline survey conducted as part of an intervention project aimed at improving the KAP of mothers on

infant nutrition and health care practices through behavior change communication in Delta State, Nigeria. This study seeks to gather evidence for policy advocacy on nutrition behavior change communication as a key strategy to improving infant health and nutrition in Nigeria.

Methods: A baseline assessment as part of formative research was conducted to review the situation and gaps in knowledge, skill or other issues related to infant nutrition and health of mothers in Delta State. A semi-structured questionnaire was used to gather information on demographic characteristics, nutritional status of mother-child pair and KAP of infant nutrition and health care strategies in 6 communities in Delta State. Knowledge, attitude and practice scores were determined by the number of correctly answered questions.

Results: 68.3% of infants in this study population were severely stunted, 15% were wasted, while 28.6% of infants in Delta State were found to be severely underweight. Infants whose mothers were overweight or obese had more tendency to have normal weight-for-age than infants whose mothers were underweight or normal. Results: **Conclusions:** The nutritional status of an infant is strongly linked to the mother's KAP of infant nutrition and health care strategies. Also, the ability of a mother to maintain a healthy BMI does not necessarily result in an infant with a healthy/normal nutritional status. There needs to be more intervention programs in the area of nutrition education at the community level.

Keywords: Infant, Knowledge, Attitude, Practice, Malnutrition

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THE PREVALENCE, AWARENESS, TREATMENT, AND CONTROL OF HYPERTENSION AMONG CHINESE ADULTS IN 2012

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Background and objectives: Unreasonable dietary rich in saturated fatty acid and salts may increase the risk of many chronic diseases.The dietary structure of Chinese population has changed greatly during the recent decades and the problem of related chronic diseases becomes more and more serious. Hypertension is a major risk factor for cardiovascular disease and treatment and control of hypertension reduces risk. The study aims to evaluate the prevalence, awareness, treatment and control of hypertension among China adults.

Methods: Data were extracted from the report of Chinese national nutrition and chronic disease status issued by National Heath and Family Planning Commission of China in 2015, in which the data were calculated based on the National Health and Nutrition Examination Survey 2010-2013.The surveillance included about 200 thousand adults aged 18 and over, which were sampled from 150 surveillance points by Multi-stage cluster random sampling.Hypertension was defined as systolic BP of at least 140mm Hg and diastolic BP of at least 90 mm Hg, self-reported use of antihypertensive medications, or both. Hypertension control was defined as systolic BP values of less than 140 mm Hg and diastolic BP values of less than 90 mm Hg.

Results: The prevalence of hypertension among Chinese adults aged 18 and over was 25.2% in 2012, 26.2% and 24.1% among men and women, respectively; 26.8% and 23.5% among urban and rural adults, respectively, and 10.6%, 35.7%and 58.9% among the groups of 18–44, 45-59, and 60 years old and over, respectively. Among adults with hypertension in 2012, 46.5% were aware of their hypertension, 41.1% were currently taking medication to lower their blood pressure, and 13.8% were controlled hypertension. Compared with 2002, the prevalence of hypertension increased by 6.4%, and the awareness, treatment and control of hypertension increased by 16.3%, 16.4% and 7.7%, respectively.

Conclusions: The prevalence of hypertension among Chinese adults has remained at a high level and has showed a rapid rising trend. Although the rates for awareness, treatment, and control of hypertension have improved markedly, they are still at a low level. These findings suggest that it is necessary to strengthen the health education and comprehensive management of hypertension in China.

Keywords: Hypertension; Prevalence; Awareness; Treatment; Control

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COMPARISON OF TWO APPROACHES OF NUTRITIONAL EDUCATION IN THE MANAGEMENT OF DIABETES

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Background and objectives: introduction: Nutrition education is one of the fundamental axes in the management of diabetes.

Objective: study the impact of two types of nutrition education (personalized and collective) on the glycemic control of diabetics in the province of Kenitra.

Methods: The population was composed of 184 patients (86 men, 98 women) with an average age of (51.7 ± 14.0) and an age range of [20 to 88.5]. Data collection was carried out using a questionnaire containing socio-demographic and anthropometric informations.

Glycemic control was based on fasting glucose (GAJ), postprandial glucose (GPP), and glycated hemoglobin (HbA1c). These analyzes were taken in three separate phases with a duration of 3 months; T0 represents the initial state (before our intervention),

t1 and t2 which represent the values of the three analyzes after our intervention.

Participants were randomized into two groups: a group that received collective nutrition education (n = 105) and another group (n = 79) had a personalized (individual) education.

BMI was the only anthropometric measure used

Results: The whole population is overweight (BMI> 25) for either women or men, also the results of glycemic control are superior to the norms in the three stages (t0, t1 or t2). Nutrition education Personalized shows statistically significant differences in the variables studied as a function of time more than those studied in collective nutrition education (p = 0.00 <0.05). Also the difference is significant between collective nutrition education and personalized nutritional education (P = 0.00 <0.05) for the means of HBA1C (%) at t1 and at t2; Fasting glucose (g / l) at t1 and t2 and post-prandial glucose (g / l) at t1 and t2.

Conclusions: The results of this study show that collective nutrition education yields significant results in terms of impact on glycemic control of theses diabetics. The number of studies on this aspect (nutrition education) remains modest, another study is desirable on a larger sample to better confirm our results

Keywords: nutrition education, glycemic control, diabetes,

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VITAMIN B12 DEFICIENCY ASSOCIATED WITH USE OF METFORMIN IN ELDERLY ADULTS WITH T2 DIABETES MELLITUS

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Background and objectives: Introduction: Vitamin B12 (VB) is an essential micronutrient, its deficiency causes neurological diseases. Type 2 Diabetes Mellitus (DM2) is a rising condition, Metformin (MTF) is the most widely used drug, its use is associated with B12 deficiency (DVB). MTF competitively blocks the binding of the intrinsic factor VB complex to its receptor, this interaction rarely generates an anemia that is reversible upon discontinuation of metformin or the addition of VB. Some individuals seem more predisposed than others to this interaction. Prevalence is variable

Objective: To determine the association between the use of MTF and DVB in elderly patients with DM2.

Methods: Descriptive observational study. The sample was obtained from patients who attended the Milstein Hospital Nutrition service between May and June 2016. Folic acid (AF), VB, VCM, hematocrit (HTO) were requested. The following data were obtained from the medical records: DM years, MTF doses, years of MTF use. It was considered deficit of VB12<200 mg, partial deficiency (DP) between 201 and 300, and as pathological values of VCM>100 and HTO<35%. The sample was divided into 2 subgroups according to age: advanced age (EA) between 60 and 74 years old, elderly aged between 75 and 89 years. P<0.05 statistically significant.

Results: The sample size was 192 patients, 56% were women, the prevalence of DVB was 12.5%, a partial deficiency was 29.5, HbA1c mean 7%, MTF dose of 1.7g, with a 8 years median of use for DVB patients and 5 years for DP, we found no statistically significant differences when analyzing HTO, VCM or AF values (p 0.58), nor differences in B12 dosage when analyzed each age subgroup.

Conclusions: The DVB reveals a public health problem. HTO, VCM and AF would not provide relevant data at the time of DVB suspicion. The control of the elderly with DM2 should include VB dosing, regardless of the dose of MTF. Studies with larger sample size are required.

Keywords: Vitamin B12; Metformin Elderly Adults Diabetes Mellitus T2

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EFFECT OF FORMULATED DRINK AND SNACK FROM COCOA, MORINGA, COMPOSITE FLOUR AND THAUMATOCOCCUS DANIELLI AS AN ORGANIC SWEETENER ON THE NUTRITIONAL STATUS OF WISTER RATS

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Background and objectives: Micronutrient deficiencies cause an estimated 1.1 million of the 3.1 million child deaths that occur each year. This study, therefore, investigates the effect of formulated nutritional supplements on the nutritional status of Wistar rats using formulated nutritional drinks and snacks from cocoa and Moringa with Thaumatococcus Danielle as an organic sweetener.

Methods: Twelve Wistar rats weighing 120g were subjected to formulated drinks and snacks to determine the nutritional effects. The rats were fed for two weeks, after the initial acclimatization, and grouped into three groups equally, the first group were given the 1mls of the formulated drink with normal rat diet, drink composed of Moringa, cocoa and spices, the second group were given formulated bread from Cocoa, Moringa, with Cassava flour and

Thaumatococcus Danielle with normal drinking water, and the control group were given normal rat diets which were the control. At the end of the two weeks, the experimental rats were weighed before they were sacrificed and there was a significant difference in their weight. Blood samples were collected to determine micronutrient (vitaminA, iron, zinc, calcium, and iodine) level in the experimental rat's blood serum.

Results: The result revealed a significant (p≤0.05) increase in the treatments in respect to the micronutrient status of the experimental rats when compared with the control group. Furthermore, there was an appreciable non-significant increase among micronutrient levels of those that were fed with the bread and drinks respectively (group two and one), except for vitamin A with 0.007.

Conclusions: Based on the results of this study, the formulated drinks and snacks had a significant effect on the growth and micronutrient levels of the experimental rats and thus can be used in combatting malnutrition.

Keywords: Malnutrition, Moringa, Cocoa, Thaumatococcus Danielle

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HIGH FODMAP PRODUCTS CONSUMPTION AMONG CHILDREN WITH GASTROINTESTINAL DISORDERS

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Background and objectives: Gastrointestinal disorders are one of the most commonly diagnosed diseases among children. Preliminary studies indicate that FODMAP (Fermentable Oligosaccharides, Disaccharides, Monosaccharides and Polyols) improves symptoms in gut disorders. Low FODMAP diet seems to be effective diet therapy mostly in IBS but also in others functional gastrointestinal symptoms [1,2].

The purpose of this pilot study was to valuate of differences in the frequency of high FODMAP products consumption among children with various gastroenterological diseases.

Methods: Retrospective study was conducted among 67 children, age range 4-17 years, who reported abdominal pain and problems with defecations. Respondents were patients of Department of Pediatrics, Gastroenterology and Nutrition Children's Hospital in Olsztyn. Symptoms have been diagnosed as constipation, functional abdominal pain and celiac disease. A food fre-

quency questionnaire was used to collected information about consumption of high FODMAP products categorized in 6 groups: sweets and snacks, dairy products, cereal products, fruits, vegetables and drinks.

Results: The most commonly consumed high FODMAP products were dairy products (mean 2,60 times a day, 95% CI: 2,32-2,89) and the least eaten were vegetables (mean 0,69 times a day, 95% CI: 0,56-0,83). Children with functional abdominal pain consumed high FODMAP food the most often during the day (mean 9,87 times a day, 95% CI: 8,53-11,20) and patients with celiac disease the least often (mean 7,91 times a day, 95% CI: 6,70-9,12). The results showed a significantly lower intake of high FODMAP cereal products among children with celiac disease compared to the other groups.

Conclusions: The pilot study showed that children with gut disorders consumed high FODMAP products from different food groups which may induce the occurrence of symptoms of disease. More long term research conducted among children is needed to confirm this association.

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Keywords: FODMAP, children, functional gastrointestinal diseases, diet therapy, celiac disease

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ASSOCIATIONS OF WAIST-TO-HEIGHT RATIO WITH EMOTIONAL EATING, IRREGULARITY OF EATING, EATING FAST, EATING UNTIL FULL, EXTERNAL EATING AND MAKING ENVIRONMENT TO PROMOTE EATING IN JAPANESE ADULTS

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Background and objectives: Waist-to-height ratio (WHtR) has started gaining attention as a measure of abdominal obesity. While the associations between various eating behaviors and higher BMI or obesity/overweight determined by BMI have been reported, studies focused on the relationship between eating behaviors and WHtR in adults are scarce. This cross-sectional study aimed to clarify eating behaviors associated with a higher WHtR in Japanese adults.

Methods: Subjects were 2818 men and women aged 20 to 75 years who had participated in baseline assessments of a cohort study in Japan from 2009 to 2013. They underwent assessments including physical examination and answered questionnaire regarding various eating behaviors (emotional eating, irregularity of eating, eating fast, eating until full, external eating and making environment to promote eating), lifestyles, and stage of change regarding diet. The relationship between the WHtR (<0.5 as a reference) and each eating behavior was examined using multiple logistic regression analysis adjusting for age, sex, lifestyles, and stages of change regarding diet.

Results: After adjusting for covariates, the WHtR showed significant positive relationships with eating behaviors regarding all items of emotional eating, having late-night snack, eating between meals, having many occasions to go to drinking parties, eating fast, eating until full, all items of external eating and making environment to promote eating. Skipping breakfast and having dinner late did not show significant associations with the WHtR.

Conclusions: Some eating behaviors were associated with a higher WHtR in adults. Putting more emphasis on these specific eating behaviors may effectively decrease the WHtR and prevent cardiovascular diseases.

Keywords: waist-to-height ratio, eating behaviors, adults

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EFFECT OF DIETARY SUPPLEMENTATION OF 25-HYDROXYVITAMIN D3 ON IMMUNE RESPONSES OF CHICKENS

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Background and objectives: Innate immunity acts as the frontline of the host defence system against pathogens, such as bacteria and viruses. Macrophages and neutrophils can internalize and destroy pathogens and activate subsequent humoral immune responses. Obesity is associated with dyslipidemia, systemic inflammation, and a susceptibility to pathogen invasion. Vitamin D3 has been shown to ameliorate obesity-related cardiomyopathy and systemic inflammation, but the role of innate immune cells against bacterial infection in obese individuals and by the effect of vitamin D3 is elusive. The preset study aimed to investigate the effect of obesity and dietary supplementation of vitamin D3 on the invasion defense in chickens using Salmonella as a pathogen.

Methods: Hens provided with a basal control diet or with vitamin 25 OH-D3 inclusion, then were released for ad libitum (AD) feeding or continued with restricted (R) feed intake. Four weeks after treatment, hens were sampled for blood collection for peripheral leukocyte isolation in the following weeks. Freshly isolated heterophils and monocytes were analyzed for bacterial killing (5 × 105 freshly cells to 106 CFUs of opsonized Salmonella Typhimurium) or migration (2 × 106 cells/well). Fasting plasma were analyzed for glucose, triglyceride and cholesterol concentrations.

Results: Hens with AD feeding ± 25OH-D3 treatment had the highest bacterial killing activity in the monocytes, but heterophils showed AD heterphils had the highest bacterial killing activity. In both R and AD hens, cell migration rate of monocytes was increased significantly (p < 0.05) by 25OH-D3 supplementation, but not in the heterophils. AD hens had a higher plasma triglyceride levels than R hens. 25OH-D3 supplementation suppressed plasma triglyceride and cholesterol levels but slightly increased glucose concentrations in AD hens but not in R hens.

Conclusions: These results suggest a cell type- and obesity-dependent innate immune cell response to 25OH-D3.

Keywords: monocytes; heterophils; Salmonella Typhimurium; migration; pathogen invasion

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A MULTI-ETHNIC AUSTRALIAN COHORT WITH CORONARY HEART DISEASE ADHERE WELL TO A MEDITERRANEAN DIET INTERVENTION AND IMPROVE PLASMA ADIPONECTIN LEVELS

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Background and objectives: The AUStralian MEDiterranean (AUSMED) Heart Trial aims to determine the efficacy of a 6-month Mediterranean Diet (MedDiet) intervention, compared to a low fat diet, in reducing secondary cardiovascular events at 12 months in a multi-ethnic Australian cohort (target n=1032) of high-risk patients, with a prior coronary event. We report initial data on participant adherence to the MedDiet intervention and whether the MedDiet improves markers of cardiometabolic risk profile at 6 months.

Methods: An initial cohort of AusMed participants (n=39, mean age 64 years, 87% male) were randomised to a MedDiet (n=24) or a Low-fat diet (n=15). Participants attended appointments with a Dietitian at 0, 3 and 6 months. Haemodynamic, anthropometric and body composition were measured and blood samples were collected for biomarker analyses. In addition, at these time points, adherence to the MedDiet was assessed using a validated 14-item questionnaire and 7-day food diaries allowed dietary composition changes to be recorded.

Results: Intervention participants adhered well to the MedDiet (baseline score of 5/14 increased to 11/14 at 6 months; p<0.001). The MedDiet adherence score of Low-fat diet participants did not change significantly. MedDiet participants had a higher intake of monounsaturated fat (22.0% vs 13.6% of total energy intake p=0.01) and polyunsaturated fat (9.2% vs 7.4% of total energy intake, p=0.02) after 6-months, compared to Low-fat diet participants. Compared to the Low-fat diet, the MedDiet did not change visceral adipose tissue, waist circumference, body weight, blood pressure or lipid profile (p>0.05). Plasma levels of the anti-inflammatory and insulin-sensitising biomarker adiponectin tended to increase in response to the MedDiet compared to the Low-fat diet after 6 months (4.7±2.3 mg/ml to 5.6±3.7 mg/ml vs. 5.1±2.5 mg/ml to 3.5±1.2 mg/ml, respectively; p=0.08).

Conclusions: These preliminary findings demonstrate that Mediterranean diet intervention in a multi-ethnic Australian population with coronary heart disease can change dietary behaviour, especially increase intake of healthy fats. This dietary change positively influences plasma adiponectin concentrations, an established protective cardiometabolic risk marker, compared with a conventional low fat diet.

Keywords: Coronary heart disease, randomised controlled trial, Mediterranean diet, secondary prevention, adiponectin

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RANDOMISED CONTROLLED TRIAL: ARTISAN WHEAT BREAD VS. INDUSTRIAL WHEAT BREAD TO RELIEVE THE SYMPTOMS OF IRRITABLE BOWEL SYNDROME

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Background and objectives: Industrial wheat bread has a high gluten content, relatively high amounts of FODMAPs (Fermentable Oligo-, Di-, Monosaccharides And Polyols), is baked with yeast and usually contains dough improvers (baking additives). Wheat bread is often considered by many patients as triggering their IBS symptoms. Sourdough baking method could theoretically improve tolerabillity of wheat bread due to lower content of FODMAPs, additives and immunogenic proteins (i.e. amylase trypsin inhibitor, ATIs) of sourdough bread.

Methods: Our aim was to evaluate if sourdough wheat bread, i.e. "artisan wheat bread", that is fermented for a long time (>12 hours) and baked without baking improvers, added gluten or preservatives would be better tolerated than regular industrial wheat bread in subjects with IBS who have poor subjective tolerance of wheat. The study was conducted as a randomized double-blind controlled parallel-group study (n=26). Participants first followed a gluten-free diet run-in period for seven days and then were randomly assigned to receive regular industrial wheat bread or artisan wheat bread for seven days while maintaining the gluten-free diet. Gastrointestinal and other symptoms were assessed on a visual analogue scale (VAS).

Results: There were no differences in the gastrointestinal signs of IBS i.e. flatulence, bloating, abdominal pain, dyspepsia, and stomach rumbling etc. between the study breads. There were statistically significantly (p≤0.03) more feelings of tiredness, joint symptoms and decreased alertness when the participants ate the artisan wheat bread. The treatment differences (mm) were 16 (95% CI 4-27, p=0.01),7 (1-13, p=0.03) and 14 (5-22, p=0.003), respectively.

Conclusions: The present results do not support the hypothesis that artisan wheat bread (sourdough bread) that contains no preservatives, added gluten or improvers would be better tolerated than regular wheat bread.

Keywords: ODMAP, gluten, grains, wheat sensitivity, irritable bowel syndrome

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THE EFFECTS OF PROBIOTIC LACTOBACILLUS FERMENTUM ME-3 (LFME-3) CONTAINING REG'ACTIV CHOLESTEROL SUPPLEMENT ON BLOOD LIPOPROTEIN PROFILES AND INFLAMMATORY CYTOKINES

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Background and objectives: Cardiovascular diseases and type 2 diabetes continue to be a challenge and burden to heath. Positive shifts in well accepted risk factors of them are the key of long-term success. We aimed to establish if the targeted composition of innovative supplement Reg'Activ Cholesterol (RAC) has a positive influence to the human cardiovascular-inflammatory and diabetes-related parameters.

Methods: 45 apparently healthy participants consumed an RAC containing an antioxidative and antiatherogenic probiotic LFME-3 for 4 weeks. The parameters measured were total cholesterol, HDL-cholesterol, LDL-cholesterol, triglycerides, oxidized LDL (oxLDL), hsCRP, IL-6 and glycosylated haemoglobin (HbA1c%).

Results: Significant improvement of the cardiovascular and diabetes risk profile of the participants was established according to next data: the reduction of total cholesterol (from 6.5±1.0 to 5.7±0.9 mmol/l, p=9.90806E-11) was on the account of LDL cholesterol as the HDL cholesterol level rose from 1.60±0.31to 1.67±0.34mml/l, p=0.01; HbA1c% was reduced from 5.85±0.28 to 5.66±0.25 p=4.64E-05 and oxLDL decreased from 84±20 to 71±15 U/l, p=4.66292E-08.

Conclusions: The consumption of RAC in clinically asymptomatic volunteers with border¬line-high values of risk factors for cardiovascular disease for 4 weeks had a positive effect on blood lipoprotein, oxidative stress and inflammatory profile.

This trial was an open label pilot study within the framework of a larger special clinical trial (ISRCTN55339917).

Keywords: Blood serum lipid profile, L. fermentum ME-3, Oxidized LDL, HbA1c%, Human clinical trial

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BODY MASS INDEX, HEIGHT FOR AGE AND WAIST CIRCUMFERENCE IN CHILDREN BETWEEN 2 AND 18 YEARS OF AGE WITH TYPE 1 DIABETES MELLITUS FROM THE HOSPITAL UNIVERSITARIO DEL VALLE "EVARISTO GARCÍA" IN CALI, COL

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Background and objectives: The American Diabetes Association recommends monitoring, among others, the nutritional status of children with type 1 diabetes mellitus (T1DM), to maintain normal metabolic control that does not contribute to the morbidity of the disease. The objective is to determine the nutritional status in children with T1DM, according to body mass index (BMI) and height for age (HA) using the WHO tables, and according to waist circumference (wc).

Methods: Prevalence study in children aged 2-18 years of the Hospital Universitario del Valle (HUV) "Evaristo García" from Cali, Colombia, who were given sociodemographic (age, sex), anthropometric variables [weight (W), height (H), wc] and were diagnosed as having malnutrition due to BMI (obesity, overweight, risk of overweight, undernutrition and severe undernutrition), altered height (low stature and severe low stature) and abdominal obesity per wc (> p90%).

Results: 147 children from HUV in Cali, Colombia; 54.4% female, 10.9±3.5 years of age, with W=39.1±17.8 kg, H=138.3±24.1 cm and wc=64.9±9.0 cm. They presented malnutrition=30.8%, altered height=10.9% and none with abdominal obesity. There was predominance of malnutrition in girls with no statistical significance (p> 0.05).

Conclusions: About 1/3 of these children presented malnutrition (undernutrition=7.5%, overweight and obesity=21.8%), few were of low height, and no abdominal obesity; without possible associations or risk factors.

Keywords: Body mass index, Height for age, Waist circumference, Type 1 Diabetes Mellitus, Children

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ANTHROPOMETRY ACCORDING TO BODY MASS INDEX, HEIGHT FOR AGE AND WAIST CIRCUMFERENCE IN CHILDREN BETWEEN 2 AND 18 YEARS OF AGE WITH DOWN SYNDROME OF CALI AND BUCARAMANGA, COLOMBIA

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Background and objectives: The Down Syndrome Growing Up Study (DSGS) of the Centers for Disease Control and Preven-

tion (CDC) from United States recently published growth charts for American children with Down Syndrome (DS). The objective is to determine the nutritional status in children with DS, according to body mass index (BMI) and height for age (HA) using the DSGS/CDC tables, and according to waist circumference (wc).

Methods: Prevalence study in children between 2-18 years of age from Cali and Bucaramanga, Colombia, to whom sociodemographic (age, sex), anthropometric variables [weight (W), height (H), wc] were taken and diagnosed by BMI on malnutrition (Obesity, overweight, risk of overweight, undernutrition and severe undernutrition), altered height by HA (low height -2 and -3 SD and low severe height > -3 SD) and abdominal obesity by wc (> p90%).

Results: There were 76 children (37 Cali and 39 Bucaramanga, Colombia), 59.2% were males, 9.4±4.3 years of age, W=30.8±15.0 kg, H=122.2±19.2 cm and wc=64.8±12.4 cm. They presented malnutrition=29.0%, altered height=27.6% and abdominal obesity=4.0%. There was a predominance of malnutrition in children aged 5-12 years and altered height in male children (p>0.05).

Conclusions: About 1/3 of these children presented malnutrition (undernutrition=15.8%, overweight and obesity=11.8%) and altered height (low height=15.8%) and 4.0% of abdominal obesity; without possible associations or risk factors.

Keywords: Body mass index, Height for age, Waist circumference, Children, Down Syndrome

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DAILY FOOD CONSUMPTION IN COLOMBIAN SCHOOLCHILDREN AND ADOLESCENTS WITH FUNCTIONAL GASTROINTESTINAL DISORDERS

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Background and objectives: The prevalence of functional gastrointestinal disorders (FGDs) in Colombian children is 29.0%; being its pathophysiology multifactorial and one of the possible risk factors, feeding. The objective is to determine the prevalence and possible risk factors of daily consumption of kilocalories (Kcal), carbohydrates (CH), proteins (Prot), fats (Fat), dietary fiber (Fib), iron (Fe+), folic acid (FolAc) and vitamin A (vitA) by means of a 24-hour reminder according to the Program for the Evaluation of Diets and Management of Food (DIAL) in Colombian children with FGDs.

Methods: Prevalence study in schoolchildren (n=897) and adolescents (n=1109) between 8-18 years of age in the Colombian Andean (La Unión=476), atlantic (Cartagena=427), pacific (Cali=1220, Quilichao=356) and amazonic (Florencia=392) zone, of public school, to whom sociodemographic (age, sex), anthropometric (weight, height, waist circumference) variables and were diagnosed as malnutrition by index of body mass, low height by height/age, abdominal obesity by waist circumference, and FGDs according to Rome III Criteria in Spanish. Normal daily consumption of kcal=1750-2250 kcal/m2, CH=50-55% total caloric value

(TCV), Prot=10-15% tcv, Fat=30-35% TCV, Fib=Age + 5 grams, Fe+=9-18 mg, FolAc=300-400 µg and VitA=500-700 µg.

Results: 2006 Colombian children were included; 50.5% male, 12.8±2.2 years old, with kcal=1924.0±644.7 kcal/m2/d, CH=258.6±110.7 g/d, Prot=327.6±297.5 g/d, Fat=321.9±304.5 g/d, Fib=21.4±14.8 g/d, Fe+=72.7±74.0 mg/d, FolAc=329.8±248.2 µg/d and VitA=648.1±1492.4 µg/d, malnutrition=25.9%, low height=6.9%, abdominal obesity=3.1% and FGDs=18.2%. They presented a hypocaloric daily consumption=73.5%, hypoglycemia=40.1%, hyperprotein=70.6%, hyperlipid=43.2%, low in Fib=50.8%, Fe+=67.5%, FolAc=75.3% and VitA=68.8% deficiency and as more frequent FGDs functional constipation=8.3% and irritable bowel syndrome (IBS)=4.3%; being the possible risk factor for IBS daily hypoproteic consumption (OR=2.78, 95%CI=1.13-7.30 p=0.0127).

Conclusions: The daily consumption of these Colombian schoolchildren and adolescents with FGDs was hypocaloric, hypoglycemic, hyperprotein, hyperfat, low in fiber, deficient in Fe+, AcFol and VitA; being the hypoproteic feeding the only possible risk factor for IBS.

Keywords: Daily food consumption, Functional gastrointestinal disorders, Children

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ESTABLISHMENT OF SIMPLE METHOD FOR EVALUATING GUT MICROBIOTA USING T-RFLP

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Background and objectives: Recently, it has been reported that there are close relationships between intestinal bacteria and various diseases including obesity and diabetes. One of common methods evaluating the intestinal bacterial flora is a DNA sequence analysis using a next generation sequencer, but it is not easy to do it for any laboratory from the viewpoint of experimental equipment and analytical cost. Previously, we have established simple separation method, which can quickly crash mouse feces and separate it into three layers including polar fraction, nonpolar fraction and feces. Terminal restriction fragment length polymorphism (T-RFLP) is a method which can analyze microbiota as mixed DNA fragment information of various microorganisms. In this study, by combining the above two methods, we aimed to simplify the analytical method for evaluating gut microbiota.

Methods: Fecal samples were collected from four male mice. Bacterial DNA was extracted using a stool DNA extraction kit from the separated fecal layer by simple separation method. The 16S rDNA was amplified by PCR using 6-FAM-labeled 8F primer and 1492R primer. The PCR products were reacted with restriction enzyme MspI at 37°C and 1 h, and the digested fragments were analyzed by Genetic Analyzer. Finally, the obtained data were analyzed by statistical software "R", and the similarity of the flora among individual animals were compared.

Results: It was possible to perform from the collection of feces to comparison of microflora in less than 1 day. Using the method, four mice could be grouped based on the similarity of the flora.

Conclusions: We established a simple method for evaluating gut microbiota. Using this method, it is possible to compare quickly and simply the similarity, for example circadian change, of microbiota among individual animals and to survey the sequential change of microbiota in a single animal.

Keywords: T-RFLP, gut microbiota, mouse.

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SERUM 25(OH)D CONCENTRATION AND META-BOLIC SYNDROME AMONG ADULTS IN SOUTH-WEST CHINA

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Background and objectives: Vitamin D deficiency has been suggested as a risk factor for various chronic metabolic diseases. However, evidence regarding this issue among Chinese population is limited. The present study aimed to examine the association between serum 25-hydroxy vitamin D (25(OH)D) and metabolic syndrome (MS) in Chinese adults.

Methods: Serum 25(OH)D was measured in a cross-sectional sample of 920 non-diabetic adults (62.61% women) aged 25-65 years recruited from Southwest China. Data on dietary intake and physical activity were collected by validated questionnaires. MS was defined according to the criteria of Chinese Diabetes Society. Fasting plasma glucose (FPG), insulin, glycated hemoglobin (HbA1c), the homeostatic model assessment-insulin resistance (HOMA2-IR), lipid profile and blood pressure were evaluated. Anthropometry measurement included waist circumstance (WC), height and weight, and the last two were used to calculate body mass index (BMI). Data were analyzed by multivariable-adjusted regression models.

Results: We observed that 7.17% participants had MS, and the percentage of overweight or obese individuals (BMI ≥ 25kg/m2) in our study was 29.24%. Compared with the lowest tertile of serum 25(OH)D, a statistically significant 53% lower odds of metabolic syndrome was observed for adults in the highest tertile (OR: 0.47, 95%CI: 0.24-0.89), after adjusting for age, gender, personal monthly income, smoking status, energy intake, and physical activity. Moreover, we observed significant inverse associations of 25(OH)D with fasting insulin (p=0.0007), HbA1c (p=0.0001),

HOMA2-IR (p=0.0007) after adjusting for potential confounders, but not with other MS components.

Conclusions: A poor vitamin D status is significantly associated with an increased risk of having metabolic syndrome and insulin resistance among Chinese adults, warranting further investigation in large prospective studies.

Keywords: Vitamin D, 25(OH)D, Metabolic syndrome

Further collaborators:

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COUNSELING ON IYCF PRACTICE TO SICK BABY (NEUROLOGICALLY DAMAGED & OTHER) TO IMPROVE BREASTFEEDING STATUS -A HOSPITAL BASED STUDY IN BANGLADESH

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Background and objectives: Specific attachment & position is effective for production and flow of breast milk. Counseling to mother on breastfeeding includes continuation of breast feeding during illness when sick baby recovers earlier. Breastfeeding is a challenge to neurologically damaged baby. Some of the baby cannot cry & cannot reflect his demand, cannot suck, most of the time it sleeps. Usually babies are kept NPO (nothing per oral) or fed expressed breast milk. The fat content of hind breast milk insulates nerve fibers and speeds electrical signals increases with breast feeding. Brain development takes place from birth. Breastfeeding helps the baby develop coordination of the muscles and nervous system. The jaw and mouth movements needed for technical help along breastfeeding.

Methods: Counseling about Breast feeding & complementary feeding was done at the pediatric ward at Rangpur Medical College Hospital in Rangpur, Bangladesh, from September 2016 to March 2017. Mothers of 144 infants at neonatal unit were taught specific attachment & position effectively for special situation of baby & mother. From total number of baby, 35 were neurologically impaired, other suffered from different illness. We taught the mothers the cross cradle position, modified cross cradle position; which is effective for flat nipple, inverted nipple, large nipple, sore nipple, nipple infection, low birth weight baby, sick baby such as: neurologically damaged, jerking problem baby & the baby who are given saline and breast fed often (8 to 12 times in 24 hours)

Results: A total of 144 sick baby were studied. About 24.3% infants were neurologically impaired baby. All neurologically damaged baby were successfully breast feed immediately, after 30 minutes, the improvement of sucking quality were visible. The rest

were kept NPO, so I gave them counseling about the technique of breast feeding of neurologically damaged baby. Babies who took less amount of breast milk had kidney infection, dysentery for giving powder milk (BIOMIL).

Conclusions: Mothers of sick baby specially neurologically damaged baby's mothers need more support & guidance about effective breastfeeding.

Keywords: Positioning, Attachment, breast feeding, sick baby

144/554

IMPACT OF PHYSICAL ACTIVITY (45 MINUTES DAILY AND 15 MINUTES THREE TIMES A DAY AFTER MEALS) ON BODY MASS INDEX OF TYPE 2 DIABETES MELLITUS FEMALE PATIENTS

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Background and objectives: Type 2 Diabetes Mellitus is a chronic progressive metabolic disorder. Obesity is its major driver. Physical activity as a part of lifestyle intervention is the cornerstone for its prevention and management. Objective of the cross-sectional study was to compare impact of physical activity (walk) 45 minutes daily to 15 minutes physical activity (walk) three times a day after each meal on Body Mass Index (BMI) of type 2 diabetic females.

Methods: Female respondents (N=175) were prospectively enrolled from Endocrinology OPD of Post Graduate Institute of Medical Research (PGIMER), Chandigarh, India. Respondents were made to walk regularly for 45 minutes followed by 15 minutes post meal walk for 6 weeks each. Self designed questionnaire and WHO validated Global Physical Activity Questionnaire (version 2) were used for data collection. Data analysis was done using SPSS software (version 20).

Results: Family history of diabetes was seen among 78.9% respondents. 95.4% respondents were diabetic for more than 6 months. Mean BMI was 28.14±3.63kg/m2, 27.93±4.05kg/m2 and 27.79±4.07kg/m2 at initiation, 45 minutes walk and 15 minutes walk after each meal respectively. Mean HbA1C was 8.31±1.96, 8.09±1.93 and 7.64±1.64 at initiation, 45 minutes walk and 15 minutes walk after each meal respectively. Mean Fasting plasma glucose (FPG) was 140.99±57.13mg/dL, 133.01±41.10mg/dL and 115.26±27.46mg/dL at initiation, 45 minutes walk and 15 minutes walk after each meal respectively. Highly significant difference between BMI, HbA1C and FPG (p <0.001) was found between 45 minutes and 15 minutes post meal walk.

Conclusions: Post meal physical activity (walk) was seen to be significantly effective for diabetics in achieving health benefits as compared to one time walk daily.

Keywords: Type 2 diabetes, physical activity, BMI, FPG, HbA1C

Conflict of Interest Disclosure: None
Further collaborators: Post Graduate Institute of Medical Research, Chandigarh, India.

144/590

EFFECTIVENESS OF HOMEMADE IMPROVED RECIPE WITH NUTRITION COUNSELLING IN THE MANAGEMENT OF SEVERELY WASTED AND SEVERELY UNDERWEIGHT CHILDREN

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Background and objectives: In Bangladesh, management of Severe Acute Malnutrition (SAM) includes the use of commercially produced therapeutic foods. The study aimed to measure the impact of selected homemade improved recipes with nutrition counselling on nutritional status of SAM and Severely undernourished children.

Methods: An experimental study among 44 children aged 6 to 59 months with uncomplicated SAM was conducted in the Institute of Child and Mother Health (ICMH), Dhaka. Subjects were purposively allocated from SAM unit of ICMH after recovery from acute phase of infection. After screening, recipe trial for 10 days was conducted by providing 6 improved homemade recipes containing 100-110 kcal/kg/day for first 4 days and 130-150 kcal/kg/day for next 6 days. Nutrition counselling using IEC materials and demonstration of cooking were provided to the mothers or caregivers of the children. Daily body weight was recorded to measure the improvement of nutritional status. Children were followed-up weekly at home for 1 month to monitor dietary compliance and nutritional status.

Results: Median age of children was 9.00 (6-42) months; Weight, Height & MUAC were (mean±SD) 5.3(±1.2) kg, 64.9(±9.6) cm & MUAC 10.8(±1.0) cm respectively. Mean calorie (kcal/kg body weight) and protein (g/kg body weight) intake were 119(± 62) and 4.5(± 2.3) at 1st day and 129(±77) and 4.92± 2.87 at 7th day. Weight gain was 18.1±16.8 g/kg/day at 4th day & 12.4 (±7.3) g/kg/day at 7th day. In community follow-up, 0.5±1.5 kg (mean±SD) weight was increased in 4th follow-up from the 1st follow-up. Practice of providing appropriate complementary food was followed by 62.5% in 1st follow-up and increased to 66.7% at 4th. Providing vitamin A and animal protein rich foods were 87.5% and 62.5% at 1st follow-up while improved to 100% at 4th follow-up. Giving breastmilk substitute reduced to 25% at 4th follow-up from 46% in 1st follow-up.

Conclusions: Nutrition rehabilitation with homemade foods of improved recipe and nutrition education at both hospital and community setting was fruitful for improving nutritional status of SAM children.

Keywords: SAM, Nutrition education, homemade improved recipe

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GASTROINTESTINAL SYMPTOMS, HYDROGEN EXCRETION AND GASTROINTESTINAL CONDITIONS MEASURED WITH SMARTPILL® IN IRRITABLE BOWEL SYNDROME PATIENTS - MEAL STUDY ON LOW-FODMAP AND REGULAR RYE BREAD-MEALS

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Background and objectives: Grains are often considered as triggers of irritable bowel syndrome (IBS) symptoms but less is known about effects of grain products with differing content of FODMAPs on gastrointestinal transit times, pH and intraluminal pressure in patients with IBS. In a previous study intraluminal pH was lower among IBS subjects than in healthy controls possibly demonstrating higher rate of colonic fermentation in IBS.

Methods: Our aim was to evaluate if rye bread low in FODMAPs would cause less hydrogen excretion, lower intraluminal pressure, higher colonic pH and less IBS symptoms than regular rye bread. The study was conducted as a randomized double blind controlled cross-over meal study. Female IBS patients (n=7) ate study breads on 3 consecutive meals, i.e. for breakfast, lunch and dinner and were followed for 630 minutes. Intraluminal conditions were measured by SmartPill®, an indigestible motility capsule.

Results: Postprandial hydrogen excretion, a marker of colonic fermentation, expressed as AUC(0-630 min) was [median (range)] 6300 (1785-10800) for low-FODMAP rye bread and 10 635 (4215-13080) for regular bread (p=0.028). The means of the VAS measurements of individual gastrointestinal symptoms during the follow-up (30 to 630 min) tended to be numerically lower after the low-FODMAP rye bread but did not show any statistically significant differences between the breads.

Intraluminal pressure correlated significantly with total symptom score after regular rye bread (ρ=0.786, p=0.036) and nearly significantly after low-FODMAP bread consumption (ρ=0.75, p=0.052). We found no differences in pH, contractions or gastro-intestinal transit times between the breads. Gastric emptying of SmartPill was slower than reported in previous studies.

Conclusions: Our meal study demonstrated that low-FODMAP rye bread reduces colonic fermentation but no difference could be found in median values of IBS symptoms, pH, colonic pressure of gastrointestinal tract when compared to regular rye bread. Our observation on the correlation between increased intra-colonic pressure and symptom severity warrants further studies in IBS.

Keywords: IBS, FODMAP, rye, colonic fermentation, intraluminal pressure

Conflict of Interest Disclosure: Fazer Bakeries funded the study and provided the breads. Reijo Laatikainen has written a Finnish book on irritable bowel syndrome and diet. He is also founder and owner of Booston Ltd, which provides IBS related dietetic services to IBS patients, health care professionals and various organisations. Laura Pirkola, Sanna-Maria Hongisto and Jussi Loponen are employees of Fazer Bakeries. Others have no personal interests to declare.

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INFLUENCE OF PUBERTAL STAGE IN CUT OFF VALUES OF WAIST CIRCUMFERENCE ASSOCIATED TO ALTERED ANTHROPOMETRIC VARIABLES AND BLOOD PRESSURE AS CARDIOMETABOLIC RISK MARKERS IN BRAZILIANS ADOLESCENTS

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Background and objectives: The adolescents' development should not be determined just by the chronological age, once it is influenced by other environmental and intrinsic factors. The pubertal stage associated with anthropometric data, such as waist circumference (WC) is considered essential for screening risk of morbidities in adolescents, especially cardiovascular disease. This measure has proved to be a useful tool for identifying nutritional status, as well as its association with chronic noncommunicable diseases. The aim of the present study was to verify the influence of pubertal stage in cut off values of waist circumference associated to altered anthropometric variables and blood pressure.

Methods: A total of 557 adolescents aged 10 to 15 years were recruited from public schools, who were classified according to pubertal stage, by Tanner criteria. The interest variables, WC and the independent variables, such as

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gender, age and weight were evaluated. The predictive power and cut off points of WC for overweight/obesity prevention were identified using ROC curves, as well as sensibility and specificity. Indeed, it was verified the correlation between the WC, anthropometric measures and blood pressure.

Results: According to the nutritional status, the adolescents were 58% eutrophic, 25.2% overweight and 13.9% obese, there was no difference between genders. It was observed a strong correlation between CC and weight, BMI, neck circumference, arm circumference, rip circumference and WC/height ratio in both genders. In addition, it was showed a weak correlation but statistically significant between WC and systolic and diastolic pressure. The WC cutoff points to determine overweight/obesity showed high sensitivity and specificity in girls and boys in all pubertal stages, pubere being representing by 64,9, 66,45 and 70,65cm in prepubescent, Pubere and post-pubere respectively in boys and by 68,5, 69,15 and 69,45cm in female adolescents.

Conclusions: The creation of WC cutoff points according to the pubertal stage, specific for the Brazilian adolescent population, proved to be an excellent, non-invasive and low cost tool for identifying overweight/obesity and cardiometabolic risk, and it is extremely relevant, due to changes in body composition resulting from puberty events.

Keywords: adolescence, waist circumference, pubertal status, cardiometabolic risk, overweight.

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THE EFFECT OF BLACK SEED POWDER ON BLOOD GLYCAEMIA, BLOOD LIPIDEMIA AND BODY COMPOSITION ON ADULTS AT RISK FOR CARDIOVASCULAR DISEASES

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Background and objectives: In United Arab Emirates (UAE), 39.6% of the population were diagnosed with metabolic syndrome (MetS) according to a previous study, while the prevalence of the MetS in the Gulf Cooperation Council Countries (GCC) is 10-15% higher than in most developed countries. Abdominal obesity, high fasting blood glucose, high blood pressure, elevated triglycerides and reduced high-density lipoprotein cholesterol (HDL-C) are the risk factors for MetS. Traditional spices, such as black seed, are used as medications for treating some of these diseases. However, several studies have proven that black seed has antioxidant, anti-inflammatory, anti-diabetic, lipid-lowering functions and thymoquinone was found to be the active form of black seeds.

Objectives: To measure the effect of 3 grams of black seed (Nigella Sativa) powder for 12 weeks on participants at risk for cardiovascular diseases for fasting blood glucose, HbA1c levels, blood pressure, blood lipid profile levels and waist circumference.

Methods: A controlled, randomized, single blind, parallel-design study conducted on 51 participants with risk of developing heart diseases. Participants were randomly assigned to consume either 3g/day of black seed powder or placebo for 12 weeks. Each of weight, height, waist circumference, body composition and systolic and diastolic blood pressure were measured at baseline, midpoint (after 6 weeks) and endpoint (after 12 weeks). Fasting blood glucose, HbA1c, total cholesterol, LDL-C and HDL-C were tested at baseline, midpoint and endpoint.

Results: After 12-weeks consumption of black seed powder, each of waist circumference, percent body fat, cholesterol, HDL and LDL levels were highly significantly improved (p-value < 0.01). In addition, body weight and triglyceride level were significantly improved (p-value <0.05).

Conclusions: Consumption of 3g of black seed powder daily for 12 weeks have shown positive effect on fasting blood glucose, blood pressure, blood lipid profile levels and waist circumference on individuals who are at risk of developing cardiovascular diseases.

Keywords: Black seed powder, metabolic syndrome, cardiovascular diseases, blood lipidemia, blood glycaemia.

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OVERWEIGHT/OBESITY: LOOKING TO EXPAND THE LIPID PROFILE

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Background and objectives: Our objectives in this work are: to establish the incidence of overweight or obesity in adult patients who perform clinical consultation for periodic health examination; describe the most frequent laboratory abnormalities observed in such patients and try the search of new biochemical parameters permitting to assess more thoroughly the insulin resistance presenting the majority of these patients.

Methods: We studied 177 patients, whose ages ranged from 18 to 75 years and who attended outpatients clinic medical of the Hospital de Clinicas, to carry out a periodic review of health, between January 1, 2010 and January 1, 2017. All patients underwent: complete clinical history, physical examination (including back of eye) and is asked the following laboratory blood tests: complete blood count; blood glucose; lipid profile (total cholesterol, HDL, LDL, triglycerides and cholesterol non-HDL; risk); apo A and apo B; T3, free T4 and TSH; Vitamin D; insulinemia; HOMA; Ultrasensitive CRP (Hscrp); full hepatograma and complete examination of urine.

Results: Of the 177 patients studied, the following results were obtained: 36,72% were overweight and 24.86% suffered from obesity. Of the total of patients, 49.7% presented alterations of blood glucose; Hypertriglyceridemia: 51.5%; hypercholesterolemia: 55.7%. The HOMA > 2.5: 41,09% ; Hscrp > 3 mg/l: 31.78%; Vitamin D < 20 ng/ml: 44,19%; TSH > 4 uUI/l: 7.75%; Non-HDL

cholesterol > 130 mg/dl: 74,42%; TG/HDL > 3.5: 26.36%; insulin values higher than 20 μU/ml were obtained in 60,47%. Of the 86 patients studied for apo A decrease, the 24.24% were below 119 mg/dl; with respect to Apo B, only 6.45% showed values higher than 163 mg/dl.

Conclusions: Emphasizes the need to strengthen the strategy of primary health care to prevent the development of Overweight/obesity and to count on a competent laboratory that encompasses the entire spectrum of the IR, in particular, the determinations of: HOMA, PCR us; dosage of vitamin D and the TG/HDL ratio. Intends this index to identify simple individuals with insulin resistance and increased risk of developing disease franchises in relation to go through a simple, economical, calculation of acceptable sensitivity and specificity, which is done with routine.

Keywords: Overweight; Obesity
Further collaborators:
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EFFECTS OF ARGININE ON THE MOBILIZATION OF ENDOTHELIAL PROGENITOR CELLS AND TISSUE INJURY IN A MOUSE MODEL OF HINDLIMB ISCHEMIA/REPERFUSION

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Background and objectives: Acute limb ischemia is a frequent event that may be caused by arterial embolism, vascular thrombosis, injury or trauma. Endothelial progenitor cells (EPC) are unique cells circulate in the blood with the ability to differentiate into endothelial cells and can contribute to vascular repair in ischemia/reperfusion (I/R) injury. This study investigated whether administration of L-arginine (L-Arg), the precursor of nitric oxide (NO), enhances blood EPC percentages and protects against I/R-induced inflammatory response in a mouse model of hindlimb I/R injury.

Methods: There were 1 normal control (NC) and 4 I/R groups. The NC group did not undergo the I/R procedure. The mice in the I/R groups were subjected to hindlimb compression with 4.5-oz orthodontic rubber bands for 150 min. Saline (S) groups were intravenously injected with saline whereas L-Arg (A) groups injected with L-Arg (300 mg/kg body weight) before reperfusion. Mice in the I/R groups were sacrificed 24 or 48 hr after reperfusion respectively. Blood and tissue samples were collected for analysis.

Results: I/R led to a significantly lower blood EPC percentage and plasma NO levels. However, plasma interleukin-6 levels as well as the inflammatory cytokine gene expressions in muscle were elevated. Compared to the saline groups, L-Arg administration resulted in a higher EPC percentages. Also, plasma NO levels, matrix metallopeptidase-9 and vascular endothelial growth factor concentrations were upregulated whereas muscle keratinocyte-derived chemokine and monocyte chemoattractant protein-1 mRNA expressions reduced after reperfusion. Histological findings consistent with the finding that muscle injury was attenuated during I/R insult when L-Arg was administered.

Conclusions: A single dose of L-Arg administration before reperfusion increases the percentage of EPCs and reduces the inflammatory reaction locally and systemically.

Keywords: L-arginine, ischemia/reperfusion, endothelial progenitor cell, nitric oxide, inflammatory cytokine

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DIETARY INTAKE AND NUTRITIONAL STATUS OF PATIENTS WITH PHENYLKETONURIA IN TAIWAN

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Background and objectives: Phenylketonuria (PKU) is due to phenylalanine hydroxylase deficiency and is characterized by accumulation of phenylalanine (Phe). Untreated patients develop severe intellectual disabilities. Early diagnosis such as universal newborn screening and early treatment by diet instruction may maintain patients' cognitive function. However, the Phe-restriction diet treatment should be maintain for lifelong and adequate nutritional status in these patients are also important. In this study, we characterize the body composition and the growth status in Taiwan PKU patients, correlating with their metabolic control status, to know if they have nutritional disturbances due to the Phe-restriction diet treatment.

Methods: We enrolled 22 controls (8-39y; 19.73 ± 10.6, table 1), and 22 patients with PKU (8-27y; 14.96 ± 5.27) including 14 patients (64%) receiving PKU-free formula as the dietary supplement. Anthropometric features (height, weight and body mass index) and body composition were analyzed. Dietary intake was also collected. For continuous parameters, the data was expressed as median ± standard deviation and Mann-Whitney U test has been used to test the difference among the groups.

Results: All patients met dietary reference intakes (DRIs) in protein (106.79 ± 33.27% of DRIs) and energy intake (103.7 ± 21.63% of DRIs). Compared to the control, PKU patients have similar height (Z-score, -0.18 ± 1.18 v.s. 0.43 ± 0.78, p=0.72), weight (Z-score, 0.04 ± 0.97 v.s. 0.39 ± 1.08,p=0.69) and body mass index (Z-score, 0.23 ± 1.10 v.s. 0.24 ± 0.98,p=0.43). The detailed body composition analysis showed that they have similar muscle mass (73.40 ± 8.79 v.s. 75.51±7.42,p=0.45) and body fat percentage (20.75 ± 8.70 vs 8.67 ± 7.53,p=0.46). Among PKU patients, the more natural protein they consumed, the more body muscle mass

they gained (Correlation coefficient 0.5360, p=0.0101) and the less fat mass they got (Correlation coefficient -0.5370, p= 0.0082).

Conclusions: Overall, Taiwan PKU patients do not show differences in body composition and growth status in comparison with controls. A normal intellectual development is expected when adequate treatment is started early in life and continued during life.

Keywords: Phenylketonuria, dietary intake, nutritional status

DISTRIBUTION OF DIETARY CARBOHYDRATE LOADING BY KIWIFRUIT ALTERS GLYCAEMIC RESPONSE CHARACTERISTICS

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Background and objectives: Partial equal carbohydrate substitution of kiwifruit sugars for starch in foods co-ingested with whole kiwifruit (KF) leads to a substantial reduction in glycaemic response. The reduction in response is due to both exchange of fructose for glucose, and to the physical influence of undigested KF remnants in the foregut. As fructose consumption has been reported to promote blood glucose disposal, and KF remnants appear to retard processes that mediate absorption of starch-derived glucose from the foregut, it is possible that overall modulation of glycaemic response to starchy food by KF may be affected by the temporal proximity of the KF and starchy staple ingestion events.

Methods: To test this possibility KF (200 g = flesh of two KF) was ingested 10 h, 90 min, 30 min before, at the same time as, or 30 min after a starch-based wheaten biscuit (WB) containing the same amount of available carbohydrate, mainly starch, as the KF. Capillary blood glucose concentrations and satiety were measured after ingestion of the foods.

Results: Partial substitution of WB by KF caused a 20-30% reduction in total glycaemic response irrespective of the separation of KF and WB ingestion. However ingesting KF 30 min before WB decapitated the blood glucose "spike", whereas the reverse, WB 30 min before KF did not.

Conclusions: The results suggest that both the temporal distribution of available carbohydrate (meal slowness) and differences in composition of foods consumed at different stages in a meal may be used to manage glycaemic response.

Keywords: glycaemia, temporal distribution, kiwifruit, carbohydrates

ASSESSMENT OF URINARY SODIUM EXCRETION AMONG UAE POPULATION

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Background and objectives: Chronic diseases such as cardiovascular diseases (CVD), cancer, chronic respiratory diseases (CRD), and diabetes are increasing worldwide and becoming the leading cause of death. Positive relationship is found between CVD and the intake of salt, trans-fatty acid (TFA) and saturated fatty acid (SFA).

Methods: A cross sectional study was conducted from March – June 2015 in United Arab Emirates. A random sample of 476 healthy individuals were recruited, (n= 214 male, n= 262 female). A screening questionnaire was designed to collect data about demographic information, lifestyle, past medical history, medications use and the current health status in addition to anthropometric measurements were assessed using standardized procedures. A single timed 24-hr urine collection was obtained for estimation of sodium excretion, and urinary creatinine and urine volume were used to measured adequacy of 24-hr urine volume. The samples were analyzed by Inductively Coupled Plasma/Optical Emission Spectrometry (ICP-OES). Dietary information was collected using 24-hr dietary recall. Energy, carbohydrate, fat, protein, unsaturated fat, saturated fat, trans-fat, cholesterol and sodium were analyzed using ESHA Food Processor and Kuwaiti Food Composition Database.

Results: Participants mean age was 37.3 ± 12.5, 55 % were females. The majority of the participants were overweight (36.1%) or obese (23.7%). The majority of the participants reported that they add salt during cooking and while eating. Majority (68.9%) reported that they were aware that high salt intake could cause a serious health problem. The mean sodium intake from food records was 2829.1 ± 1404.9 mg while mean sodium excretion in urine was 2713.4 ± 713 mg. This amount of sodium is significantly higher (P<0.001) than the amount recommended by WHO which is above the WHO recommendations.

Conclusions: A large proportion of UAE population consumes sodium above levels recommended by WHO. This is probably the reason for the high incidence of CVD in UAE.

Keywords: Urinary sodium excretion, cardiovascular diseases, urinary creatinine, Non-communicable diseases, ESHA Food Processor

KNOWLEDGE AND MANAGEMENT OF FOOD ALLERGY AMONG PRE- SCHOOL CHILD CAREGIVERS IN OGUN STATE. NIGERIA

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Background and objectives: Children whose mothers work outside the home are most of the time left in the hands of secondary caregivers for certain period of time. Investigating the knowledge and management of food allergy among these caregivers then becomes necessary as the severe case of this immunological response can lead to life threaten action. This study assessed the knowledge and management of food allergy among pre-school child caregivers in Ogun State, Nigeria.

Methods: Descriptive survey using multisampling technique was adopted to select eight-two (82) child caregivers from the study area. A validated Food Allergy Knowledge and Management Questionnaire (FAKMQ) was used for data collection. Knowledge and management scale of 0-10 was adopted and categorized high: ≥7, moderate: 4.0-6.9 and poor: 0-3.9. Data collected were analyzed using descriptive statistic and t test at p=0.05.

Results: The results of the findings showed that respondents possessed low knowledge in the following areas: food that can cause allergic reactions in children (2.45±0.42), signs and symptoms of food allergy (3.20±0.85), factors that increase the risk of having food allergy (2.20± 0.62), severe allergic reactions (anaphylaxis) (2.0±0.26) . Most respondents could not differentiate between food allergy and food intolerance (1.20±0.35). Results:

Conclusions: Knowledge and management of food allergy was poor among pre-schools child caregivers in Ogun State Nigeria. Regular training should be organized for caregivers to increase their knowledge on food allergy by reviewing past occurrences to identify better ways of management.

Keywords: Food Allergy, Management, Caregivers

IMPACT OF TRANSTHEORETICAL METHOD INTERVENTION ON HYPERPHOSPHATEMIA AND FLUID CONTROL OF HEMODIALYSIS SUBJECTS

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Background and objectives: Nutritional therapy on hemodialysis (HD) is complex and a challenging for patients, since significant changes in eating habits and behavioral patterns are required. Thus, the objective of the present study was to evaluate the impact of change in food behavior on hyperphosphatemia and fluid control of HD individuals.

Methods: This intervention study based in transtheoretical method enrolled 83 HD subjects (55 men/28 women, age: 61 ± 15 years) attended at a Nephrology Center. In the nutritional intervention, three individual consultations and two group meetings were conducted during four months, to achieve improvement of metabolic disorders by change in food behavior. The stages of change were classified as pre-contemplation, contemplation, preparation, action and maintenance, grouped into active (action and maintenance) and inactive (pre-contemplation, contemplation and preparation). Serum phosphorus and interdialytic weight gain (IWG) were collected in the medical records and evaluated before and after the intervention.

Results: At the beginning of the study, 2.4% of the participants were allocated to pre-contemplation, 42.2% contemplation, 28.9% preparation and 26.5% action. After nutritional intervention, 2.4% of patients presented in the pre-contemplation stage, 10.8% contemplation, 26.6% preparation and 60.2% action. The effectiveness of the intervention on stages of change was confirmed by the observed impacts on the metabolic markers. Hyperphosphatemia significantly reduced (41.0 vs. 10.8%, p<0,001). The individuals considered inactive, in relation to the behavioral stage, presented higher IWG in relation to the actives (2.4 ± 1.0 vs. 1.9 ± 0.7 kg, respectively; p = 0.022). In addition, the active presented a reduction in the serum phosphorus concentration after the intervention, when compared to the inactive (4.8±1.4 vs. 4.1±0.8 mg/dL, respectively; p=0,006).

Conclusions: The intervention based on the transtheoretical model promoted a behavior change with increase to action stage (active condition) in HD individuals, which had direct and positive impact on the metabolic markers of important control in HD subjects. Financial support: CAPES, FAPEMIG and CNPq.

Keywords: Transtheoretical model, food behavior, serum phosphorus, interdialytic weight gain, chronic kidney disease.

QUALITY OF LIFE IN OBESITY. DO DEPRESSION-ANXIETY SYMPTOMS ARE PRESENT AMONG OVERWEIGHT AND OBESE PATIENTS MORE OFTEN THAN AMONG PATIENTS WITH PROPER BODY WEIGHT?

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Background and objectives: Depression, anxiety disorders, and obesity are common co-occurring disorders. Psychodietetics

in the scope of overweight therapy shows that psychological desta-bilisation leading to a decrease of individual life quality, frequently results in excessive eating [1]. Due to the scarcity of research on the depression-anxiety disorders expansion in the group of people with BMI≥25, the objective of this paper is to analyse the level of depression and anxiety in a group of obese patients of the Obesity Treatment Ward compared to the group to patients with proper body weight.

Methods: The research covered two equal research groups. The first group included 340 obese female patients of the Obesi-ty Treatment Ward (BMI 36.8, range 25.0-52.4), aged 25-67 years. The second group included 340 female primary patients (BMI 23.9, range 22.3-24.9), aged range 24-67 years. Hospital Anxiety and Depression Scale HADS was used to collect psychological in-formation.

Results: The analysis showed a significantly higher level of depression and anxiety in the HADS scale among overweight or obese persons in comparison to those with proper body weight. In the obese group there was an increase of anxiety level in 31% of patients, including 11% with anxiety at a pathological level. An increased level of depression was recorded among 33% patients, including 15% with pathologically intensified depression symp-toms. For comparison, an increased anxiety level occurred in 14% patients with proper body weight and increased level of depression in 17%. Only 1% of respondents with pathological anxiety or de-pression were recorded in this group.

Conclusions: The results showed significantly higher preva-lence of depression-anxiety disorders among obese people in com-parison to those with proper body weight. Psychological condition may be one of the factors which determine the efficiency and sus-tainability of the lifestyle change associated with the goal of dietary therapy [2]. Therefore, obese people should receive individual psy-chological support during weight loss treatment, due to the level of anxiety and/or depression.

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Keywords: obesity, depression, anxiety

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IMPACT OF DIETARY PROTEIN INTAKE DURING FIRST TRIMESTER OF PREGNANCY ON GESTA-TIONAL DIABETES MELLITUS

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Background and objectives: Dietary intervention is a con-siderable management of gestational diabetes mellitus (GDM). Al-though several dietary factors have been related to GDM risk, ma-jority of studies have previously focused on carbohydrate and fat content and in turn their subtypes, however, the association with dietary protein is still poorly characterized. The objective of the study was to investigate the association of dietary protein intake during first trimester of pregnancy with the incidence of GDM.

Methods: A prospective study was conducted among 573 chinese singleton pregnancy without diabetes from first trimester pregnancy onwards. Dietary information was assessed by using a validated food-frequency questionnaire. To screen GDM, partici-pants underwent an OGTT test during 24-28 weeks of gestation. Logistic regression were used to estimate RRs and 95% CIs for associations of the quintiles of specific protein and the source of protein intakes in early pregnancy with GDM status.

Results: 110 incident cases of GDM were documented. After adjustment for age, parity, family history of diabetes, history of GDM and prepregnancy BMI, across increasing quintiles of animal protein, RRs (95% CIs) for GDM were 1.00 (reference), 2.02 (0.98-1.10), 1.50 (0.73-3.31), 2.39 (1.18-5.07), 2.41(1.16-5.23) (P-trend <0.05) and 1.00 (reference), 1.10 (0.52-2.36), 2.06 (1.04-4.21), 2.69 (1.33-5.62), 1.43 (0.72-2.95) (P-trend <0.1) for red meat.

Conclusions: Higher first trimester of pregnancy intakes of animal protein especially red meat was associated with a greater risk of GDM.

Keywords: gestational diabetes, animal protein, first trimester of pregnancy

Conflict of Interest Disclosure: The authors report no con-flicts of interest relevant to this article.

Further collaborators:

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THE EFFECT OF NUTRITIONAL COUNSELING ON THE DIETARY BEHAVIOR CHANGES OF TYPE 2 DIABETIC PATIENTS

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Background and objectives: Diabetes care needs com-prehensive treatment including medicine, life style change and

healthy eating habit. In Taiwan, diabetic patients treated at medical institutions could participate the diabetes shared care program (DSCP) and received integrated care from physician, diabetes educator, and dietitian. The aim of this study was to investigate the effect of nutritional education during the DSCP.

Methods: A total of 2966 type 2 diabetic patients participated the DSCP in Chang Gung Memorial Hospital from 2011 to 2015 were retrospectively reviewed. There were nineteen items of dietary behaviors recorded in each nutritional counseling (total 8 times). Higher score indicated more ideal dietary behavior. The scores of dietary behaviors were considered as outcome to evaluate the effectiveness of nutritional education. These patients' clinical information and glycated hemoglobin change were also analyzed.

Results: The average summed score of dietary behaviors significantly increased after 8 times education (from 16.0 ± 2.3 to 17.6 ± 1.4). Their glycemic control (glycated hemoglobin) also had improvement along with the increased dietary behavior score (effect size: -0.036, p value < 0.001). Eighteen items of dietary behaviors had significantly increased but one item (Satisfied with food) had decreased in the end of this study. We also found that patients with younger age (≤65 years old), male gender, overweight (body mass index ≥ 24), family history of diabetes, or higher glycated hemoglobin (HbA1c > 7) had lower initial dietary behavior scores. Nevertheless, the patients of these groups with inappropriate dietary behaviors initially had more obviously improvement in scores after education program than those with good dietary behaviors.

Conclusions: Nutritional education was effective to improve the dietary behaviors of type 2 diabetic patients and therefore improve their glycemic control. Especially for those without healthy eating habit, the regularly nutritional counseling would provide most benefit.

Keywords: Type 2 diabetes mellitus, Diabetes shared care program (DSCP), Dietary behavior, Nutritional education

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ASSOCIATION BETWEEN DIETARY HABITS, BODY COMPOSITION INDICES AND HBA1C OF ADULT TYPE-2 DIABETES PATIENTS ATTENDING ROUTINE OUT-PATIENT CLINIC REVIEW: A CROSS-SECTIONAL STUDY

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Background and objectives: Low intake of fruits, vegetables, excessive energy intake and reduced physical activities has been associated with type-2 diabetes (T2DM) and it associated co-mor-bidities. Unhealthy dietary patterns and increased body fat (adiposity), which are associated with increased inflammation, can also serve as a precursor for the development of co-morbidities in patients with T2DM. Good dietary habits such as increased fibre intake are associated with reduction of glycated haemoglobin (HbA1c), improved lipid profile and loss of body weight. Quantification of adiposity and its relation to dietary habits and HbA1c levels are thus important for assessing future health risks and development of T2DM co-morbidities. The objective of the study was to determine the association between dietary habits, body composition and HbA1c of T2DM patients, attending routine out-patient review clinic in Northern-western Ghana.

Methods: A cross-sectional study involving one hundred and seventeen (117) subjects, aged between 35 and 64 years. Pregnant women, subjects with concomitant debilitating illness and impaired memory or cognitive functions were excluded. Dietary habits was assessed with validated FFQ, body composition with Omron Bio-impedance analyser (OMRON HBF-516b, Japan) and % glycated haemoglobin (HbA1c) measured with Quo-lab. Data was analyzed using SPSS version 20. Associations and correlations were determined for all variables of interest using chi-square and significance set at p≤0.05.

Results: Mean age and BMI of participants were 52.9744 ± 8.74097 and 27.5845 ± 4.79002 respectively, with mean % body fat of 35.3835 ± 10.2815, indicating high adiposity. Mean %HbA1c was 9.44783 ± 4.28958 indicating poor glycaemic controls. Dietary habits represented by predictors such as type of Carbohydrate consumed,type of fibre intake and type of fat intake significantly correlated with % body fat (p<0.049) and HbA1c (p<0.041).

Conclusions: Strategies focusing on improving healthy food intake habits which could lead to prevention of excess adiposity and better glycaemic control is urgently required to prevent onset of T2DM complications and co-morbidities.

Keywords: Dietary habit, HbA1c, Type-2 diabetes. Body composition, Northern-western Ghana

NUTRITION AND CANCER IN PRIMARY PREVENTION: NEW INSIGHTS FROM CIRCADIAN REGULATION

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Background and objectives: Circadian disruption, resulting from shiftwork, has been classified as probably carcinogenic to humans by the International Agency for Research on Cancer. The biological circadian clock is subject to environmental effects, particularly light exposure and rhythmic food intake. However, the association between circadian nutritional behaviors and cancers has never been well explored. We investigated the prospective associations between time of the last eating episode, number of eating episodes, night-time fasting duration and the nutritional quality of the last eating episode, with overall, breast and prostate cancer risks.

Methods: This prospective study included 41,389 men and women of the French population-based NutriNet-Santé cohort (2009-2016) who completed at least three 24h-dietary records during the first two years of follow-up. The risk of developing can-cer was compared across different groups using multivariable Cox models.

Results: 1,732 first primary incident cancer cases were diagnosed during follow-up, among which 428 breast cancers and 179 prostate cancers. Late eaters (last eating episode after 9:30 pm) had an increased risk of breast cancer (HR=1.48 (1.02-2.17), p=0.03) and prostate cancer (HR=2.20 (1.28-3.78), p=0.004); on the other hand, early eaters (last eating episode before 7 pm) had a lower risk of overall cancers (HR=0.78 (0.63-0.96), p=0.02). No association was observed between the number of eating episodes, night-time fasting duration and the nutritional quality of the last eating episode, with cancer risk.

Conclusions: This large cohort study suggests that circadian disruption associated with late time of last food intake may be involved in carcinogenesis at different locations. Beyond nutritional quality of food intake, targeting time of food intake might be interesting in cancer prevention.

Keywords: feeding time, cancer risk, circadian rhythm, prospective study

NUTRITION KNOWLEDGE AND DIETARY HABITS OF PATIENTS WITH TYPE-2 DIABETES ATTENDING POST MANAGEMENT REVIEW CLINIC: A CROSS-SECTIONAL SURVEY

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Background and objectives: Chronic diseases such as type-2 diabetes require continuous medical care and ongoing patient self-management education and support to prevent multiple complications and premature mortality. Adequate nutrition knowledge and appropriate dietary habits play key roles in the nutritional management of type-2 diabetes. Therefore, providing adequate nutrition information and skills on indicators such as good diet, adequate physical activities have been shown to improve the well-being of individuals. The objective was to assess the nutrition knowledge and dietary habits of type-2 diabetes patients attending routine clinical review at a regional hospital in Ghana.

Methods: A cross-sectional study consisting of one hundred and seventeen participants recruited using systematic random sampling technique. Structured questionnaire and validated FFQ were used to assessed nutrition knowledge and dietary habits respectively. Data was captured in excel, cleaned and then exported into SPSS version 20 for statistical analyses. Nutrition knowledge was scored using performance-rating scale.

Results: The mean BMI for the female and male participants were 28.59±4.699kgm-2 and 24.96±4.019kgm-2 respectively. Most

participants' (45.3%) nutrition knowledge was below average and generally had poor dietary habits with majority (90%) consuming sweets and high fat food source thrice (3×) daily, indicating poor nutritional status.

Conclusions: Below average nutrition knowledge was associated with poor dietary habits. Type-2 diabetic subjects therefore must be encouraged to take part in nutrition education programs in order to effectively manage their disease condition.

Keywords: Dietary habit, Nutrition knowledge, Type-2 diabetes, Ghana

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PERCEPTION OF CHANGES IN HEALTH CONDITIONS AND LIFESTYLE AFTER PERSONALIZED NUTRITIONAL INTERVENTION: PROCARDIO-UFV STUDY

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Background and objectives: Many nutrition care programs have been performed to treatment of obesity and other cardiometabolic conditions, but the evaluation of related-stages has not been reported. Thus, this study evaluated the perception of the suitability of nutritional treatment activities and lifestyle changes in users of the Cardiovascular Health Care Program, Universidade Federal de Viçosa, Minas Gerais, Brazil (PROCARDIO-UFV).

Methods: The PROCARDIO-UFV is a nutritional intervention program for individuals with cardiometabolic risk who have some connection with the UFV (ReBEC – Id:RBR-5n4y2g). The study included 53 users of the program (31 women/ 22 men, 43.5-15.9 years), all of them with cardiometabolic risk. The subjects answered an evaluation questionnaire based in the Likert Scale regarding to: Process (diet meal plan, orientations and educational actions for health promotion) and Results (information comprehension, lifestyle changes and clinical and metabolic improvement) of the program, according to with the method proposed by Donabedian.

Results: Among the users, 96.2% (n=51) reported having received and understood the diet meal plan passed on during the nutritional treatment; 81.1% (n=43) said that the diet meal plan was adapted to their reality and disease and 94.3% (n=50) said they received some kind of educational material to encourage the adoption of healthy food. In addition, 96.2% (n=51) considered the nutritional treatment to be effective and satisfactory. Finally, the users reported having acquired knowledge about food and healthy lifestyle (94.3%, n=50) as well as having presented clinical-metabolic improvement (88.7%, n=47) and changes in lifestyle (84.9%, n=45), after the nutritional intervention offered by PRO-CARDIO-UFV. Interestingly, there was a negative correlation between the perception of clinical-metabolic improvement by users and reductions of body weight (r=-0,333; p=0,036), waist circumference (r=-0,458; p=0,003) and BMI (r=-0,333; p=0,036) after three months of intervention.

Conclusions: The users have evaluated as satisfactory the methods using by PROCARDIO-UFV in nutritional treatment and health education, at the same time they presented a perception of improvement in clinical-metabolic conditions and lifestyle, with emphasis on a healthier diet. Altogether, our results indicate the importance of personalized nutrition in the treatment of individuals with cardiometabolic risk. Financial support: FAPEMIG, CAPESe CNPq.

Keywords: Cardiovascular Disease, Diet, Health Service, Health Assessment.

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VITAMIN D INSUFFICIENCY AFFECTS CALCIUM ABSORPTION EFFECTIVENESS OF PREBIOTICS

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Background and objectives: Low Ca intake (CaI) is related to osteoporosis among others pathologies. Passive and active intestinal Ca absorption (Abs) is regulated by vitamin D within limits, which compensate for the lesser CaI. Prebiotics also positively affect Ca Abs by selectively increasing acid lactic bacteria's which releases short-chain fatty acids which improve Ca salts solubility by lowering intestinal pH, and favor colonic epithelial cell proliferation. The aim of the present report was to evaluate the effectiveness of prebiotic to absorb Ca in adult rats feeding a low Ca diet and vitamin D insufficiency. Objectives: The effectiveness of Galacto-oligosaccharides/Fructo-oligosaccharides (GOS/FOS®) mixture to increase CaAbs was evaluated in a model of VD insufficiency (-VD) and established osteopenia.

Methods: Female adult Wistar rats were ovariectomized and fed a commercial diet during 15 days postsurgery. Then, rats were divided: 32 fed a diet VD-free (0 IU%) during 45 days to become VD insufficient (-VD) and 16 fed a normal VD diet (100 IU%) (+VD). At day-60, +VD were subdivided in 2 groups and received during 45 days: AIN´93 (control diet)(+VD Ca0.5%); AIN´93 containing 0.3%Ca and 2.5% GOS/FOS® (9:1) (+VD Ca0.3%Prebiotics); -VD were subdivided in 4 groups and received during 45 days: VD free-AIN´93 (-VD Ca0.5%); VD free-AIN´93 contain-

ing 0.3%Ca (-VD Ca0.3%); VD free-AIN´93 containing 0.3%Ca and 2.5% prebiotics (-VDCa0.3% Prebiotics) or VD free-AIN´93 containing 0.3%Ca and prebiotics 5% (-VDCa0.3%:Prebioticsx2). Food intake and faeces (F) were collected to determine Ca intake (CaI) and Ca en feces (CaF). Ca Abs% = CaI – CaF/ CaI x 100.

Results: Ca Abs % as mean±SD: -VDCa0.5%: 32.71±1.74; -VDCa0.3%: 38.33±2.33;

-VD0.3%Prebiotics: 44.71±1.84; -VD0.3%x2Prebiotics: 56.40±1.39; +VD0.3%Prebiotics: 87.45±1.82; +VD0.5%: 67.80±2.21. As expected, VD insufficiency reduced Ca Abs%

(-VDCa0.5% and –D0.3% vs. +VDCa0.5%; p<0.001). Moreover, GOS/FOS® effectiveness was negatively affected (-VD0.3% Prebiotics vs. +VD0.3% Prebiotics; p<0.001). Ca Abs% of free-VD diets containing GOS/FOS® mixture was improved by increasing prebiotic % in the diet (-VD0.3% Prebiotics vs. -VD0.3:2xP; p<0.01).

Conclusions: Under our experimental conditions VD nutritional status affected the effectiveness of prebiotics on Ca Abs.

Keywords: Prebiotics,low calcium intake, vitamin D insufficiency, rats

Further collaborators:
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CARDIOMETABOLIC PREDISPOSITION AT ESCUELA AGRÍCOLA PANAMERICANA ZAMORANO 2016

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Background and objectives: In the bodily composition, fatty components show a tight bond with obesity and the development of non-transmissible chronic diseases. The posed objectives were:

- Assess blood glucose level, cholesterol and blood pressure
- Determined the BMI, % visceral fat, muscle mass and body water
- Link levels of income and physical activity

Methods: It is a descriptive study with a sample of 30-years-old and older 80 voluntary employees (56% female) with three years or more of seniority in Zamorano. An equipment of bioelectric impedance mBCA SECA 514 was used. The sample was estimated with a reliability of 99%, precision of 3% for a bilateral hypothesis adjusted to 5% lost.

Results: Age and seniority averaged 43±9.92 y 15.6±2, respectively. 67% of the women and 63% of the men showed prediabetes. 9% of females and 15% of males presented high levels of CT. 16%

of women and 9% of the men showed diabetes and hypertension. Higher physical activity was linked with higher levels of TAS (r=-0.273, p=0.016). 82% of females and 89% of males presented android obesity, males reported visceral fat percentages of 4.05% in comparison to females (2.69%) (p=0.0022). The muscle media was 25.38Kg in women and 33.5 Kg in men inducing to a Sarcophenic obesity. 77% of the population registered optimum levels of hydration as compared to high levels of hydration in physically active employees. Higher levels of income correlated to a higher T.E.E r=0.8472 p<0.001 and r=0.453 p=0.001and a low physical activity. Lower incomes reported higher P.A.E.E.

Conclusions: The BMI glucose, cholesterol, visceral fat and P.A.E.E revealed that employees are at a high risk of cardio metabolic disease not only affecting their quality of life but also their work performance.

Keywords: diabetes, hypertension, bioelectric impedance, metabolic syndrome

Further collaborators:
ITCH

HOST TRANSCRIPTIONAL RESPONSES FOLLOWING EX VIVO RE-CHALLENGE WITH MYCOBACTERIUM TUBERCULOSIS AMONG A MALNOURISHED POPULATION

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Background and objectives: The identification of immune correlates that are predictive of disease outcome for tuberculosis remains an ongoing challenge. To address this issue, we evaluated gene expression profiles from peripheral blood cells following ex vivo challenge with Mycobacterium tuberculosis (M. tb), among participants with active TB disease (ATBD), latent TB infection (LTBI), and previous active TB disease (after successful treatment; PTBD), relative to controls.

Methods: Study participants with TB were recruited at a rural hospital in India, which has a clinical population with a high prevalence of malnutrition (median body mass index 18.7 kg/m2 [interquartile range 16.8, 22.1]). Peripheral blood mononuclear cells from participants with ATBD (n=10), LTBI (n=10), and PTBD (n=10), and controls (n=10) were infected with live M. tb. Differential gene expression profiles were assessed by suppression-subtractive hybridization, dot blot, real-time polymerase chain reaction, and the comparative cycle threshold methods.

Results: Comparing ATBD to control samples, greater fold-increases of gene expression were observed for a number of chemotactic factors (CXCL1, CXCL3, IL8, MCP1, MIP). ATBD was also

associated with higher IL1B gene expression, relative to controls. Among LTBI samples, gene expression of several chemotactic factors (CXCL2, CXCL3, IL8) were similarly elevated, compared to individuals with PTBD.

Conclusions: Our results demonstrate that samples from participants with ATBD and LTBI have distinct gene expression profiles in response to ex vivo M. tb infection. These findings indicate that there is value in further characterizing the peripheral responses to M. tb challenge as a route to defining immune correlates of disease status or outcome, particularly among populations with a high burden of malnutrition.

Keywords: Mycobacterium
Tuberculosis
Gene expression profiling
Subtractive hybridization techniques

Conflict of Interest Disclosure: E.A.Y., S.H.J., E.C.T., D.G.R., and J.K. have no conflicts of interest. S.M. is an unpaid board member of a diagnostic start-up focused on developing assays for low-cost and point-of-care measurement of certain nutrients from a drop of blood using results from his research as a faculty member at Cornell University.

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TRIGLYCERIDE–GLUCOSE INDEX (TYG INDEX) AS AN INDICATOR OF CARDIOMETABOLIC RISK IN OVERWEIGHT MAN APPARENTLY HEALTHY

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Background and objectives: The detection of insulin resistance in apparently healthy individuals represents an important clinical tool in the prevention of cardiovascular diseases. Recently, the Triglyceride-glucose index (TyG index) was considered a promising marker of insulin resistance associated with the occurrence of cardiovascular events regardless of the presence of other risk factors. This way, the objective of present study was use TyG index for evaluate the insulin resistance and your association with other cardiometabolic risk factor in overweight man apparently healthy.

Methods: This was a cross sectional study performed with 64 overweight man (BMI: 26 - 34,9 kg/m2; 18–50 years) apparently healthy that, after informed consent, gave blood in fasting condition. The volunteers were submitted the anthropometric and cardiometabolic markers measurements. TyG index {TyG= Ln [fasting triglyceride (mg/dL) × fasting plasma glucose (mg/dL)]/2} was used as a measure for to assess the degree of insulin resistance

Results: The volunteers had on average 27,5 ± 0,9 y and BMI 29,7 ± 0,3. Altogether, 61% (n = 39) were overweight and the rest were obese. According to TyG index TyG, 50% (n=32) of the volunteers were insulin resistant (TyG > 4,65). There were significant correlations between the TyG index and fasting glucose (r= 0,640, p<0,001), fasting insulin (r=0,600, p<0,001), total cholesterol (r=0,256, p=0,041), triglycerides (r=0,988, p<0,001), HDL-c (r= -0,450, p<0,001), VLDL-c (r=0,987, p<0,001), LDL-c:HDL-c (r=0,488, p<0,001), total cholesterol:HDL-c (r= 0,685, p<0,001) and Non-HDL cholesterol (r=0,459, p<0,001). There were no correlations between TyG index and weight, BMI or waist circumference. When grouped in resistant and non-insulin resisting using to TyG index, insulin resistant individuals had higher values of BMI (p=0,026), waist circumference (p=0,014), fasting glucose (p<0,001), fasting insulin (p<0,001), total cholesterol (p=0,007), triglycerides (p<0,001), HDL-c (p=0,002), VLDL-c (p<0,001), LDL-c:HDL-c (p<0,001), total cholesterol:HDL-c (p<0,001) and Non-HDL cholesterol (p<0,001) In relation to non-insulin resistant individuals.

Conclusions: The present study demonstrated the efficiency of the TyG index in the identification of insulin resistance associated with cardiometabolic risk in apparently healthy overweight men.

Keywords: Cardiometabolic markers, Overweight man, TyG index.

Further collaborators:
The number of authors did not exceed the allowed total

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K36, A SYNTHETIC CAFFEAMIDE DERIVATIVE, IMPROVES THE PATHOLOGY OF ALZHEIMER'S DISEASE IN STREPTOZOTOSIN AND HIGH FAT DIET-INDUCED TYPE 2 DIABETIC RATS

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Background and objectives: Type 2 diabetes mellitus (T2DM) is a metabolic disease accompanied with hyperglycemia and hyperinsulinemia. T2DM, which is major caused by obesity, characterized with insulin resistance, may result in the metabolic disorder. Epidemiology studies showed that T2DM is a high risk factor of Alzheimer's disease (AD). Previous studies confirmed that caffeamide may improve serum glucose and insulin resistance in diabetic animals. This study aims to investigate the protective effect of caffeamide derivative compound K36 on pathology of AD in the streptozotosin (STZ)-high fat diet (HFD)-induced T2DM rats.

Methods: The male Wistar rats fed HFD (60% fat of calorie) for 4 weeks, then were intraperitoneally (ip) injected STZ (30mg/kg b.w.). After injection, the rats were served HFD continuously for 8 weeks to induce T2DM, and then orally administered with

K36 (15mg/kg b.w.) once a day for 13 weeks. The rats were received cognition test before sacrificing. The blood biochemical analysis was conducted after the rats were scarified. The expression of cerebral hippocampus and cortex insulin signaling, synaptic function protein and synaptic expression related protein were analyzed by western blotting.

Results: The results showed that rats exhibit hyperglycemia (216.8 mg/dl) and hyperinsulinemia (1.53 μg/mL) after STZ injection and HFD feeding for 8 weeks, indicating the induction of T2DM. The serum total cholesterol (TG, p<0.05), serum triglyceride (TC, p<0.05), free fatty acid (FFA, p<0.01) is significantly decreased in K36 treated T2DM rats compared to the T2DM rats (p<0.05). The results from Morris Water Maze task indicated K36 significantly improves the cognition ability in T2DM rats (p<0.05). Western blotting analysis revealed that the protein expression of cerebral insulin receptor substrate-1 (IRS-1), brain-derived neurotrophic factor (BDNF), postsynaptic density protein 95 (PSD-95) in K36 treated T2DM rats were increased compared to the T2DM rats (p<0.05).

Conclusions: In addition, K36 also suppresses the expression of amyloid bata precursor protein (βAPP) and amyloid beta (Aβ) in T2DM rats. According to the above results, we suggest that caffeamide derivative K36 may prevent AD progression via alleviating cerebral insulin resistance and ameliorating synaptic plasticity in STZ-induced T2DM rats.

Keywords: caffeamide derivative, Alzheimer's disease, type 2 diabetes mellitus, cerebral insulin resistance.

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ALPHA LIPOIC ACID ALLEVIATES HYPERLIPIDEMIA AND INFLAMMATION OF VISCERAL ADIPOSE TISSUE IN HIGH FAT DIET PLUS STREPTOZOTOCIN -TREATED RAT MODEL

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Background and objectives: Hyperlipidemia is a symptom commonly occurred in type 2 diabetes mellitus (T2DM). Studies suggest that individuals with both T2DM and hyperlipidemia may increase the risk of cardiovascular disease (CVD)-related complications, such as coronary artery disease. The dysfunction of visceral adipose tissue (VAT) is considered to be associated with insulin resistance and subsequently may result in the lipid metabolism abnormality in T2DM. Evidence indicates that inflammatory related markers are associated with the high serum lipid level. Alpha lipoic acid (ALA) is an endogenous cofactor located in mitochondria. Previous studies reported that ALA has therapy potential on improving hypoglycemia in diabetic rats. This study investigates the effect of ALA on hyperlipidemia in high-fat-diet (HFD) plus STZ-induced diabetic rats.

Methods: Male Wistar rats were fed HFD (60% fat of calorie) for 4 weeks followed by single intraperitoneal injection of streptozotocin (STZ, 30mg/kg), and then served HFD continuously for 8 weeks to induce hyperglycemia. The HFD-STZ-induced diabetic rats were orally administered with ALA once a day at a dosage of 200 mg/kg for 13 weeks. After rats were sacrificed, the serum lipid profiles were measured, the VAT (epididymal and perirenal adipose tissues) was picked up and weighed, and the pro-inflammation related cytokines of VAT were analyzed.

Results: Our results showed that HFD plus STZ treatment results in markedly hyperlipidemia and hyperglycemia in rats. The administration of ALA significantly reduced the levels of fasting serum insulin, total cholesterol, low density lipoprotein, triglyceride and free fatty acid by 55%, 39%, 73%, 68% and 53%, respectively, whereas significantly increased high density lipoprotein level by 1.54 fold in diabetic rats (p<0.05), suggesting the reduction on the risk of CVD-related complications. The relative VAT weight was significantly decreased by 40% in ALA treated diabetic rats (p<0.05), indicating the suppression of lipid accumulation. Moreover, ALA also significantly decreased the levels of pro-inflammatory cytokines such as interleukin 6, tumor necrosis factor-alpha in serum and IL-1β in VAT of diabetic rats (p<0.05).

Conclusions: In conclusion, the present study demonstrates that ALA may have benefits on preventing the progression of hyperlipidemia via ameliorating blood lipid profiles and inflammation of VAT in HFD-STZ-induced diabetic rats.

Keywords: alpha lipoic acid, hyperlipidemia, inflammation, type 2 diabetes mellitus, visceral adipose tissue

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EFFECT OF DIFFERENT DIETARY OIL COMBINED WITH LYCIUM BARBARUM POLYSACCHARIDE EXTRACT ON LIVER FIBROSIS INDUCED BY CCL4 IN RATS

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Background and objectives: The effective therapy for liver fibrosis is still elusive. Olive oil and Lycium barbarum polysaccharides were considered to act as hepatoprotective activity. This study investigated anti-inflammatory and anti-fibrotic effects of olive oil and Lycium barbarum polysaccharide extract (LBE) on CCl4-induced liver fibrosis in rats.

Methods: Male Sprague-Dawley rats were divided into 7 groups: normal diet (N), soybean oil diet (S), olive oil diet (O), soybean oil/olive oil diet (mix oil, M), soybean oil diet + LBE (S+L), olive oil diet + LBE (O+L), and soybean oil/olive oil diet + LBE (M+L). The LBE-treated groups were given 50 mg/kg/day LBE. Except for the N group, other six groups were injected with CCl4 intraperitoneally for 8 weeks.

Results: The results showed that CCl4 caused more severe liver fatty change, necrosis, and fibrosis, and increased plasma activities of aspartate aminotransferase and alanine aminotransferase (ALT), while the groups treated with mix oil or LBE decreased plasma ALT activity compared with the S group or corresponding group without LBE. Compared with the N group, liver interleukin (IL)-10 level was significantly lower in the S, O, and S+L groups, but liver tumor necrosis factor-α (TNF-α) level was not changed in the S group. The mix oil group restored liver IL-10 level compared with the S group, and the LBE-treated groups decreased liver TNF-α level. The N group had significantly higher matrix metalloprotein (MMP)-2 level than other groups. The S group had significantly higher tissue inhibitors of metalloprotein (TIMP)-1 level than the N group, and olive oil or LBE decreased liver TIMP-1 level compared with the S group. Liver hydroxyproline was significantly higher in the O, M, and S+L groups compared with the N group, and olive oil reduced hydroxyproline when LBE was given.

Conclusions: Mix oil and LBE decreased liver injury and inflammation. Olive oil or mix oil combined with LBE inhibited inflammation but improved liver fibrosis partially.

Keywords: olive oil, Lycium barbarum polysaccharides, inflammation, liver fibrosis

Conflict of Interest Disclosure: All authors declare no conflict of interest. The study is supported by the Ministry of Science and Technology, Taiwan (grant no. 105-2320-B-038-036-MY3).

Further collaborators: Prof. Suh-Ching Yang

EFFECTS OF ORAL BALANCED NUTRITIONAL SUPPLEMENT ON INFLAMMATION AND OXIDATIVE STRESS IN HEMODIALYTIC PATIENTS

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Background and objectives: According to the United States Renal Data System 2015 Data Report, Taiwan had the highest prevalence of end-stage renal disease (ESRD) in the world. Inflammation and oxidative stress are risk factors of cardiovascular disease in ESRD patients. Insufficient data show whether intake of oral balanced nutritional supplement can improve inflammation and oxidative stress in hemodialytic patients. Therefore, this study evaluated the effect of oral balanced nutritional supplement on inflammation and oxidative stress in hemodialytic patients.

Methods: One hundred hemodialytic patients were recruited and divided evenly into two groups. The subjects in the control group were kept on their regular diet without supplement. The subjects in the treatment group were assigned one or two packages (43 g per package) of oral balanced nutritional supplement (200 kcal energy, 48% carbohydrate, 32% fat, and 20% protein per package) containing arginine (0.7%, w/w) and glutamine (4.8%, w/w)

daily for 12 weeks based on the recommended energy requirement. Serum interleukin-6 (IL-6), interleukin-10 (IL-10), tumor necrosis factor-α (TNF-α), C-reactive protein (CRP), malonaldehyde (MDA), and total antioxidant capacity (TAC) were measured at weeks 0, 6, and 12.

Results: Serum IL-10 and TAC levels in the treatment group were increased significantly at week 12. Moreover, serum IL-6, TNF-α, CRP, and MDA levels in the treatment group were decreased significantly at week 12. There were no significant differences for inflammatory and oxidative stress markers in the control group at weeks 0, 6, and 12. Increases in serum IL-10 level in the treatment group were significantly greater than those in the control group at week 12 compared with the baseline. Furthermore, decreases in serum TNF-α and CRP levels in the treatment group were significantly greater than those in the control group at week 12 compared with the baseline.

Conclusions: Our results suggest that oral balanced nutritional supplement is effective for anti-inflammation and antioxidation in hemodialytic patients.

Keywords: oral supplement, inflammation, oxidative stress, hemodialysis

Further collaborators: Prof. Shwu-Huey Yang

EFFECTS OF MELATONIN ON GLUCOSE HOMEOSTASIS, ANTIOXIDANT ABILITY AND ADIPOKINE SECRETION IN NA/STZ-INDUCED DIABETIC ICR MICE

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Background and objectives: The relationship between the melatonin and diabetes has been previously investigated. Moreover, supplement of melatonin on obese diabetic rats can improve their metabolic syndromes, such as blood glucose, plasma lipid and adipokine. The aim of this study was to investigate the effects of different dosage of melatonin on glucose hemostasis, oxidative state and adipokine secretion in diabetic ICR mice.

Methods: Mice were divided into five groups, including: control (C), diabetic (D), three dosage melatonin-treated group. Treated group were subdivided into L, M and H that given melatonin respectively 10, 20, 50 mg/kg. Melatonin was dissolved in vehicle (ethanol aqueous solution). After the diabetes induction, the mice were given melatonin or vehicle orally between 17:00-19:00 daily. Oral glucose tolerance test (OGTT) was performed at week 0 and 6. After the six-week-intervention, hepatic and plasma lipid, malondialdehyde (MDA), and anti-oxidative enzyme were analyzed by colorimetric method. Plasma insulin, leptin and adiponectin were measured.

Results: Although none of melatonin-treated group performed reduced glucose level, H group performed significant less increased glucose level and higher insulin level compared to diabetic group (p < 0.05). Treating melatonin could reduce diabetes-increased MDA level in liver and plasma and increase superoxide dismutase activity in liver. Moreover, there were no significant differences in relative fat mass between D and treated group, but melatonin-treated group revealed significant higher adiponectin and lower leptin and leptin/adiponectin ratio compared to diabetic group, especially in H group.

Conclusions: High dosage of daily oral melatonin administration ameliorates the glucose tolerance, oxidative stress and adipokine without affecting fat mass in NA/STZ-induced diabetic mice.

Keywords: melatonin, diabetes, leptin, adiponectin and insulin resistance

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BODY COMPOSITION BY BIOELECTRICAL IMPEDANCE IN A MULTI-ETHNIC POPULATION FROM GERMANY, MEXICO AND JAPAN

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Background and objectives: According to the WHO Expert Consultation, current BMI cut-offs should be retained as an international classification. It is therefore important to consider the impact of race/ethnic differences on clinically meaningful body composition at these cut-offs.

The aim of the study was to analyze ethnic differences in the bioelectrical impedance analysis (BIA) outcome measures fat mass index (FMI), fat-free mass index (FFMI), skeletal muscle mass (SMM), visceral adipose tissue, extracellular/total body water (ECW/TBW), bioelectrical vector analysis (BIVA) and phase angle.

Methods: Body composition was measured (seca mBCA 514/515) in 3,069 healthy adults with a wide range of age and BMI (18-78 y, BMI 13.9–44.3 kg/m²) from Germany, Japan and Mexico (1,048 Caucasians, 995 Japanese and 1,026 Mexican). Regression analyses between BIA outcome variables and BMI were used to predict ethnic-specific reference values for different WHO-BMI cut-off points.

Results: Caucasian men and women had the highest fat free mass (FFM) per fat mass (FM) whereas Japanese and Mexican populations had a lower and similar amount of FFM per FM at an underweight and normal weight BMI. However in obesity, the Japanese phenotype corresponds more closely to the Caucasian body composition. In the Japanese population, phase angle was lower compared with Caucasians (compatible with lower SMM/FFM and higher ECW/TBW) and BIA vector was shorter compared with Mexicans.

Conclusions: Ethnic-specific relationships between BMI and body composition vary with weight status and emphasize the need for ethnic-specific normal values for the diagnosis of obesity, sarcopenia or disturbed hydration.

Keywords: Ethnicity, body composition, BIA, BIVA, reference values

Conflict of Interest Disclosure: Björn Jensen and Michael Maisch are employees of seca

gmbh & co. kg, Hamburg, Germany. The remaining authors declare no conflict of interest.

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LONG-TERM DITYROSINE ADMINISTRATION INDUCES MYOCARDIAL DYSFUNCTION BY OXIDATIVE STRESS

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Background and objectives: Cardiovascular disease is connected with inflammation and oxidative stress. Previous studies indicated administration of oxidized protein impairs antioxidant system in organs. Dityrosine is an oxidative biomarker of acute myocardial infarction and generated during food processing and storage. This studies aim to explore the role of dityrosine in cardiac diseases.

Methods: The rats were administered with dityrosine for 24 weeks. Blood pressure and heart rate were measured. T-AOC, GSH-Px and other oxidative stress markers as well as CK-MB, LDH, AngII, NO, FFA were examined. The ultrastructural features of heart mitochondria were examined under a transmission electron microscope. And quantitative PCR was carried out to examine the expression level of related genes.

Results: Dityrosine administration increases DBP and SBP, but no change in heart rate. CK, CK-MB, LDH, ICTP, PIIINP and FFA were upregulated by dityrosine and NO was downregulated. With dityrosine administration for 24 weeks, the biomarkers of oxidative stress in myocardium such as MDA, AOPP, DT were increased, while T-AOC and GSH-Px were decreased, indicating impaired antioxidant capacity by dityrosine administration. Transmission electron microscopic result suggested the alternation of heart mitochondria ultrastructure induced by dityrosine. Finally, Dityrosine upregulated TNF-α, IL-6 and P38 expression level and downregulated PPARα expression level in myocardium of rats.

Conclusions: These results indicated dityrosine induce oxidative stress in myocardium and reduce myocardial collagen degradation rate, which lead mitochondrial dysfunction and myocardial energy generation.

Keywords: Dityrosine, Oxidative stress, Myocardial dysfunction

Conflict of Interest Disclosure: There are no competing financial interests in relation to the work.

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ESTABLISHMENT OF HEMOGLOBIN MEASURING METHOD FOR THE PREVENTION OF SPORTS ANEMIA IN FEMALE ATHLETES

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Background and objectives: For a female athlete, iron deficiency and anemia is one of the symptoms which remarkably lowers performance, and could cause health impairment. Athletes frequently undergo anemia due to rigorous training, reducing food intake for weight control and destruction of erythrocyte by repeated sole impulse. In addition, menses make it difficult for females to improve anemia.

In this study, we focused on the collegiate female athletes of land jump, volleyball and fencing who often complain anemia, and tried to establish the simple method of measuring the hemoglobin concentration in blood using non-invasive fingertip sensor, in order to monitor the status of iron nutrition easily.

Methods: Subjects were composed of each 27 collegiate female athlete of land jump, volleyball and fencing. The hemoglobin concentration was measured at before training using measuring instrument of non-invasive fingertip sensor (Pront-7). Furthermore hearing investigation was performed to record the physical condition and food intake frequency of one week.

Results: In hearing investigation, the athletes who complained symptom of anemia were70%, 40% and 35% in land jump, volleyball and fencing, respectively. The score of anemia condition negatively correlated with hemoglobin concentration. Hemoglobin concentrations were 12.4±0.2 g/dL, 12.1±0.4 g/dL and 12.9±0.2 g/dL athletes of land jump, volleyball and fencing, respectively. As a result of surveying the meal intake frequency in the athletes of jumping events of athletic competition, there was a positive corre-

lation between the amount of iron, protein or zinc intake per day and hemoglobin level. (iron: r = 0.575, protein: r = 0.630 and zinc: r = 0.661, respectively)

Conclusions: The measurement of hemoglobin using fingertip sensor might be useful option for monitoring the status of iron nutrition to prevent sports anemia.

Keywords: sports anemia, hemoglobin, non-invasive fingertip sensor, protein, iron

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ASSISTING THE MANAGEMENT OF NUTRITION CARE WITH COMPUTER SYSTEMS

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Background and objectives: In the treatment of cancer patients, it is necessary to provide adequate nutritional support. Traditionally, patients' conditions are recorded on paper by physicians, and screening for a nutrition consultation was done manually. However, patients' needs were often neglected due to the lengthy work process. In order to simplify the nutrition consultation process, and further avoid the possibility of missing cancer patients' needs, we set up computer systems to better assist the management of nutrition care.

Methods: The nutrition consultation standard for gastrointestinal tract cancer patients was developed in 2013. The "ICD Code Consultation Standard" for gastrointestinal tract cancer was established as the main consultation guide. When a doctor assigns a patient with a cancer ICD code, the computer system screens and sends a nutrition consultation notice immediately. Dietitians then advise the patient according to the resulting consultation list, providing nutrition care and advice based on the assessment. The nutrition recommendations and intake of these patients are recorded to analyze the effectiveness of nutritional care.

Results: 826 patients were counseled with gastrointestinal cancer nutrition care within 48 hours after consultation from 2013 to 2016. When enteral nutrition (EN) support was inadequate, parenteral nutrition (PN) support was provided as alternative nutritional intervention. The actual calorie intake of patients through EN or PN was recorded and analyzed. During hospitalization, the average percentage of recommended calorie intake increased from 53% to 75% (2013 to 2016), and recommended protein intake increased from 58% to 74% (2014 to 2016).

Conclusions: With improvement in nutritional consultation delivery supported by technology, cancer patients can receive early nutrition intervention, and get better nutrition care.

Keywords: Computer; Nutritional consultation; Gastrointestinal tract cancer

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DIET QUALITY SCORES AND LUNG CANCER RISK: A CASE-CONTROL STUDY OF ADULTS MEN FROM THE NORTH-EASTERN REGION OF POLAND

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Background and objectives: Lung cancer is the most common cause of cancer death in men worldwide [1, 2]. The studies describing the cumulative effect of food consumption on the lung cancer risk are limited. Objective: Assessment of the association between diet quality and risk of lung cancer in men from the north-eastern region of Poland.

Methods: The case-control study involved 339 men aged 29-83 years from the north-eastern region of Poland. Lung cancer was diagnosed in 140 men. On the basis of the food frequency questionnaire (QEB) [3] two diet quality scores were created. Pro-Healthy Diet Index-8 (pHDI-8) included 8 items: fruit, vegetables, wholemeal bread, milk, fermented milk drinks, cottage cheese, fish, legumes. Non-Healthy Diet Index-8 (nHDI-8) included 8 items: sweets, fried food, instant soups, fast foods, canned, sweetened carbonated beverages, energy drinks and alcoholic drinks. Multiple logistics regression analysis was used. Two models were created: crude and adjusted for: age, SES index, overall physical activity, sedentary lifestyle, occupational exposure, smoking, prevalence of cancers in family, BMI, weight change and waist-to-height-ratio.

Results: The odds ratios (ORs) of lung cancer prevalence in comparison to the absence of cancer (OR=1.00) were from 0.37 (95% confidence interval 95% Cl: 0.21-0.65; p<0.001; crude) to 0.25 (95% Cl: 0.12-0.51; p=0.0001; adjusted) in men in the upper tertile of the p-HDI-8. The ORs of lung cancer in comparison to the absence of cancer (OR=1.00) were 0.57 (95% Cl: 0.33-0.98; p<0.05; crude) in men in the upper tertile of the n-HDI-8, but not significant after adjustment.

Conclusions: In men from north-eastern Poland, the high diet quality score characterized by the frequent consumption of the pro-healthy foods strongly reduced the incidence of lung cancer, independently of confounders. The associations between low diet quality score and lung cancer risk was not clear and needs further research. References: [1] Vieira AR et al. Fruits, vegetables and lung cancer risk: a systematic review and meta-analysis. Ann Oncol, 2016, 27(1):81-96. [2] Didkowska J et al. Lung cancer epidemiology: contemporary and future challenges Worldwide. Ann Transl Med, 2016, 4(8):150. [3] http://www.uwm.edu.pl/edu/lidiawadolowska/, available at: 24.03.2017.

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POLISH ADAPTED PRO-MEDITERRANEAN DIET SCORE AND OTHER DIETARY PATTERNS AND BREAST OR LUNG CANCER RISK: A POOLED ANALYSIS OF TWO CASE-CONTROL STUDIES

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Background and objectives: Results: **Methods:** This pooled analysis of two case-control studies involved 560 subjects (280 men and 280 women) aged 40-75 years from north-eastern Poland. Breast cancer in 140 women and lung cancer in 140 men were diagnosed. The food frequency consumption for selected 21 food groups was collected using the FFQ-6 [2]. Three DPs were identified in Principal Component Analysis: 'Prudent', 'Non-Healthy' and 'Dressings and sweetened-low-fat dairy'. The 8-items Pro-Mediterranean diet (Pro-MED) score (range: 0-8 points) included: vegetables, fruit, whole grain, fish, legumes, nuts and seeds, ratio of vegetables oils to animal fat, red and processed meat. Multiple logistics regression analysis was used. Two models were created: crude and adjusted for: age, sex, type of cancer, BMI, SES index, overall physical activity, smoking status and abuse of alcohol.

Results: The odds ratios (ORs) of both cancers prevalence in comparison to the cancer absence (OR=1.00) were 0.37 (95% confidence interval 95%Cl:0.21-0.64;p<0.001; adjusted) and 0.35 (95%Cl:0.21-0.58;p<0.0001; crude) in the top category (6-8 points) of the Pro-MED score and in the upper tertile of the 'Prudent' DP was 0.62 (95%Cl:0.41-0.94;p<0.05; crude), not significant after adjustment. The cancer ORs in comparison to the cancer absence were 1.65 (95%Cl:1.05-2.59;p<0.05; adjusted) and 1.89 (95%Cl:1.25-2.86;p<0.01; crude) in the upper tertile of the 'Non-Healthy' DP. The cancer ORs for the 'Dressings and sweetened-low-fat dairy' DP were not significant.

Conclusions: In Polish adults from northern-eastern Poland, the high adherence to the Mediterranean diet significantly low-

ered the chance of the breast or lung cancer, independently of confounders. The beneficial effect of the Mediterranean diet was stronger than the 'Prudent' pattern. The high adherence to the 'Non-Healthy' pattern increased chance of the breast or lung cancer. References: [1]Schwingshackl L., Hoffmann G. Adherence to Mediterranean diet and risk of cancer: an updated systematic review and meta-analysis of observational studies. Cancer Medicine, 2015, 4(12):1933-1947. [2]http://www.uwm.edu.pl/edu/lidiawadolowska/, available: 25.03.2017.

Keywords: breast cancer, lung cancer, dietary pattern, Mediterranean diet, adults

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THE ASSOCIATION BETWEEN DIETARY CHOLESTEROL INTAKE AND DYSLIPIDEMIA PREVALENCE AMONG ADULTS IN CHINA: FINDINGS FROM THE CHINA HEALTH AND NUTRITION SURVEY

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Background and objectives: There is still controversy about deleting the recommendation of no more than 300mg/d dietary cholesterol for the healthy person. This study aims to examine the dose-response association between dietary cholesterol intake beyond 300mg/d and serum lipids-profile in Chinese adults.

Methods: Data from China Health and Nutrition Survey in 2009, 6,521 adults aged 18 to 65 who had complete diet data, serum lipids and sociodemographic data were selected as the analysis sample. Dietary cholesterol intake was assessed with consecutive 3-d 24-h recall and classified into 6 levels (0-<100mg/d, 100-<200mg/d, 200-<300mg/d, 300-<400mg/d, 400-<500mg/d and ≥400mg/d). The adults were defined as dyslipidemia (including high triglycerides, high total cholesterol, high LDL-C and low HDL-C) according to Guidelines for prevention and treatment of dyslipidemia in Chinese adults revised in 2016.

Results: About 36.4% of the men and 28.3% of the women had at least one abnormal serum lipid and only 21.9% of the men and 26.7% of the women had ideal level of the lipids-profile. The prevalence of high triglycerides, high total cholesterol, high LDL-C and low HDL-C in Chinese adults was 19.3% (men 22.9%

vs. women 16.0%, P<0.05), 8.6%, 10.1 and 10.7% (men 14.1% vs. women 7.5%, P<0.05), respectively. Multivariate Logistic regressions showed that the odds of having high TC and high HDL-C among the adults with dietary cholesterol intake higher than 500mg/d were 1.81 times (95%CI: 1.03, 3.22, p-trend>0.05) and 1.70 times (95%CI: 1.02, 2.81, P-trend>0.05) the odds in the adults with dietary cholesterol intake of 200-300 mg/d after adjusting for all potential covariates, respectively. However, the levels of dietary cholesterol intakes were not associated with the prevalence of high TG and low HDL-C.

Conclusions: it was found that the impact of dietary cholesterol intake on the prevalence of high TC and high LDL-C in Chinese adults may be threshold, rather than linear trend, at the level of 500mg/d or higher instead of limit of 300mg/d Prospective study in this field is needed to confirm the findings.

Keywords: Dietary cholesterol, lipids-profile, dyslipidemia, adults, China

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INTAKE OF ADDED SUGARS AND SATURATED FAT IN HEART FAILURE

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Background and objectives: Heart failure (HF) has high rates of hospitalization and mortality. There is no consensus in the literature whether diets rich in saturated fat and added sugars contribute to the incidence and progression of HF. This study aimed to evaluate if the intake profile of saturated fat and added sugars would be associated with HF.

Methods: The study used data from DIGITALIS, study that estimated the prevalence of HF in the population assisted by the Family Medical Program in Niterói, Rio de Janeiro - Brazil. It was applied FFQ to evaluate the intake of added sugars and saturated fat. HF was diagnosed by clinical examination, electrocardiogram, echocardiogram and B-type natriuretic peptide and the population classified as: healthy (0), no symptomatic with risk factor (A), no symptomatic with functional/structural alterations (B), symptomatic with functional/structural alterations (C) and frequent symptomatic (D). ANOVA test was performed for continuous variables and Chi-Square test for categorical variables, considering p≤0.05 for statistical significance. The intake was evaluated by the recommendation, 10% and 7% of total energy intake for added sugars and saturated fat, respectively, and by quintiles.

Results: Around 59% and 70% of the sample exceeded the recommendation for added sugars and saturated fat, respectively. The analyses for recommendation and last quintile for added sugars and saturated fat together, showed there was no statistically significant difference between HF categories and healthy individuals (p=0.905 and 0.127, respectively). The result was similar in the individualized analysis for grams per day (p=0.115 and p=0.331, respectively) and quintiles (p=0.245 and 0.144, respectively).

Conclusions: The incidence and progression of HF were not associated with intake of added sugars or saturated fat, either above the recommendation or in the last quintile of intake in this population.

Keywords: heart failure, added sugar, saturated fat

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LOW HDL IS ASSOCIATED WITH REDUCED GLOMERULAR FILTRATION RATE IN CHILDREN WITH OVERWEIGHT/OBESITY

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Background and objectives: Several longitudinal studies have found an association between childhood overweight/obesity and the risk of kidney disease. Indeed, the increasing prevalence of kidney disease in children suggests that obesity-related glomerulopathy might begin at early stages of life. Renal hyperfiltration is postulated as one of the early events in obesity-related glomerulopathy. However, decreased, instead of increased, glomerular filtration rate (GFR) has been recognized in some series of children with overweight/obesity. The aim of this study was to evaluate the correlation between the GFR and biomarkers of the nutritional status in children with overweight/obesity.

Methods: Prospective study carried out in 35 children [age: 11(9-13)years] with overweight/obesity who attended the Pediatric Nutrition Unit of the "Complejo Médico Churruca-Visca", Buenos Aires, Argentina. Anthropometric measures were recorded. Z-scores were calculated according to the World Health Organization (WHO) growth charts. GFR was estimated using the Zappitelli combined formula which includes creatinine and cistatin C measurements. Routine laboratory measurements and biochemi-

cal evaluation of selected micronutrients were performed. Differences were evaluated by T or U test and correlations by Pearson or Spearman Correlation test, according to data distribution.

Results: Out of the 35 children studied (18 males), 25 were obese and 10 were overweight. Mean GFR was 97±15 ml/min.1.73m2, range: 76–132 ml/min.1.73m2. GFR was lower in males than females (-15%,p<0.01). Neither insulin resistance markers nor plasma levels of ferritin, vitamin B12 and vitamin D were correlated with GFR. GFR was only significantly correlated with HDL-C (r=0.41,p<0.01). Children with low HDL-C (n=23) presented higher Z-BMI (+16%,p<0.05), triglycerides (+33%,p<0.01) and cistatin C (+22%,p<0.01), as well as lower GFR (-21%,p<0.01) and Vitamin B12 (-30%,p<0.01) than children without low HDL-C. No differences in sex distribution were observed between the children with or without low HDL-C.

Conclusions: In this study of children with overweight/obesity we did not observe GFR values compatible with hyperfiltration (>135 ml/min.1.73m2). Instead, a trend towards lower GFR values was observed in this population. HDL-C was inversely correlated with the GFR. Children with overweight/obesity and low HDL-C may be at increased risk of renal dysfunction. Longitudinal studies are needed to confirm this hypothesis.

Keywords: Obesity, kidney disease, glomerular filtration rate, children, HDL-C.

Conflict of Interest Disclosure: The authors have no conflict of interest

Further collaborators:

The authors thanks the collaboration of the Registered Nurse Beatriz Castillo.

144/928

NUTRITION SCREENING FOR OVER NUTRITION IN ADULTS AGED 18-49 YEARS IN URBAN CITY OF KAMPALA, UGANDA

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Background and objectives: Background: According to WHO findings, Non-communicable diseases (NCDs) primarily cardiovascular diseases, cancers, chronic respiratory diseases and diabetes, are responsible for 63% of all deaths worldwide (36 million out of 57 million deaths), which could easily be prevented through nutrition education and early screening. About 80% of all NCD deaths occur in low and middle income countries in which Uganda belongs. The lack of nutrition education and direct disease screening programs for communities in urban areas, has been a critical gap in the community and national response to lifestyle diseases, especially nutrition related NCDs. Objective: To create awareness on NCDs, bring screening services closer to the urban population in order to promote an economically productive and non-communicable disease free population through Mobile Nutrition clinics; which provide effective community nutrition

screening and education; to ensure early detection, referral and treatment of nutrition- related NCDs in the community.

Methods: A three-day Urban Public Nutrition clinic (4th to 6th/09/2016) was organized by the Human nutrition students at Kampala Railway ground. Services provided included screening for 1) Malnutrition using anthropometry, 2) Random blood sugar test to screen for diabetes and 3) Blood pressure measurement. 4) Nutrition education using IEC materials, food demonstrations using the food pyramids, counseling and referrals.

Results: A total of 534 (77.7%, Males & 22.3%, Females) adult participants assessed, 41.7% had BMI above normal (>24.9 Kg/m2). Of these, 66.7% had high blood sugar levels and 49.6% had raised systolic blood pressure. They were counseled and referred to hospitals for treatment.

Conclusions: Conclusion: High incidence of NCDs among overweight urban population living in Kampala. Bringing services closer to Kampala urban population would help create awareness, educate and identify NCDs cases early and save lives.

Keywords: non- communicable diseases, mobile nutrition clinic, screening, Urban areas and over nutrition.

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POTENTIAL RENAL ACID LOAD: A DIETARY PREDICTOR OF SERUM URIC ACID

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Background and objectives: Experimental studies indicated that a reduction of dietary acid load, e.g., by an increased consumption of fruits and vegetables, leads to increased renal uric acid excretion and reduced serum uric acid (SUA) levels. Against this background we examined the association between dietary potential renal acid load (PRAL) and SUA in a representative sample of the German adult population.

Methods: Cross-sectional analyses were performed in n=6894 participants (18-79y) of the German Health Interview and Examination Survey for Adults (DEGS1). Dietary intake was assessed by a food frequency questionnaire (FFQ). Nutritive acid load and the intake of uric acid equivalents (UAE) were characterized by assigning PRAL and UAE values, respectively, to the reported food consumption. Multiple linear regression models were used to analyze the association of PRAL, UAE and relevant food groups with SUA. Multiple logistic regressions were used to calculate the odds ratio (OR) for hyperuricemia comparing lower (T1) and upper (T3) tertiles of the predictors.

Results: After adjusting for relevant confounders, PRAL (p=0.003), alcohol (p<0.0001), UAE (p=0.03) and meat intake (p=0.003) were positively associated with SUA whereas the intake of fruits & vegetables and of milk products was inversely associated (both p<0.0001). Subgroup analyses among participants without interacting medication use largely confirmed these results. Additionally, participants with lower PRAL had lower odds for hyperuricemia (OR=0.60, 95% CI: 0.43-0.83).

Conclusions: Apart from substantiating known dietary influences on SUA, a low PRAL shows itself as a potentially SUA-reducing dietary pattern. This strengthens the importance of dietary alkalization as a future nonpharmacological tool to treat elevated SUA levels and gout.

Keywords: Dietary acid load, potential renal acid load, serum uric acid, nutrition, DEGS1

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ASSESSING THE IMPACT OF DIETARY PATTERNS, ANTHROPOMETRICS, AND LIFESTYLE ON CARDIAC RHYTHM: RESULTS FROM THE HEART RHYTHM AND OBESITY PREVENTION (HEARS) STUDY

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Background and objectives: Cardiac rhythm abnormalities are well known to be predictors of severe, life-threating, cardiac arrhythmias, especially in patients with underlying cardiovascular diseases. In recent years, it has been suggested that eating habits may affect cardiac rhythm and the chance of developing rhythm abnormalities. However, evidence are controversial and inconclusive. The aim of the present study was to inspect relationships among lifestyle, dietary patterns, and anthropometrics with heart rhythm (Heart Rate Variability (HRV), Premature Ventricular and Atrial Complexes (PVC and PAC)), in patients undergoing Holter monitor.

Methods: The Heart Rhythm and ObeSity Prevention (HEARS) study is a cross-sectional investigation enrolling sub-

jects undergoing Holter monitor. Socio-demographic characteristics, body composition (full-body bioimpedentiometry), 24-h dietary recall, and quality of life were assessed. Generalized Additive models, considering a Zero Adjusted Gamma distribution (accounting for outcomes' skewness), were estimated to assess the relationship between outcomes of interest and variables collected.

Results: The study enrolled 121 patients, showing a median of 33 PVC (1-400; I-III quartiles) and 39 PAC (9-224; I-III quartiles), registered by Holter monitor. At multivariate analysis, fruit consumption was directly associated with HRV (p-value 0.044), while higher BMI was associated with lower HRV. PVC showed significant direct association with age (p-value 0.005), intake of grain-based product (p-value 0.001), snacks (p-value 0.063), and sugars (p-value 0.013); while fruit intake was significantly inversely associated with PVC (p-value 0.024). Regarding anthropometrics, mass of body fat was in a direct relationship with PVC (p-value <0.0001). Aging and cardiovascular comorbidities were significantly associated with PAC. Regarding dietary intake, condiments and sauces raised the likelihood of PAC (p-value 0.01), while protein food consumption was significantly inversely associated to PAC (p-value <0.0001).

Conclusions: These findings highlighted that anthropometrics, lifestyle, and nutrition are associated with cardiac rhythm abnormalities, and that factors importance changed according with outcome considered. Despite the need of further studies to better characterize the contribution of such factors to cardiac rhythm abnormalities, these findings might be useful to improve the management of patients attending cardiac rhythm labs, in order to tailor ad hoc prevention strategies (modification of lifestyle and eating habits) based on Holter parameters.

Keywords: Heart Rate Variability, Premature Atrial Complex, Premature Ventricular Complex, Eating habits, Adiposity

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BODY COMPOSITION, ANTHROPOMETRIC MEASURES AND CLINICAL-NUTRITIONAL PARAMETERS OF PEOPLE LIVING WITH HIV/AINDS WITH CLINICAL DIAGNOSES OF HIV-ASSOCIATED LIPODYSTROPHY SYNDROME SUBDIVIDED BY GENDER

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Background and objectives: HIV-associated lipodystrophy (HALS) is characterized by morphological changes due to fat tissue heterogeneous disorders, with body fat redistribution associated or not to metabolic alterations. Such alterations are consequences of the chronic inflammatory state due the viral infection and the usage of specific therapy to treat the sickness. The HALS is described as a syndrome which consider the fat loss and/or accumulation, classified in three subtypes. The impairments due these metabolic and morphological alterations go beyond esthetic consequences, once there may be an increased risk to the development of other disturbances, such as the Metabolic Syndrome (MS). Considering the existence of body composition differences per gender, the objective of the present study was to verify, among genders, the clinical-nutritional and anthropometric differences of people living with HIV/AINDS with clinical diagnoses of HALS.

Methods: The study was observational and transversal, with its sample selected by convenience and performing clinical immunological characterization, anthropometric assessment, nutritional diagnosis, body composition of PLHA during the follow-up of specialized outpatient service in infectiology with a clinical HALS diagnosis from July 2015 to July 2016, in regular ART use for at least a year, ranging from 18 to 60 years old. Pregnant women, people with chronic kidney failure, nephrotic syndrome, B and C virus chronic infection, uncontrolled hypothyroidism were excluded from the study.

Results: Forty individuals were distributed equally by gender, with age of 45,5 ± 8,2 years, diagnostic time of 15,3 ± 6,2 years and antiretroviral therapy usage time of 13,8 ± 5,7 years. The results showed significant difference on lipid profile to female gender, with increased values, exce-pt for HDL-cholesterol. No statistical differences were observed for fasting blood glucose and clinical-immunological parameters between genders.

Conclusions: Despite the lack of differences, body fat and anthropometric indicators presented higher alterations among women living with HIV/AIDS. Lipid profile significant alterations and high body fat values (even without statistical significance) among women suggests an increased risk for cardiovascular diseases when compared to men in the aforementioned population, highlighting the importance to adopt different follow up strategies for those patients.

Keywords: People living with HIV/aids, lipodystrophy, body composition, metabolic syndrome.

Further collaborators:

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THE ASSOCIATION BETWEEN DEPRESSION AND FOOD INSECURITY STATUS IN TWO IRANIAN ETHNIC GROUPS LIVING IN NORTHWEST OF IRAN

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Background and objectives: Studies approve that Food insecurity (FI) influences on mental health. Minor ethnic group may experience higher level of FI and this situation may be related with higher depression prevalence. The aim of this study was to determine the association of depression with general and central obesity in major (Azeri) and minor (Kurd) ethnicities living in Urmia, West Azerbaijan, Iran.

Methods: In this cross-sectional study, 723 participants (427 women and 296 men) aged 20–64 year old, from two ethnic groups (445 Azeri and 278 Kurd) were selected through a multi stage cluster systematic sampling. Depression rate was assessed by "Beck" short form questionnaire (validated in Iranians) through interviews. Household food insecurity status (HFIs) were measured using adapted household food insecurity access scale through face-to-face interviews at homes. Multinomial logistic regression was used to estimate odds ratios (OR) of depression across HFIS.

Results: Higher percent of Kurds had moderate and severe depression in comparison with Azeri group (73[17.3%] vs. 86[27.9%]). There was not any significant differences between the two ethnicities in mild depression. Also, of all the subjects, moderate-to-sever FI was more prevalent in Kurds (28.5%), compared to Azeri group (17.3%) [P<0.01]. IN Kurd ethnic group who were food secure or with mild HFI had lower chance to have sever depression (OR=0.097; 95% CI: 0.02-0.47) in comparison to those with sever FI. However, there was no significant association between depression and HFI in Azeri group.

Conclusions: Findings revealed that the severity of HFI was related with severity depression in minor studied ethnic groups. However in Azeri ethnicity as a major group other confounders may have influence on the relation with depression and FI that not controlled in the present study.

Keywords: depression, food insecurity status, ethnicity, Iran

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ANTHROPOMETRIC AND BIOCHEMICAL PROFILE OF PATIENTS AT THE TIME OF DIAGNOSIS OF HEPATITIS C: A CASE-CONTROL STUDY

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Background and objectives: Currently 170 million people worldwide are infected with the hepatitis C virus, the biggest cause of viral hepatitis. The objective of our study was to evaluate the differences between the anthropometric and biochemical profile of patients with hepatitis C diagnosis and controls from the Polyclinic Piquet Carneiro (Rio de Janeiro, Brazil).

Methods: Case-control study. Patients were recruited at the time of the diagnostic examination of hepatitis C. We included 99 adult patients with positive diagnosis. The 50 controls were recruited among people without hepatitis C at the time of routine exams. The individuals were weighed and measured. Blood samples were collected for the determination of total cholesterol, HDL cholesterol, LDL cholesterol, triglycerides, total bilirubin (TB) and direct bilirubin (DB), glutamic oxalacetic transaminase (GOT), glutamic pyruvic transaminase (GPT) and iron.

Results: Most of the subjects were overweight and obese, 40.8% and 24.5% of the patients, and 36.9% and 27.2% of controls respectively. total cholesteroland LDL were significantly higher in control subjects (Md 196.00 mg/dL -IQ 123.00-343.00) and (Md 118.00 mg/dL-IQ 43.00-256.00), when compared to patients with hepatitis C (Md 170.50 mg/dL-IQ 108.00-314.00) and (Md 93.00 mg/dL-IQ 31.60-225.00). The levels of TB, DB, AST, ALT and iron were lower in the controls when compared to patients with hepatitis C. In the final model, adjusted for age and presence of comorbidities, TB (p 0.02), DB (p 0.02), AST(p <0.01) and Iron (p 0.04) remained significantly lower in the controls.

Conclusions: Overall, These results demonstrated that patients do not have significant anthropometric alterations at the

time of diagnosis of hepatitis C, but already present significant alterations in the biochemical markers. These results reinforce the importance of the composition of biochemical and anthropometric indicators for a correct diagnosis.

Keywords: Hepatitis C; Anthropometry; Biomarkers

NUTRITIONAL CHARACTERISTICS AND QUALITY OF LIFE OF PATIENTS SUBMITTED TO ROUX-EN-Y GASTRIC BYPASS

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Background and objectives: In some cases, bariatric surgery may be an alternative treatment for obesity, which may contribute to weight loss and control comorbidities, but may also lead to food intolerances. The objective of this study was to evaluate the nutritional characteristics and quality of life of patients undergoing bariatric surgery.

Methods: 39 patients who are in treatmente in a multidisciplinary center and who met these inclusion criteria were enrolled: consent to participate in the research, performance of Gastric bypass Roux-en-Y technique and age between 18 and 59 years. Personal and clinical data were obtained through interview and consultation in medical records and anthropometric measures and dietary reviews were do by a nutritionist. The quality of life evaluation was done by the BAROS protocol.

Results: 87.2% of the participants were females and a mean age of the population was 37.2 ± 8.7 years. The mean preoperative body mass index was 45.1 ± 7 kg / m² and a percentage of preoperative weight adequacy corresponded to $204.3 \pm 25.9\%$ for women and 236.4 ± 47, 3% for men. Of the 22 patients who reported comorbidities on preoperative, 91% had disease resolution. The mean percentages of excess weight loss according to the postoperative period were, respectively, $24.9 \pm 8\%$ (up to 3 months), $52 \pm 13\%$ (4 to 11 months) and 62.3 ± 15, 9% (1 year or more). The median postoperative time was 7 months and the minimum and maximum values were 1 to 24 months, respectively. All patients underwent multidisciplinary treatment before and after surgical intervention. The dietary assessment indicated that 23% of the individuals presented intolerance to red meat, 18% did not accept chicken meat and 5.1% had difficulty consuming fish. The vegetables were not accepted by only 2 participants (5.1%). 53.8% of the participants obtained the maximum score in the BAROS Protocol, classifying their quality of life as excellent.

Conclusions: Surgery promotes progressive weight loss and resolution of comorbidities, and although there are certain food intolerances, especially with animal protein items, quality of life is considered excellent by the majority of the patients operated on.

Keywords: Gastroplasty. Obesity. Nutrition assessment. Quality of life.

Further collaborators:
UNIFRAN (University of Franca) and UNIMED Franca.

ENTERAL NUTRITION IN CRITICALLY ILL ADULTS: ARE THE PRESCRIPTION AND THE NUTRIENT DELIVERY ACCORDING TO THEIR REQUIREMENTS?

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Background and objectives: Identify factors that impede the delivery of enteral nutrition, and assess the amount of nutrients prescribed, required, and actually delivered for critically ill adults.

Methods: In a prospective cohort study 55 consecutive patients aged 58.2 ± 11.4 years, who received enteral nutrition for > 2 days through gastric or post-pyloric tubes, were followed from admission until the first 15 days of nutritional delivery. The amounts of prescribed / delivered energy were recorded daily and compared with basal metabolic rate (goal energy) according to the recommendations of WHO (1). The reasons for cessation of enteral feeding were evaluated. The prognostic score The Acute Physiology and Chronic Health Evaluation (APACHE II) (2) and Simplified Acute Physiology Score (SAPS II) was used at admission.

Results: The mean caloric intake was 19.5 ± 8.8 kcal/kg/day, 60% of the median caloric amount required, and 85% of the prescribed. The ratio delivery/required was > 90% of the goal energy in only 44% of enteral nutrition days (164/370). Low prescription rate was the predominant reason for not achieving the goal energy in the first five days of enteral nutrition; after this study point, other factors were associated. In bivariate analysis, factors significantly associated with low energy delivery were: APACHE II > 14, gastrointestinal complications, use of adrenergic vasoactive drugs regardless of the dose with which the patient is. When the logistic regression model was applied, only the use of adrenergic vasoactive drugs was a independent and significant factor (p=0,043).

Conclusions: The prescription and delivery of energy were not appropriated in > 50% of enteral nutrition days. Among the factors analyzed, a low rate of enteral nutrition prescription and the use of adrenergic vasoactive drugs showed association with low energy delivery.

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ENTERAL NUTRITION IN SEPTIC SHOCK IN THE ELDERLY: DO THE TIME ELAPSED UP TO THE START AND THE ACHIEVED BASAL ENERGY EXPENDITURE INTERFERENCE IN MORTALITY?

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Background and objectives: The earliest start point of the enteral nutrition (EN), as well as the basal energy expenditure (BEE) achieved in a time space as short as possible seem to benefit a good amount of critical patients.

Objectives: To analyze the time to start the EN and the BEE achieved in the elderly interned with a septic shock diagnose and to verify the association with mortality in these patients.

Methods: Prospective cohort hold within 32 months and with 67 patients over 65 years-old in ICU with septic shock where 59 of those had EN. The APACHE II score was carried out in every patient. The following variables were analyzed in this group: the time taken to start the NE, the BEE (achieved or not), the time to reach the BEE in those who got it. These variables were correlated with death and it was still observed if there was correlation between the start time point of EN and the achieved BEE. The statistics tests used were: T test and chi-square, considering 5% as the significance level.

Results: The average age was 80 + 7 (min.= 66, max.= 96), the APACHE II average was 18 + 5 (min.= 8, max.= 28), and the time average to start EN was 80 ± 53 h (min. de 12 h e max. de 240 h). The achieved BEE occurred in 69,5% (n= 41) of the patients and the time average to reach it was 115 ± 56 h (min. de 72 h e max. de 360 h). Death was associated with time to start EN (p= 0,001) and with the non-achieved BEE (p< 0,001). However, there was no correlation with time to reach BEE (p= 0,22). The time to start EN did not show association with the achieved BEE (p= 0,08).

Conclusions: The EN initiated as soon as possible and the BEE when achieved in this group of patients showed some benefit. The time to achieve the BEE seems not to have correlation with mortality in these patients. The time to start NE did not have association with the BEE achieved in this sample.

Keywords: Septic shock, Enteral nutrition, Start nutrition, Mortality

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HIGH -PROTEIN DIETARY PATTERN INCREASED A RISK OF IMPAIRED GLUCOSE TOLERANCE: THE OHASAMA STUDY

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Background and objectives: To determine the association between dietary patterns identified via a validated food frequency questionnaire (FFQ) and the risk of impaired glucose tolerance in community-dwelling adults.

Methods: We followed 798 participants who did not take medication for diabetes treatment and less than 5.4% of HbA1c, completed a self-administered questionnaire at baseline, and participated at least one identical follow-up health check-ups, and who did not develop diabetes (start of medication for diabetes and/or HbA1c 6.5% or more) during the follow-up period. In this study, impaired glucose tolerance was defined as HbA1c concentrations of 5.4-6.4%. The association of dietary patterns with impaired glucose tolerance was examined logistic regression analysis with adjustment for potential confounding variables.

Results: During the follow-up period, we identified 378 incident cases of impaired glucose tolerance. Using principal component analysis and dietary data collected through a FFQ, we identified three major dietary patterns: Japanese, high protein, and western breakfast. After adjustment for potential confounding variables, the highest quartile of the high protein pattern was 1.59 times higher risk of developing impaired glucose tolerance (95% confidence interval 1.06-2.40). Other dietary patterns were not appreciably associated with impaired glucose tolerance.

Conclusions: Our findings suggest that high protein dietary pattern may be related to increasing the risk of impaired glucose tolerance in Japanese populations.

Keywords: dietary pattern, impaired glucose tolerance, community-dwelling adults

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SYSTEMIC RESPONSES OF METHIONINE RESTRICTION IN MICE WITH HIGH FAT DIET BY METABOLOMIC STUDIES

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Background and objectives: Dietary methionine restriction shows many beneficial effects on health including extends mean and maximum lifespan, improves insulin sensitivity and reduces adiposity, and reduces reactive oxygen species generation and oxidative stress. However, the systemic responses of high fat diet mice to dietary methionine restriction remain largely unknown. This study aims to investigate the effects of dietary methionine restriction on the systemic metabolism of high fat diet C57BL/6 mice.

Methods: Mice were fed with a high fat diet containing either 0.86% methionine or 0.17% methionine for 22 consecutive weeks. We analyzed the metabolic alterations in mice plasma and urine using 1H NMR-based metabonomics approaches and coupled with multivariate data analysis methods.

Results: We found that dietary methionine restriction caused significant level elevation for albumin, 3-hydroxybutyrate, acetoacetate, citrate, glycerophosphorylcholine, propionate, isobutyrate, ethanol and decline for tyrosine, 1-methylhistidine, lipids (-CH2-, CH2C=C, =CCH2C=), unsaturated lipids, α-glucose, β-glucose, trimethylamine-N-oxide, N-acetyl glycoprotein, O-acetyl glycoprotein in mice plasma. Dietary methionine restriction also caused elevation of citrulline, 3-hydroxybutyrate, acetoacetate, acetone, succinate, α-ketoglutarate, lactate, propionate, valerate, sarcosine, succinimide, taurine in mice urine together with depletion of 2-keto-isovalerate, urea, N-methylnicotinamide, trimethylamine, trimethylamine-N-oxide, allantoin, indoxyl sulfate, 4-hydroxyphenylpyruvate, 2-(4-hydroxyphenyl) propanoate.

Conclusions: These observations indicated that dietary methionine restriction caused widespread systemic metabolic changes, including reduced catabolism of amino acids, increased energy expenditure (enhanced fatty acid oxidation, glycolysis and tricarboxylic acid cycle metabolism), reduced oxidative stress and inflammation, altered gut microbiota functions, reduced the risk of atherosclerosis and vascular disease, and improved learning and memory. These findings provide a comprehensive insight into the biochemical consequences and metabolic responses to dietary methionine restriction in high fat diet mice.

Keywords: Methionine restriction, High fat diet, Metabonomics, Nuclear magnetic resonance

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EFFECTS OF METHIONINE RESTRICTION ON THYROID HORMONES AND SKELETAL MUSCLES MITOCHONDRIAL CONTENT AND FUNCTION IN HIGH-FAT DIET MICE

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Background and objectives: Dietary methionine restriction (MR) limits fat deposition and expends lifespan without food restriction. Our objective was to investigate the effects of methionine restricted high-fat diet on thyroid hormones and skeletal muscle mitochondria content and function in mice.

Methods: A total of twenty-seven male C57BL/6 mice were randomly divided into control feeding diet (CON), high-fat diet (HFD) and methionine restricted-high fat diet (MR-HFD). In 22th week, the energy metabolism was measured by comprehensive laboratory animal monitoring system (CLAMS). Thyroid gland histological analysis was performed by microscopy. The plasma levels of lipids, thyroid hormones and the skeletal muscle levels of deiodinase 2 (Dio2) activity, mitochondrial membrane potential (MMP), ATP content were detected. Mitochondrial DNA copy number, relative mRNA expression of Dio2, mitochondrial biogenesis related genes PGC-1α, Tfam and ATP6 were determined by quantitative reverse transcription-polymerase chain reaction.

Results: Compared to HFD group, the average body weight was significantly decreased by methionine restriction (P<0.05), while the level of energy intake and energy expenditure were significantly increased (P<0.05). In plasma, methionine restriction significantly decreased the level of lipids (P<0.05), while the level of thyroid hormones was significantly increased (P<0.05). In skeletal muscle, the level of Dio2 activity, MMP, ATP, mitochondrial DNA copy number and the mRNA expression of Dio2, PGC1α, Tfam, ATP6 were significantly increased in MR-HFD group than those in HFD group (P<0.05).

Conclusions: Methionine restriction may enhance skeletal muscle mitochondria content and function by increasing T3 profited from both improvement of thyroid gland function and the high expression of skeletal muscles Dio2 in high fat diet mice. As a consequence, the energy metabolism of skeletal muscle was accelerated and the weight of mice was reduced.

Keywords: Methionine restriction, Skeletal muscle, Deiodinase 2, Thyroid hormones, Mitochondria

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COMBINED INTERVENTION OF METHIONINE RESTRICTION AND COLLAGEN PEPTIDES ON LIPID METABOLISM AND OXIDATIVE STRESS IN HIGH-FAT DIET-FED MICE

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Background and objectives: Methionine restriction and collagen peptides are different dietary intervention that both reduces adiposity and improves oxidative stress. Our present objective was to elucidate the combined intervention of methionine restriction and collagen peptides on lipid metabolism and oxidative stress in high-fat diet-fed mice.

Methods: Thirty-six male C57BL/6 mice were randomly equally divided into normal diet (ND) group, high-fat diet (HF) group, high-fat with methionine-restricted diet (MR) group, or MR diet supplemented with 1% collagen peptides (PMR) group, respectively. Mice were fed for 22 weeks. Plasma lipid profiles were examined. The concentrations of total cholesterol (TC) and triglyceride (TG), the levels of total antioxidant capacity (T-AOC), glutathion peroxidase (GSH-Px), malondialdehyde (MDA) and reactive oxygen species (ROS) in liver were determined. The mRNA expressions of FAS, ACC-1, SREBP1c, CYP7A1, CPT1 and PPARα in liver were assayed by real-time PCR.

Results: Compared to HF, MR significantly decreased the body weight, the concentrations of TG and TC in plasma and liver, the levels of MDA and ROS in liver, the expressions of FAS, ACC-1 and SREBP1c in liver. MR significantly increased T-AOC and GSH-Px activity in liver, the expressions of CYP7A1, CPT1 and PPARα in liver. Compared to MR, PMR significantly decreased the body weight, the concentrations of TG and TC in plasma, the concentration of TG in liver, the expressions of SREBP1c and ACC-1 in liver. Meanwhile, the activity of GSH-Px and the expressions of PPARα and CPT1 in liver were increased.

Conclusions: Dietary methionine restriction can significantly decrease plasma lipid profiles and liver fat content, enhance antioxidant capability in high-fat diet-fed mice. Combined intervention of collagen peptides and methionine restriction can more effectively increase the antioxidant capacity, decrease plasma lipid profiles and liver fat content.

Keywords: Methionine restriction, Collagen peptides, Lipid metabolism, Oxidative stress

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NON-PROCESSED RED MEAT CONSUMPTION IS ASSOCIATED WITH A LOWER RISK OF A FIRST CLINICAL DIAGNOSIS OF CENTRAL NERVOUS SYSTEM DEMYELINATION

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Background and objectives: The evidence associating red meat consumption and risk of multiple sclerosis (MS) is inconclusive. We tested associations between non-processed and processed red meat consumption and risk of a first clinical diagnosis of CNS demyelination (FCD), a common precursor to MS.

Methods: We used food frequency questionnaire data from the 2003-2006 Ausimmune Study (272 cases, 519 controls), an incident case-control study examining environmental risk factors for FCD. We calculated non-processed (beef, veal, lamb, pork) and processed (ham, bacon, salami, sausages) red meat density as grams of meat intake per 1000 kcal of energy intake per day. Red meat density was categorised into quartiles based on the thresholds for control participants. Logistic regression models were adjusted for age, sex, geographical region, smoking, vitamin D status, history of infectious mononucleosis, education and dietary misreporting (n=746).

Results: Compared with those in the lowest quartile of non-processed red meat density, the risk of FCD was 5% lower for those in the second quartile (OR=0.95; 95%CI 0.63,1.45; p=0.826), 39% lower for those in the third quartile (OR=0.61; 95%CI 0.39,0.95; p=0.030), and 38% lower for those in the highest quartile (OR=0.62; 95%CI 0.39,0.98; p=0.041). The results suggest a non-linear protective association between non-processed red meat density and risk of FCD, with beneficial effects for non-processed red meat density above 35 g per 1000 kcal/day, and similar effects for the top two quartiles. For a diet consisting of 2000 kcal/day, the strongest FCD risk reduction (approximately 40%) equates to a non-processed red meat consumption of at least 70 g/day. We found no statistically significant associations between processed red meat consumption and risk of FCD.

Conclusions: Our results suggest a possible protective effect of higher non-processed red meat consumption and risk of FCD. Further investigation is warranted to understand the important components of a diet that includes at least 70 g of non-processed red meat per 2000 kcal for lower FCD risk.

Keywords: Multiple sclerosis, diet, red meat, processed meat, Ausimmune Study

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EFFECTS OF ALLIUM HOOKERI LEAF ON PLASMA GLUCOSE AND LIPID PROFILE IN STREPTOZOTOCIN INDUCED DIABETIC RATS

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Background and objectives: Diabetes mellitus has been one of major health risks in industrialized countries. The first burden of disease is diabetes mellitus in Korea. Allium hookeri (AH) has been used as food and medicine in Southeast Asia. We used AH leaf grown in Korea as an experimental material. This study was designed to examine the effects of AH leaf on plasma glucose and lipid profile in streptozotocin (STZ) induced diabetic rats.

Methods: Diabetes mellitus was induced in male Sprague-Dawley rats through injection of STZ dissolved in citrate buffer into tail veins at a dose of 45 mg/kg body weight (BW). Sprague-Dawley rats were fed an AIN-93 recommended diet and the experimental groups were fed a modified diet containing 5% and 10% of AH leaf powder for 4 weeks. The experimental groups were divided into four groups, consisting of a normal control group, STZ-control group, and diabetic groups fed with AH 5% & 10%. Rats' body weights, organ weights, plasma glucose, total cholesterol, HDL-cholesterol, triglyceride (TG), and free fatty acid (FFA) values in plasma were measured along with hematocrit (Hct) values and aminotransferase activities.

Results: The organ weights/100g BW of kidney and liver in the STZ-AH 5% and 10% diabetic groups were significantly decreased compared to the STZ-control group. Plasma glucose was significantly reduced in the STZ-AH 10% diabetic group. HDL-cholesterol significantly increased while FFA significantly decreased in the STZ-AH 10% diabetic group.

Conclusions: These results indicate that supplementation with Allium hookeri leaf maybe beneficial in management of diabetes mellitus as a potential therapeutic candidate.

Keywords: Allium hookeri, STZ diabetic rats, plasma glucose, lipid profile.

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THE EFFECT AND MECHANISM OF OAT BETA-GLUCAN ON TYPE 2 DIABETES MELLITUS BASED ON GUT MICROBIOTA

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Background and objectives: It's aims to evaluate the relationship between oat beta-glucan and the rats with T2DM from the gut microbiota's point of view.

Methods: A model of SD rats with high fat diet-induced combined low dose STZ was used. AIN93G diets containing 0.275%, 0.55% and 1.1% oat beta-glucan were supplied to normal or diabetic rats for 10 weeks. The proinflammatory and inflammatory markers such as serum lipopolysaccharide, TNF-a, IL-6 were measured using commercially availbale ELISA kits. Expression of CD14 and Toll-like receptor in serum and skeletal were measured by western blot analysis. Gut microbiota were assessed by stand plate counting method and 454 genesanalysis.

Results: After 10 weeks feeding, comparing with the model control, the food consumption of 1.1g/kg*bw oat beta-glucan rats was significantly decreased (P<0.05), whereas urine volume was relatively reduced without significant difference (P>0.05). Oat beta-glucan intervention significantly reduced the blood glucose (P<0.05) and improved insulin resistance (P<0.05). Besides, oat beta-glucan intervention was found to reverse the elevated serum and hepatic lipid profiles in diabetic rats (P<0.05). There were clearly structural differences of gut microbiota between model control and normal control group at both the phyla and genus levels. Bacteroidetes were significantly decreased in diabetic rats compared to normal control group, with Firmicute and Proteobacteria elevated. Our research showed oat beta-glucan supplement could change the diabetic-disrupted gut microbiota to a healthier state by increasing the abundance of Bacteroidetes and reducing the abundance of Firmicute. Results: **Conclusions:** This study verified that oat beta-glucan had an benefits effect on T2DM, by reducing blood glucose and decreasing insulin resistance, and Modulation of gut microflora may be one potential mechanism.

Keywords: oat beta-glucan, type 2 diabetes mellitus, gut microbiota

Further collaborators:
Some issue about the T2DM.

SOCIODEMOGRAPHIC AND ECONOMIC FACTORS ARE ASSOCIATED WITH WEIGHT GAIN BETWEEN BEFORE AND AFTER CANCER DIAGNOSIS: RESULTS FROM THE PROSPECTIVE POPULATION-BASED NUTRINET-SANTÉ COHORT

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Background and objectives: While many cancer patients are affected by weight loss, others tend to gain weight, which may impact prognosis and risk of recurrence and of second cancer. The aim of this prospective study was to investigate weight variation between before and after cancer diagnosis and socio-demographic, economic, lifestyle and clinical factors associated with moderate-to-severe weight gain.

Methods: 1051 incident cases of first primary cancer were diagnosed in the NutriNet-Santé cohort between 2009 and 2015. Weight was prospectively collected every 6 months since subjects' inclusion (i.e. an average of 2y before diagnosis). Mean weights before and after cancer diagnosis were compared with paired Student's t-test. Factors associated with moderate-to-severe weight gain (≥5% of initial weight) were investigated by age and sex-adjusted logistic regression.

Results: Weight loss was observed in men (-3.54±4.39kg in those who lost weight, p=0.0002) and in colorectal cancer patients (-3.94±4.40kg,p=0.001). Weight gain was observed in breast and skin cancers (2.83±3.21kg,p=0.04, and 2.96±2.75kg,p=0.04 respectively). Women (OR=1.75[1.06-2.87],p=0.03), younger patients (2.44[1.51-3.70],p<0.0001), those with lower income (OR=1.30[1.01-1.72],p-trend=0.007), lower education (OR=1.32[1.03-2.70],p-trend=0.03), excess weight before diagnosis (OR=1.64[1.12-2.42],p=0.01), lower physical activity (OR=1.28[1.01-1.64],p=0.04) and those who stopped smoking (OR=4.31[1.99-9.35],p=0.005]) were more likely to gain weight. In breast cancer patients, induced menopause was associated with weight gain (OR=4.12[1.76-9.67]), but no association was detected for tumor characteristics or treatments.

Conclusions: This large prospective cohort provided original results on weight variation between before and after cancer diagnosis, highlighting different weight trajectories. Socio-demographic and economic factors appeared to influence the risk of weight gain, illustrating social inequalities in health.

Keywords: Weight gain, weight loss, cancer diagnosis, breast cancer, socio-demographic factors

Further collaborators:

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EFFECTS OF METHIONINE RESTRICTED DIET ON BONE FORMATION IN MICE

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Background and objectives: To investigate the effects of methionine restricted diet on the bone strength and microstructure of the femur in mice and the mechanisms by using the oxidative stress status and micro-CT.

Methods: Mice were fed with normal diet (CON) with methionine content of 0.86% and methionine restricted (MR) diet with metnionine content of 0.17% for 22w. After feeding, the femur length, femur dry weight, BMC, BMD, microstructure, bone strength and redox state of femur were determined.

Results: Compared with CON group, femur length, femur dry weight and bone mineral density (BMD) of MR group have no difference. BMC, cancellous bone volume and trabecular thickness significantly increased, oxidative stress significantly decreased, while the bone strength significantly decreased.

Conclusions: 22w MR diet can significantly increase the BMC and trabecular thickness, improve the microstructure of bone tissue, significantly reduce the body weight of mice and bone strength. There is a tendency to reduce fat cell content of femur, but there is no significant difference in bone strength/body weight.

Keywords: Methionine restricted, Micro-CT; mice, Oxidative stress

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IMPACT OF SOCIOECONOMIC STATUS ON ONE-CARBON METABOLISM IN PRE-ELDERLY AND ELDERLY: THE LIFELINES COHORT AND BIOBANK STUDY

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Background and objectives: Low socioeconomic status (SES) is an established risk factor for cardiovascular disease and for low intake of micronutrients, such as B-vitamins. The latter could adversely affect one-carbon metabolism, especially in populations at increased risk of inadequate nutritional intake, such as pre-elderly and elderly. We therefore evaluated folic acid, vitamin B12, vitamin B6, and homocysteine in plasma of pre-elderly and elderly with high and low SES.

Methods: From the population-based LifeLines Cohort and Biobank Study (N=167,729), 1,600 individuals between 60 and 75 years were included to create two gender-matched groups (both N=800) with different socioeconomic status (SES). Since education is more differentiating than income in the egalitarian Dutch population, SES-groups were defined according to highest completed education as high (university degree) and low (no or only primary education)). Parameters of one-carbon metabolism were measured using validated routine assays. Differences between groups were tested with linear regression analysis.

Results: Mean±SD age and BMI were 65±4 years and 25.7±3.6 kg/m2 in the high-SES group, compared to 67±4 years and 28.2±4.2 kg/m2 in the low-SES group, respectively (both P<0.001). For high- and low-SES groups, we found similar prevalences of smokers, 86 (11%) versus 105 (13%), and energy intakes, 1865±488 versus 1871±555 kCal/day (P=0.42 and 0.89, respectively). Conversely, concentrations of folic acid, vitamin B12, and vitamin B6 were significantly lower and homocysteine higher in the low SES group, 14.4 [9.7-22.7] nmol/L, 275 [218-347] pmol/L, 48.8 [34.0-72.8] nmol/L, and 14 [12-16] μmol/L, compared to the high-SES group, 18.4 [12.7-27.4] nmol/L, 303 [234-380] pmol/L, 60.0 [40.7-91.2] nmol/L, and 13 [11-15] μmol/L, respectively (all P≤0.001). These differences were independent of potential confounders, such as age, BMI, smoking, and energy intake.

Conclusions: Pre-elderly and elderly with low SES have a significantly worse folic acid, vitamin B12, vitamin B6, and homocysteine status compared to those with high SES, independent of potential confounders. This could contribute to their increased cardiovascular risk, and could provide a logical target for nutritional intervention in this vulnerable group.

Keywords: Socioeconomic Status, One-Carbon Metabolism, Vitamins, Elderly, Cardiovascular risk.

144/1091

NEITHER SELF-REPORTED ATOPY NOR IGE MEDIATED ALLERGY ARE LINKED TO INCREASED GASTROINTESTINAL SYMPTOM BURDEN IN PATIENTS WITH IRRITABLE BOWEL SYNDROME

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Background and objectives: It has been proposed that the presence of atopic disease may correlate with more severe symptoms among patients with Irritable Bowel Syndrome (IBS), but few studies have investigated this. We therefore assessed if the presence of self-reported atopic symptoms and serum IgE in patients with IBS was associated with increased symptom severity.

Methods: The levels of total and specific IgE in serum were measured in 223 patients with IBS and 47 non-IBS controls. Participants also completed questionnaires assessing the presence of atopic disease (i.e eczema, asthma, and rhinoconjunctivitis), gastrointestinal symptom burden (IBS severity scoring system, IBS-SSS), food intolerance, and somatic (The Patient Health Questionnaire, PHQ-15) and psychological symptoms (Hospital Anxiety and Depression scale, HAD).

Results: Presence of atopic disease was reported in 123 (55%) patients with IBS compared to 19 (40%) of the non-IBS controls (N.S.). IBS patients with atopic manifestations had higher median serum IgE levels (31 vs. 16 kU/L, P<0.001) and higher prevalence of self-reported food intolerance than non-atopic IBS patients (28% vs. 9%, P=0.002), but no major difference in gastrointestinal or psychological symptom burden was noted. However, having severe somatic symptoms was more common among atopic than non-atopic IBS patients (38% vs. 27%, P=0.028). Specific IgE to common food allergens was rare and was unrelated to the IBS symptom pattern and self-reported food intolerance.

Conclusions: Atopic disease is a common comorbidity in patients with IBS, but our data do not support major differences in

IBS symptoms between atopic and non-atopic IBS patients, except for slightly increased prevalence of self-reported food intolerance and more somatic symptoms in atopic IBS patients.

Keywords: Irritable bowel syndrome, atopy, IgE, food intolerance

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144/1099

INTAKE AND DIETARY SOURCES OF FATTY ACIDS OMEGA 3 6 AND 9 AND MARKERS OF CARDIOMETABOLIC RISK IN PATIENTS WITH ABDOMINAL ADIPOSITY: PRELIMINARY RESULTS

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Background and objectives: Abdominal adiposity is associated with metabolic risk profile such as dyslipidemia and low grade systematic inflammation. Dietary unsaturated fatty acids (FA) could influence metabolic alterations associated with visceral adipose tissue. We aimed to analyze food sources of n-3 and n-6 and n-9 FA and their association with cardiometabolic risk markers in patients with abdominal adiposity.

Methods: Participated 47 adults, between 40-80 years old, both sexes, with central adiposity determined by waist circumference (WC), attended in Cardiology Division, National Hospital of Clinics, Córdoba, Argentina, 2014-2016. Medical history and validated food frequency questionnaire were applied. Food information was processed by Interfood v.1.3. nutritional software. FA food sources were classified in: n-9 FA (olive oil, avocado and olives), 20:4 n-6 FA (red meat, chicken and eggs), 18:2 n-6 FA (corn, soybean, sunflower and mixed oil), 20:5 and 22:6 n-3 FA (fish and seafood), and 18:3 n-3 FA (nuts and seeds). Anthropometric measures, serum lipid profile (total cholesterol, LDL-col, col-HDL and triglycerides), glycemia and hs-CRP were determined. Lineal regression adjusted by age, sex, total energy intake, body mass-index, smoking, and physical activity was development to analyze associations between FA food source and biochemical markers.

Results: Medium age was 60.4 ± 9.8 in men and 57.1 ± 9.3 years old in women. 40% showed overweight and 41% obesity. According WC, 26% had high-risk and 74% very high risk. Medium total cholesterol was 185.4 ± 37.3 mg/dL, LDL-c 108.6 ± 30.6 mg/dL, HDL-c 50.6 ± 13.1 mg/dL, triglycerides 145.1 ± 65.2 mg/dL, glycemia 113.1 ± 26.2 mg/dL, and PCR-us 4.0 ± 2.5 mg/L. About dietary intake, the consumption for n-9 food was 13.1 ± 12.6 g/day, 20:4 n-6 FA 226,4 ± 122,6 g/day, 18:2 n-6 FA 22.4 ± 16.2 g/day, 20:5-22:6 n-3 FA 13.5 ± 14.2 g/day and 18:3 n-3 FA 11.6 ± 18.6 g/day. Significant positive association was observed between intake of 20:4 n-6 FA and triglycerides concentration (β=0,25; p=0,04) and between 20:5-22:6 n3 FA and HDL-c (β=0,35; p=0,03).

Conclusions: These preliminary results show the influence of diet in lipid profile. Dietary intervention are an important tool in patients with cardiometabolic risk factors.

Keywords: Food source, fatty acids, markers, cardiometabolic risk.

144/1100

ACUTE EFFECTS OF AGE WINE, SPANISH WHITE WINE, CONSUMPTION INCREASED CIRCULATING ENDOTHELIAL PROGENITOR CELLS AND REDUCED CARDIOVASCULAR RISK FACTORS IN MEN: A RANDOMIZED INTERVENTION TRIAL

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Background and objectives: Several epidemiological studies suggest that moderate wine consumption have beneficial effects on cardiovascular risk, related to appearance and progression of the atherosclerosis. No previous studies have analyzed the beneficial effects of aged wine (AW), a type of Spanish white wine, on cardiovascular risk factors. The aim of this study was to evaluate the effects of AW and gin on circulating endothelial peripheral cells (EPC) and circulating biomarkers, related to appearance and progression of the atherosclerosis, in high cardiovascular risk subjects.

Methods: A total of 38 high-risk male volunteers, between 55-80 years, who received at random 30g of ethanol per day in form of AW or gin. The study was an open, randomized, controlled, cross-over trial that aims to compare the effects of moderate consumption of AW and gin after 3 weeks of intervention, in which the diet and physic at activity was monitored. After a run-in period and after interventions, we assessed changes on the expression of EPC and biomarkers related to atherosclerosis.

Results: A significantly increased the circulating EPC 39.63% (P=0.03) was observed after intervention AW. We observed a significantly decreased the systolic and diastolic blood pressure (P= 0.033 and P=0.030 respectively) and increased HDL cholesterol after AW intake. On the other hand, we observed a significantly increased the LDL cholesterol (P=0.005) and glucose (P=0.025) after the gin intake. However, when analyzed other biochemical and anthropometric parameters, we observed a significantly increased for Apolipoprotein A (P=0.001; both) and protombine time (P=0.022, P=0.018) for both beverages, without changes in triglycerides, homocysteine, fibrinogen or body mass index. Finally we observed a significantly increased for calcium (P=0.001; both), potassium (P=0.006) iron (P=0.044) and folic intracellular (P= 0.050) after AW intake.

Conclusion: Fermented alcoholic beverages, such as AG, appear to confer greater cardioprotective effects than distilled beverages (gin), probably due to their higher content of polyphenols. Interventions with AW, showed beneficial changes on cardiovascular risk biofactors, and increases the number of circulating EPC in peripheral blood that increases the ability to repair and maintain endothelial integrity.

Keywords: Aged wine; cardiovascular risk; diet; polyphenol.

144/1102

INTAKE OF FATTY ACIDS AND ITS CORRELATION WITH RENAL FUNCTION IN CHILDREN WITH OVERWEIGHT/OBESITY

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Background and objectives: Polyunsaturated fatty acids (PUFA) are defined as the sum of ω3 and ω6-fatty acids (FA). Their impacts on health are mainly attributed to anti-inflammatory effects and to the activation of the peroxisome proliferator-activated receptors(PPAR)-γ. In dietary interventions for obesity the substitution of saturated fatty acids (SFA) by PUFA is encouraged. Only few studies addressed the impact of PUFA intake over the glomerular filtration rate (GFR) in patients without renal disease. Our aim was to evaluate the association between dietary FA and GFR in children with overweight/obesity.

Methods: Prospective study which included 35 children [age: 11(9-13)years] with overweight/obesity who attended the "Servicio de Diabetes y Nutrición Infanto-Juvenil" of the "Complejo Médico Churruca-Visca", Buenos Aires, Argentina. Anthropometric measures were determined and Z-scores were calculated (WHO). Nutritional assessment was performed by the 24-hour dietary recall method using the tables from the "Sistema de Análisis y Registros Alimentarios" (SARA, Ministerio de Salud). GFR was estimated using the Zappitelli formula using serum creatinine and cistatin C levels. Serum lipids and levels of selected micronutrients were recorded. Correlations were evaluated by Pearson or Spearman Correlation tests, according to data distribution.

Results: Out of the 35 children studied (18 males), 25 were obese and 10 were overweight. Mean BMI Z-score was 1.9±0.5. None of the children were taking dietary supplements. Median intake of SFA, monounsaturated fatty acids (MUFA) and PUFA were, median(interquartile range), 14.1(10.2-24.7)g/day, 17.6(11.3-20.7) g/day and 4.5(1.9-10.0)g/day, respectively. Mean GFR was 97±15 ml/min.1.73m2. Intakes of SFA and MUFA were only correlated with waist circumference (r=0.36,p<0.05; r=0.37,p<0.05, respectively). PUFA intake was correlated with cistatin C (r=-0.47,p<0.01) and GFR (r=0.41,p<0.01). In order to correct by individual differences in total FA intake the ratio PUFA/totalFA was calculated. The ratio PUFA/totalFA was inversely correlated with Z-BMI (r=-0.37,p<0.05), cistatin C (r=-0.58,p<0.001) and GFR (r=0.52,p<0.005). The correlation between GFR and PUFA/totalFA ratio was independent of age but not sex-independent.

Conclusions: In this study of children with overweight/obesity the GFR was associated with PUFA intake. Nutritional advice to substitute SFA by PUFA might be useful to prevent the obesity-associated decline in renal function. Longitudinal studies are needed to confirm this hypothesis.

Keywords: Children, obesity, glomerular filtration rate.

144/1105

ALCOHOLIC BEVERAGES, MEDITERRANEAN DIETARY PATTERN AND CONSUMPTION OF FOODS RICH IN VITAMIN D IN A POPULATION WITH HIGH CARDIOVASCULAR RISK. PREDIMED STUDY

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Background and objectives: Background: Epidemiological studies have shown that deficiency of Vitamin D is associated with higher incidence of cardiovascular disease. This deficiency has been related to low sun exposure, reduced intake of some foods, and higher alcohol consumption.

Aims: The aim of this study was to determine the possible relationship between consumption of foods rich in vitamin D, adherence to Mediterranean Diet (MeDiet) and consumption of wine or beer in a population with high cardiovascular risk.

Methods: PREDIMED trial is a 5-year parallel group; multicenter, randomized, controlled clinical trial aimed to evaluate the effects of a MeDiet supplemented with extra virgin olive oil (EVOO) or nuts on incidence of cardiovascular disease. We analyzed baseline data from the Food Frequency Questionnaire with 137-items that included the amount and type of alcoholic beverage consumed and foods rich in vitamin D. A validated 14-point score of adherence of MeDiet was also tested.

Results: We included data from 7,447 high-risk participants. The mean age was 67.88 ± 6.08 years, 27.7% were males, and the mean BMI was 30.20 ± 4.0 kg/m2. Wine and beer drinkers showed a significant increased in food rich in vitamin D consumption compared with non-drinkers 5.96 ± 0.81 vs 5.44 ± 0.67 µg/d, p< 0.001). Among different foods rich in vitamin D analyzed, cured cheese, fat fish, and seafood were the more frequently consumed. In the other hand, drinkers showed higher score of baseline adherence of MeDiet compared to non-drinkers (8.79 ± 0.04 vs 8.39 ± 0.04, p< 0.001).

Conclusions: Wine and beer drinkers showed a higher intake of foods rich in vitamin D, and a higher adherence to MeDiet than non-drinkers. Therefore, moderate alcohol consumers in the Mediterranean area report a healthier lifestyle compared to drinkers from other cultures.

Keywords: Mediterranean diet; foods; cardiovascular risk; alcohol beverages; vitamin D.

Further collaborators: Alexander Medina, Paula Villanueva.

144/1107

NUTRITIONAL MANAGEMENT OF AN ADULT PATIENT BEFORE, DURING AND AFTER LIVER PARTITION (ALPPS) FOR DIFFUSE HEPATIC EPITHELIOID HEMANGIOENDOTHELIOMA

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Background and objectives: 54-year-old female patient.
Diagnosis: multifocal hepatic epithelioid hemangioendothelioma, treated with two-stage hepatectomy.
- Medical history
Hypertension
Dyslipidemia
Class I obesity
Hepatic steatosis
Thyroid failure
Parathyroid insufficiency
Appendectomy
Thyroidectomy + Parathyroidectomy

Objectives

This study shows that nutritional support in the perioperative period reduces nutritional complications, shortens hospital stay and improves post-surgical recovery.

Methods: Nutritional assessment at an outpatient clinic 60 days prior to surgery. Height: 1.60 m; weight: 79 kg; medium build; class I obesity; no weight loss.
Hospital stay:
First stage of surgery: liver transection + right portal vein ligation + metastasis resection from segments II-III. FLR/TLV: 27%.
Postsurgical period:
Day 1: parenteral nutrition with SMOF lipid.
Day 2: liquid diet + TPN.
Day 3: bland diet + TPN.

Day 4: hepatoprotective diet + TPN.

Day 6: TPN is interrupted due to fever and replaced by oral diet. Hypertrophy: 42% of total increase. FLR/TLV: 38%.

Day 7: right hepatic trisectionectomy + cholangiojejunostomy. Fasting.

Second stage of surgery:

Day 3: liquid diet. Poor tolerance, vomiting.

Day 6: TPN.

Day 7: trophic EN via NGT (semi-elemental formula) + TPN.

Day 10: oral bland diet + EN + reduced PN.

Day 11: TPN is interrupted and replaced by EN and bland diet.

Day 13: NGT is removed, oral feeding + hypercaloric supplement.

Day 18: food intake improvement. Dietary plan to be followed on hospital discharge is created.

Results: Parameters   Before surgery: 79 kg,hemoglobin (Hb)13,1 , albumin 3,6

Between surgeries: 77kg, Hb 10,9, Lymphocytic cells 1280, Albumin 2,9, total protein 5,6, nitrogen balance +6

At discharge: 76,5 kg, Hb 12,2,lymphocytic cells 1158, albumin 3,3, Total protein: 5,8

Conclusions: An interdisciplinary approach is essential for managing highly complex, elective surgical procedures. Timing nutritional interventions to the surgical planning improves therapeutic results.

Keywords: nutritional support, hepatectomy, ALPPS.

144/1116

EFFECT OF OMEGA-3 FATTY ACIDS ON EN-DOTHELIAL FUNCTION IN METABOLIC SYN-DROME: A SYSTEMATIC REVIEW

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Background and objectives: Omega-3 polyunsaturated fatty acids (ω3-PUFA) are increasingly being used in the management of several metabolic pathologies, due to its anti-inflammatory role. The aim was summarize the findings on the effects of ω3-PUFA on endothelial function in patients with metabolic syndrome.

Methods: An electronic literature search from 2004-2015 in Medline, Lilacs, Cochrane Library and Scielo, was conducted. We combined search terms related to the exposure (i.e. ω3-PUFA, syndrome metabolic) and outcomes of interest (blood pressure, endothelial dysfunction, endothelial markers). Randomized-controlled interventional trials without language restrictions were considered. PRISMA guidelines were employed. Methodological quality, i.e. study design, sample size, bias, and statistical analysis, was assessed by Jadad scale.

Results: 273 references were identified, of which 25 were finally included. Articles were classified in food pattern modification (i.e. mediterranean-style diet, prudent food pattern, n=7), ω3-PU-FA supplementation (i.e. fish oil, flaxseed oil, EPA/DHA capsules, n=10) and mixed interventions (food pattern modification and ω3-PUFA supplementation, n=8). Five articles with food pattern modification, reported significantly reduction in systolic (SBP) and diastolic blood pressure (DBP), and four studies observed lower levels in C-reactive protein (CRP) with diet change. In clinical trials with ω3-PUFA supplementation, three studies observed a significant decrease in SBP with reduced circulation levels of CRP, sICAM-1, PAI-1 and IL-6. About mixed interventions, two studies reported lower levels of SBP, DBP, CRP and IL-6.

Conclusions: Dietary interventions and supplementation with ω-3 PUFA in metabolic syndrome are a relevant strategy to the maintenance of cardiovascular health and prevent future complications.

Keywords: ω-3 fatty acids, metabolic syndrome, blood pressure, endothelial dysfunction

144/1135

CORRELATIONS OF SERUM 25(OH) VITAMIN D LEVELS WITH THE METABOLIC PARAMETERS IN SUBJECTS WITH DIFFERENT BODY MASS INDEX

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Background and objectives: We triedto describe the correlation between serum 25(OH) vitamin D and metabolic parameters in men and womenwith different BMI.

Methods: 264 subjects participated – 109 men and 155 women aged 20-60 years.Body weight and height, waist circumference, systolic and diastolic blood pressure were recorded. Body composition was assessed by bioelectrical impedance (Tanita BC 420 MA, Tanita Inc., Japan).Serum 25(OH)D Total and insulin were measured by electro-hemi-luminescence (Elecsys 2010 analyzer, Roche Diagnostics, Switzerland). High-sensitivity C-reactive protein was measured by an immune turbo-dimetrical method(Cobas Integra 400+ analyzer)together with total, HDL-cholesterol (direct)and triglycerides. Statistical analysis was performed on a SPSS 23.0 for Windows (SPSS Inc., Chicago, IL).

Results: 27.2 % of the participants had normal weight, 24.6 % - overweight, 29.2 % -class I obesity, and 18.9 % – class II or III. 33.3 % had vitamin D deficiency, 40.2 % - insufficiency. Vitamin D was weakly and inversely correlated to many variables in the group as a whole. The most powerful correlations were with weight, WC, WC/Height, % body fat and HOMA-IR index (r=-0.231, -0.283,

-0.307, -0.339, -0.328 respectively, all p<0.001). Fewer correlations were registered in men than in women. Splitting the subjects according to BMIled to loss of significance. Backward analysis revealed Total-C / LDL-C ratio, and LDL-C/HDL-C ratio as strongest predictors (p=0.001; R2=0.204).

Conclusions: The association of vitamin D with blood pressure,plasma lipids, glucose and insulin is very weak on an individual level.It might be demonstrated in large surveys.

Keywords: Body composition; Obesity; Metabolism; Vitamin D

144/1144

IMPORTANCE OF DIETARY COUNSELING TO PATIENTS WITH DIABETES MELLITUS TYPE 2 FROM AN OUTPATIENT CLINIC IN SÃO PAULO

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Background and objectives: A healthful eating pattern and regular physical activity are extremely important components of type 2 diabetes mellitus management. For many individuals with type 2 diabetes mellitus, the most difficult part of the dietetic plan is to decide what to eat. Dietary therapy has been recognized as an essencial strategy for helping patients with type 2 diabetes mellitus, improving self-management, developing nutritional education and providing an eating plan. In this context the purpose of this work is to correlate the eating habits of patients who received professional guidance with those who did not receive any guidance.

Methods: This is a cross-sectional, descriptive study with primary data collection, sampling done by convenience, approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A structured questionnaire to characterize food intake was developed for this research and applied to 82 patients with type 2 diabetes mellitus, both male and female, attending an outpatient clinic in São Paulo. Data analyses were performed using descriptive statistic, the Qui-square test with a level of significance of p<0.05.

Results: Regarding the interviews, the mean age was 63 ± 10.6 years characterizing an elderly population (64.6%). The majority of respondents (80%) received specific dietary guidance for type 2 diabetes mellitus but only 30% admitted to follow the guidance given by the health professional. It is noteworthy that the main health professionals who carried out dietary counseling were nutritionists (50%) and physicians (46%). People who received guidance showed a slightly more varied diet than those who did not receive guidance. Nevertheless, this result was not statistically significant (p=0.26). The most consumed types of food were: fruits, vegetables and greens (74%), pasta, breads and biscuits (66%) and food of animal origin (59%).

Conclusions: Patients who received professional guidance on diet present a more varied food profile in relation to those who did not receive it. Therefore, the professional counseling in this population is extremely important for an adequate management of the disease and quality of life.

Keywords: Diabetes mellitus; Dietary counseling; Food intake; Dietary Patterns

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144/1161

PLASMA GLUCOSE KINETICS FOLLOWING INGESTION OF TWO CEREAL PRODUCTS DIFFERING BY THEIR SLOWLY DIGESTIBLE STARCH CONTENT IN HEALTHY MALES AND FEMALES

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Background and objectives: High postprandial plasma glucose concentrations have been implicated in the development of chronic metabolic diseases. Cereal products with a high content in Slowly Digestible Starch (SDS) elicit lower glycemic responses than those with a low SDS content. This has been shown when ingested in a breakfast. The objective of the present study was to describe the kinetics of glucose provided by two cereal products differing by their SDS content and consumed alone in healthy males and females.

Methods: Fourty-one young healthy males and females volunteered to consume in a random order ~ 45g of two cereal products differing by their SDS content: co-extruded cereals (0.2% SDS – Lo-SDS) or biscuits (19% SDS – Hi-SDS). Carbohydrate in these products were intrinsically labelled with 13C and plasma glucose kinetics were measured using [6,6-2H2]glucose infusion along with plasma glucose, insulin, Non-Esterified Fatty Acides (NEFA) and glucose-dependent insulinotropic peptide (GIP) concentrations.

Results: When compared to the Lo-SDS co-extruded cereals the rate of appearance of exogenous glucose (RaE) was lower with the Hi-SDS biscuits in the first part of the postprandial period. This was reversed 2h following the ingestion of the product with the RaE observed with the biscuits higher than with the co-extruded cereals. The same kinetics was observed for the rate of disappearance of exogenous glucose. This resulted in lower plasma glucose levels in the first 2h of the postprandial period and higher levels in the next 3h following ingestion of the biscuits than the co-extruded cereals. Plasma insulin was also lower with the biscuits than the co-extruded cereals over the first 2h of the postpran-

dial period. No difference was observed between the two products for plasma NEFA and GIP concentrations.

Conclusions: Substituting Lo-SDS co-extruded cereals with Hi-SDS biscuits slows down the availability of glucose from the cereal product and its appearance in peripheral circulation, reduces the early peak of plasma glucose and distributes the glucose ingested over a longer period following the meal.

Keywords: Slowly Digestible starch, cereal products, glucose appearance rate, glycemic response, insulinemic response

Conflict of Interest Disclosure: A. Meynier and S. Vinoy are employees of the Nutrition Department, Mondelēz International R&D; F. Péronnet is an occasional consultant for the Nutrition Department, Mondelēz International R&D; R. Rabasa-Lhoret received an unrestricted grant from Mondelēz International R&D to conduct this work. The remaining authors declare no conflict of interest.

144/1162

SIGNIFICANCE OF SUPPLYING OF INFORMATION ABOUT THE CHANGE OF POTASSIUM CONTENTS IN VEGETABLES BY COOKING DURING THE COURSE OF NUTRITIONAL GUIDANCE FOR DIALYSIS PATIENTS

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Background and objectives: During the nutritional guidance for dialysis patients, it is important to be aware of how much they know about potassium and how much they pay attention to cut down its dietary intake in each meal. In the present study, we performed a survey to investigate the patients' awareness of potassium and its dietary control. Furthermore, we determined potassium concentrations in some vegetables to answer the patients' questions such as whether vegetables in season or greener vegetables have higher contents of potassium in comparison to those out of season or less greener vegetables, respectively.

Methods: A questionnaire survey was conducted to investigate the patients' knowledge about potassium contents in vegetables and their practical trials to cut down dietary intake of potassium on 41 dialysis outpatients (27 males and 14 females, 65±14 years of age, and 128±123 months of dialysis treatment). In order to improve our knowledge as nutritional advisers to help the patients, we determined potassium contents in some vegetables such as cabbages in and out of season and broccoli and cauliflower as a typical pair of green and white vegetables.

Results: There were positive correlations between their knowledge on potassium and their endeavor to cut down their dietary potassium intake and between their lengths of dialysis treatment history and their degrees of concern about dietary intake of phosphate. Potassium determination results: There were no significant differences between the vegetables in and out of season or between

those green and white vegetables, but when they were boiled, broccoli lost potassium faster than cauliflower.

Conclusions: Supplying the dialysis patients with those potassium determination data may be helpful therapeutically from the view point of nutritional guidance.

Keywords: dialysis patients, dietary management, potassium determination

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144/1166

WEIGHT LOSS AND LONG TERM WEIGHT MAINTENANCE WITH A NON-DIETING APPROACH

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Background and objectives: Classical models of weight loss interventions achieve short-term success, but regain is common. Our objective was to evaluate the efficacy of a non-dieting approach intervention in weight loss and long term weight loss maintenance.

Methods: Overweight and obese adult outpatients, who consulted for individual treatment, were enrolled. After completed basal evaluation (t0), they underwent to a non-dieting approach weight loss program during at least 6 months (t1). At t0 and t1 weight, height, frequency of physical activity (PA), physically active condition (10,000 steps / day), unhealthy eating patterns (UEP) and emotional eating (EE), were assessed. At least 18 months after ending interventional period (t2), patients were interviewed by phone, about weight, PA, physical active condition, UEP and EE. Weight loss (WL) was defined as a reduction > 3% of baseline weight (BW).

Results: Ninety-four patients completed interventional period (44.8 ± 1.5 years of age; 78.7% females, mean BMI 33.4 kg/m2). Mean weight reduction rate (WRR) was 5.9 ± 5.5% of t0 weight; 71.3% lost weight (34% between 5 and 9.9%, and 21.3% ≥10% of t0 weight). Participants significantly lost weight and reduced BMI between t0 and t1, (89.9 ± 18.5 kg vs 84.5 ± 17.7 kg, and 33.4 ± 5.5 kg/m2 vs 31.3 ± 5.4 kg/m2, respectively; p < 0.001). Difference was significant for PA and physically active condition (7.4% vs 57.4% and 16.0% vs 42.6%, respectively; p < 0.001). Forty-two patients answered the telephone interview; time elapsed was 30.6 ± 7.4 months; weight and BMI were significant lower compared to baseline (p < 0.05); WRR was 7,6 ± 8,1%; 45,2% of patients reduce more than 10% of t0 weight, and compared to baseline, there was a significant difference related to PA (16.0% vs 68.9%; p < 0.0001), physically active condition (7.4% vs 64.4%; p < 0,0001), UEP (94.7% vs 62.2%; p < 0,001), and EE (86.2% vs 71,1%; p = 0.033).

Conclusions: A non-dieting approach intervention can be considered a long term effective method to treat obese and overweight patients. More studies are needed to confirm this preliminary data.

Keywords: obesity treatment , weight loss, non dieting approach, weight loss maintenance .

Further collaborators: Lewitan Dalia

144/1184

LIPID METABOLISM MARKERS IN CELIAC CHILDREN

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Background and objectives: Celiac disease (CD) is an autoimmune disorder characterized by inmunologically mediated intolerance to gluten, which is managed with lifelong gluten free diet (GFD). Several dietary surveys had suggested high intakes of saturated fat and sucrose and inadequate intakes of fiber and micronutrients (thiamin, riboflavin, niacin, folate, iron, calcium) in subjects with CD following a strict GFD (Öhlund et al., 2010). Furthermore, some studies have shown a higher rate of cardiovascular disease in patients with CD (Ludvigsson et al., 2011; Assa et al.,2017). Therefore, the objective of this study was to assessment the association of CD with lipid metabolism markers, considered as risk cardiovascular factors, and GFD consumption.

Methods: 25 children (range 3-15 years) diagnosed as CD and consuming GFD for at least one year, were evaluated for their lipid hematological profile. The diagnosis, according to accepted criteria, and analysis were made at Pediatric Gastroenterology and Nutrition Unit, Virgen de las Nieves University Hospital, in Granada, Spain. Blood was collected from fasting patients by venipuncture into EDTA-containing vacutainer tubes. Samples were centrifuged at 1700 x g for 15 min at 4°C to obtain plasma. Total plasma-cholesterol (Total-Col), serum high-density lipoprotein cholesterol (HDL-Col) and triglyceride (TG) concentrations were measured by enzymatic colorimetric methods using commercial kits (Spinreact, Barcelona, Spain). LDL-Col was calculated using the Friedewald equation: LDL-C=total cholesterol–(HDL-C)–(triglycerides/5), mg/dL. Study was approved by the Ethics Committee of the University of Granada. The data obtained were processed with the SPSS 20.0 software.

Results: Blood lipid concentrations (mean value ± standard deviation) determined were: 176.83 ± 26.34 mg/dl Total-Col, 56.63 ± 12.91 mg/dl HDL-Col, 105.6 ± 26.98 mg/dl LDL-Col and 68.04 ± 17.75 mg/dl TG. These values are between de reference values (140-200 mg/dl, 40-60mg/dl, 100-130 mg/dl and 89-150 mg/dl respectively), although Total-Col and LDL-Col levels are in the limelight of cardiovascular disease.

Conclusions: As hyperlipidemia, particularly elevated LDL cholesterol, is an established risk factor for cardiovascular disease (Murphy et al., 2010) and total cholesterol level is an important determinant of the Framingham risk score for cardiovascular disease, our data suggest that blood lipid levels should be monitored in CD.

Keywords: Gluten free diet, cardiovascular risk, celiac disease

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144/1190

MINIMUM EFFECTIVE DOSE OF COMMONLY CONSUMED BEANS REQUIRED TO SIGNIFICANTLY LOWER POST PRANDIAL BLOOD GLUCOSE RESPONSE

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Background and objectives: Beans elicit a low glycemic response compared to other starchy foods. However, previous studies have tested serving sizes that may not be achieved in a usual meal. This study compared the blood glucose response of beans consumed at ¼ and ½ cup with that elicited by similar amounts of common starchy foods.

Methods: Six commonly consumed Canadian beans (pinto, black turtle, cranberry, red kidney, navy and great northern) and starchy control foods (white rice, macaroni, instant potato and corn) were consumed by healthy volunteers in a using an open-label, randomized cross-over trial. Foods were consumed at either ¼ cup (n=16 to 24) or ½ cup (n=12 to 18) after an overnight fast and blood glucose response was measured over a 2hr period. Incremental area under the blood glucose (iAUC), relative glycemic response and insulin (at ½ cup only) response curves were calculated and analyzed for treatments effects.

Results: Overall beans consumed at ¼ cup servings elicited lower glycemic responses than ¼ cup servings of corn, macaroni, potato and rice, although iAUC for individual beans were not significantly different from corn. At ¼ cup serving, mean reductions in blood glucose response elicited by the beans compared to controls were: 34±4% (vs. corn); 59±3% (vs. macaroni); 51±3% (vs. potato) and 61±3% (vs. rice) (paired t-test; all p<0.05). Similarly, at ½ cup serving mean reductions in blood glucose response elicited by beans were: 38±5% (vs. corn); 64±3% (vs. macaroni); 55±5% (vs. potato) and 68±3% (vs. rice) (paired t-test; all p<0.05).

By ANOVA all 6 beans had significantly lower iAUC than the respective starchy control, except for cranberry, which had an iAUC that was not significantly different from corn eaten at ½ cup. Insulin response curve elicited by ½ cup beans was not significantly different from potato indicating that the blood glucose lowering effect of beans is not due to hyperinsulinemia.

Conclusions: Beans consumed at ¼ and ½ cup reduce blood glucose response by a minimum of 20%, which is defined as a significant effect. This information can be used for regulatory approval of a health claim for pulse and blood glucose attenuation.

Keywords: beans, glucose, glycemic response, human, pulse

Further collaborators:

144/1191

FOOD INTAKE AND BODY MASS INDEX OF PATIENTS WITH TYPE 2 DIABETES MELLITUS FROM AN OUTPATIENT CLINIC IN SÃO PAULO

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Background and objectives: The prevalence of type 2 diabetes mellitus is increasing in all populations worldwide. This increase is accompanied by the rising rates of obesity and overweight observed over the past decade. For this reason, the analysis of the body mass index (BMI) may serve as a powerful tool in the assessment of the risk factor for Diabetes. As overweight is directly related to the to lifestyle and eating habits, a better understanding of food intake in patients with type 2 diabetes mellitus is essential in order to correct problems, stimulate healthy habits and foster weight loss of these population. This study objective is to classify the population using the BMI scale and correlate it to food intake.

Methods: This is a cross-sectional, descriptive study with primary data collection, sampling done by convenience, approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A structured questionnaire to characterize food intake was developed for this research and applied to 82 patients with type 2 diabetes mellitus, both male and female, attending an outpatient clinic in São Paulo. BMI was classified according to the World Health Organization. Weight and height were self-reported. Data analyses were performed using descriptive statistic, the Quisquare test with a level of significance of p<0.05.

Results: Regarding the interviews, the mean age was 63±10.6 years. Mean BMI was 29.6 ± 5 kg/m2 ranging from 28.5 to 30.8 kg/m2 (for a 95% of confidence interval). When BMI was classified as underweight, normal weight and overweight it was possible to find a significant difference (p=0.04) between the groups regarding their eating habits. As for individuals with overweight the most consumed foods were: fruits, vegetables and greens (86%), pasta, breads and biscuits (82%), foods of animal origin (73%) and sweets in general (27%).

Conclusions: Most patients with type 2 diabetes mellitus are overweight and there are significant differences in food choices according to their BMI score. This insight may bring possibilities for dietary changes and may facilitate the translation of findings to public health recommendations.

Keywords: Diabetes mellitus. Body mass index. Food intake. Eating habits.

144/1193

EFFECT OF GLUTEN FREE DIET CONSUMPTION ON THE CLINIC PROGRESS OF CHRONIC MUSCULOSKELETAL PATHOLOGY

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Background and objectives: Recently, success in the treatment of some diseases has been associated with the follow-up of a gluten-free diet, in the absence of celiac disease, although there is controversy as to whether this diet is better for subjects who do not need it. Therefore, the objective of this study was to study in subjects with chronic musculoskeletal pathology the effect of consumption of the gluten-free diet on the clinical progress of their disease.

Methods: We studied 47 subjects who attended a rehabilitation medical center with more than one year of musculoskeletal pathology progression. In addition all had symptoms of digestive disorders.

The patients had: rheumatoid arthritis (10), irritable bowel syndrome associated with musculoskeletal disorder (15), fibromyalgia (10), osteoarthritis (10) and rheumatic pelvic spondylitis (2).

After informed consent, they began to follow a strict gluten-free diet for 6 months, during which they were followed up weekly with a nutritional study through a 48h reminder survey.

At the beginning and end of the study, a test for the assessment of musculoskeletal signs and symptoms (EVA pain scale, muscle weakness and joint stiffness) and extra-articular muscles (fatigue, gastrointestinal discomfort and perception of their condition) were performed. Study was approved by the Ethics Committee of the University of Granada. The data obtained were processed with the SPSS 20.0 software.

Results: The results showed that, in general, all patients improved as gastrointestinal symptoms, pain, weakness, stiffness and tiredness decreased and they perceived a better general condition. This improvement was greater in subjects diagnosed with irritable bowel syndrome. No patient worsened with dietary treatment.

Conclusions: We conclude that the non-celiac gluten sensitivity may be the underlying cause of the symptoms raised by the need to conduct a controlled clinical trial for testing.

Keywords: Gluten free diet, musculoskeletal disease, non-celiac gluten sensitivity

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144/1222

IS HIGH BMI AT EARLY ADULTHOOD A RISK FACTOR FOR THE EARLY INCIDENCE OF CHRONIC NONCOMMUNICABLE DISEASES?

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Background and objectives: High body mass index (BMI) is the third largest modifiable risk factor for morbidity and mortality to cancer, cardiovascular disease and diabetes. The early incidence of these diseases raises costs in the health service and reduces the quality of life. To analyze the effect of BMI at the age of 25 years (USA) and 20 years (Brazil) on the early incidence of 3 major chronic noncommunicable diseases [3CND] during adult life.

Methods: American NHANES-IV data (2007-2014) [25 to 49 years old] and Brazilians of PNS data (2013) [20 to 49 years] about the age of incidence for 3DCNT, BMI at age 25 (USA) and BMI at age 20 (Brazil), ethnicity, schooling, physical activity, smoking time, and alcohol consumption were modeled in Cox regression to estimate the effect (harzard ratio [HR]) of BMIearly on the time of incidence of any of 3CND.

Results: Men with BMIearly above 25 kg/m2 had a risk of 1.78 in the USA and 1.9 in Brazil. The women presented a risk of 2.18 and 1.4, respectively. For BMIearly above 30 kg/m2 in Brazilians man the HR was 2.84 and woman was 2.1. In American man the HR was 4.2 and was 3.13 in woman. High schooling was a protective factor in Brazilian and American women, but not in American men (1.04). In both genders, belonging to the black ethnic group in the USA was a risk factor, but in Brazil non-white women presented protection. In the USA obesity anticipated in 6 years the incidence of one of the 3CND in men and 5 years for women. In Brazil, this anticipation was 10 years for men and 8 years for women, bringing the findings closer in the two countries.

Conclusions: BMI of early adulthood is a high and modifiable risk factor for the incidence of one of the 3CND. The effects of BMIearly are direct and indirect, multiplicative, and indicate the relevance of preventing excessive weight gain during and at the end of adolescence. Surveillance and intervention actions are advisable in this age group.

Keywords: BMI; Chronic diseases; Morbidity; Survival; Risk.

144/1226

CATTLE OWNERSHIP, CHILDHOOD MALARIA AND ANEMIA IN UGANDA

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Background and objectives: Agricultural interventions may improve rural household food production and consumption, income, nutrition and health. Animal source foods, such as milk, meat, fish and poultry provide critical nutrients essential to child growth and health. Livestock ownership may also predispose humans to diseases with potential implications for nutrition and health.

This study explored the linkages between cattle ownership, malaria and anemia in children below 5 years.

Methods: Panel surveys were conducted in 6 rural districts of Uganda in 2012 and 2014 obtaining comprehensive household and individual data on demographics, agricultural production, dietary consumption, water and sanitation, health, education, and income producing activities. Moreover, we measured child hemoglobin levels and tested for malaria using rapid diagnostic tests. To control for potential observed and unobserved confoundedness, multivariate analyses—including linear probability model, pooled probit and correlated random effects models with and without the control function—were conducted. Coincidentally two of the four agro-ecologically similar districts in Northern Uganda had received multiple rounds of indoor residual spraying (IRS) against malaria within the study period. To able to link our analysis to IRS, we further conducted PCR analysis to compare mosquito species variability across IRS-sprayed and non-IRS districts.

Results: Multivariate analyses that conservatively control for confounding showed that cattle ownership was significantly associated with a higher prevalence of malaria in children under five years of age. Cattle ownership was generally associated with a 3% increase in childhood malaria (p<0.05). Malaria was in turn linked to a 28% increase in anemia (p< 0.01). In the 2 IRS districts, both childhood malaria and anemia prevalence were significantly lower (p<0.001). However, in the IRS districts, cattle ownership enhanced childhood malaria prevalence by 4-8% (p<0.01) compared to the non-IRS districts. PCR analysis showed that outdoor mosquito species that feed on livestock are predominant in IRS districts while indoor mosquito species are predominant in non-IRS districts.

Conclusions: IRS, which kills indoor mosquito species, may unmask residual malaria transmission by outdoor mosquito spe-

cies, which feed on both cattle and humans. Efforts to enhance nutrition and health by the agricultural intervention of cattle promotion may need to include livestock-oriented vector control.

Keywords: Cattle ownership, malaria, anemia, indoor residue spraying, anemia

Further collaborators:

David Hoel and William Brogdon of the CDC as well as Michael Okia of Abt Associates in Uganda provided and analyzed mosquito data using PCR.

144/1234

SUPPLEMENTATION OF VITAMIN D IN TYPE 2 DIABETIC PATIENTS WITH HYPERTENSION DECREASES OFFICE AND 24-H AMBULATORY BLOOD PRESSURE MONITORING

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Background and objectives: Background and Objectives: Data on the potential beneficial effects of supplementation of vitamin D in hypertensive patients with type 2 diabetes mellitus (DM) and hypovitaminosis D are still scarce. The aim of study was to evaluate the effect of a single dose (100.000 IU) of vitamin D on 24-h ambulatory blood pressure monitoring (ABPM) in patients with type 2 DM, hypovitaminosis D and hypertension.

Methods: In a double-blind, placebo-controlled trial, 43 hypertensive patients with type 2 DM and hypovitaminosis D were randomly assigned to vitamin D supplement group (single dose 100,000 IU) or placebo group (single dose). Blood pressure (BP) was assessed by office measurements (Omron HEM-705CP) and 24-h ABPM (Spacelabs®). Physical activity was evaluated by steps counter (pedometer – Yamax Digi-Walker®). Clinical, nutritional, and laboratory parameters were evaluated by a standardized protocol before and after the supplementation. Body composition was determinate by bioimpedance In Body®. Results were expressed as mean, median, or number of patients with the characteristic. Changes in variables during the study were analyzed by the general linear model (GLM) for repeated measures.

Results: Forty-three 43 patients (age 65.4±9.2 years; 35% males; BMI 30.6±4.4 kg/m², DM duration 12.4±7.7 years; HbA1c 7.6±1.0%) were included. Mean 25(OH)D was 14.1±4.4 ng/ml. Office systolic and diastolic BP were 147.0±17.0 and 82.8±6.8 mmHg, in placebo group and 148.9±18.1 and 84.2±13.7 mmHg

in intervention group. After eight weeks, supplementation of vitamin D caused ABPM reduction on systolic 24-h (-5.1vs.-0.9 mm Hg; P=0.025), systolic daytime (-6.3 vs.-0.3 mm Hg; P=0.004), and diastolic daytime (-4.9vs.-0.1 mm Hg; P=0.006) and office systolic BP (-6.3 vs. -3.4 mm Hg; P <0.001) measurements than observed in the control group.

Conclusions: Vitamin D supplementation in patients who had hypovitaminosis caused a clinically significant reductions in systolic office BP and ABPM values in hypertensive patients with type 2 diabetes.

Keywords: hypertension, type 2 diabtes, vitamin D, hypovitaminosis

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144/1235

EFFECT OF A 6-MONTH PERSONALIZED NUTRITION INTERVENTION PROGRAM IN RECENTLY DIAGNOSED BREAST CANCER PATIENTS

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Background and objectives: During antineoplastic treatment, breast cancer patients' body composition can be negatively affected increasing the risk of tumor recurrence and mortality. These changes include an increase in fat mass and a decrease in their muscle mass, known as sarcopenic obesity. The implementation of a personalized nutrition intervention for breast cancer patients could prevent these consequences. The aim of this study was to evaluate the effect of a 6-month personalized nutrition intervention in body composition components of breast cancer patients.

Methods: Anthropometric data was obtained and indexes were developed. Subjects' body composition was measured using dual-energy x-ray absorptiometry and participants' total energy expenditure was estimated using an algorithm for Mexican population. When required, a caloric restriction (500-1000 kcal/d) was considered, according to each patient's nutritional status. The dietary plan followed the NIH guidelines, modifying dietary protein (1.2-1.5 g/kg/d) in order to prevent sarcopenic obesity. Socioeconomic and cultural preferences were considered to develop the personalized nutrient-specific diet. Patients were followed every 2-weeks and a different diet menu was provided by a specialized nutritionist, for 6 months.

Results: Nine volunteers have completed the intervention. At baseline, 70% were overweight or obese and after 6 months a significant weight loss of -2.8 kg was observed (p<0.01), -1.9 kg of fat mass (p<0.05), -3 cm hip circumference (p<0.01), and -1 cm arm circumference (p<0.01).

Conclusions: A 6-month nutrition intervention program based in a personalized nutrient-specific diet for breast cancer patients had a positive effect in their body composition.

Keywords: sarcopenic obesity, personalized diet, dietary assessment, food-based intervention

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144/1236

TOTAL POLYPHENOL INTAKE AND THE INCIDENCE OF CARDIOVASCULAR DISEASE IN A MEDITERRANEAN COHORT: THE SEGUIMIENTO UNIVERSIDAD DE NAVARRA (SUN) PROJECT

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Background and objectives: Polyphenol-rich diets have been associated with reduced risk of CVD. However, few prospective epidemiological studies have evaluated the relationship between the risk of CVD and total polyphenol intake and classes of polyphenols. To evaluate the association between total intake of polyphenol and classes of polyphenol and the risk of major cardiovascular events in the Seguimiento Universidad de Navarra (SUN) Project, a prospective Spanish cohort.

Methods: We included 17,319 Spanish university graduates who were followed-up for a mean of 10.0 years (standard deviation, 4.1 years; total person-years: 172,918). Polyphenol intake was assessed using a validated semi-quantitative 136-item food frequency questionnaire and by matching food consumption data with the Phenol-Explore database. Cox proportional hazards models were used to estimate the adjusted HR and 95%CI for incident cardiovascular events.

Results: Cherries, chocolates, coffee, apples, and olives were the major sources of polyphenols. A total of 130 incident cases of cardiovascular events were identified during the follow-up. Among the classes of polyphenol, flavonoids were inversely associated with cardiovascular events, with a 63% reduction in risk observed on comparing quintile fifth with quintile first (adjusted HR: 0.37; 95%CI: 0.17-0.84; P for trend=0.01) after adjusting for potential confounders.

Conclusions: In this large prospective Mediterranean cohort, we observed an inverse association between the intake of flavonoids and the risk of cardiovascular events.

Keywords: dietary polyphenols, cardiovascular disease, SUN cohort, prospective studies.

Further collaborators:

144/1248

COFFEE INTAKE AND RISK OF BREAST AND OVARIAN CANCER: UPDATED SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: Cancers of the breast and ovary are important among women worldwide with breast cancer being the most commonly diagnosed and the leading cause of cancer death. Coffee is one of the most frequently consumed beverages worldwide; its association with these gynecological cancers has been investigated since the 1980s but early results were inconsistent. In 2016 a Working Group (WG) for an update of the 1991 IARC Monographs classification of coffee as a possible carcinogen, reported evidence suggesting lack of carcinogenicity and inadequate evidence of carcinogenicity for coffee intake and female breast and ovarian cancer, respectively. We undertook a meta-analysis of all studies included in the WG report, to provide the most updated summary of the collective evidence regarding the association of coffee intake with breast and ovarian cancer risk.

Methods: Case-control and cohort studies were identified by searching the PubMed database as of June 2016, and by reviewing the reference lists of retrieved articles. Random effect models were used to provide summary estimates of individual associations.

Results: 40 and 32 studies including, respectively, 76,748 women with breast and 11,411 women with ovarian cancer were considered in the meta-analysis. The combined RR (95% CI) for the study-specific highest vs. lowest coffee consumption was 0.97 (0.93–1.00, I2 5.5%) for breast and 1.03 (0.93–1.14, I2 31.9%) for ovarian cancer. These associations did not differ by study design, geographical location or menopausal status (both cancer sites), ER/PR status and body mass index (breast cancer) or histological type (ovarian cancer). For decaffeinated coffee the respective RRs were 1.00 (0.93-1.08) and 0.83 (0.71-0.96) for breast (13 studies) and ovarian (9 studies) cancer. Heterogeneity was medium-to-low but higher among ovarian as compared to breast cancer studies. The association of coffee intake with ovarian cancer risk was higher among studies published before 1990, (RR 1.38 95%CI (1.11-1.71)) compared to after 1990 (RR 0.97 95%CI (0.87-1.07)) (p-heterogeneity 0.004).

Conclusions: Findings from this updated meta-analysis suggest a weak inverse association with breast cancer and no association with ovarian cancer risk. Given the high consumption of coffee worldwide these results may be of high public health importance.

Keywords: breast cancer; ovarian cancer; coffee; meta-analysis

Further collaborators: The IARC Monograph Working Group on the update of the 1991 International Agency for Research on Cancer (IARC) Monographs for the classification of coffee as a carcinogen (Lancet Oncology, 2016)

144/1250

EFFECT OF PROBIOTIC BIFIDOBACTERIUM LACTIS BL-04 ON HOST RESPONSES AND MICROBIOTA IN EXPERIMENTAL RHINOVIRUS INFECTION IN HEALTHY ADULTS

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Background and objectives: Ingestion of probiotics may be beneficial for reducing the risk of upper respiratory tract illnesses. Bifidobacterium animalis subspecies lactis Bl-04 (Bl-04) significantly reduced the risk of respiratory illness episodes by 27% over 5-month winter season in healthy active adults. The mechanisms of this effect is unknown. The purpose of this study was to determine the effect of probiotic Bl-04 administration on host responses to experimental rhinovirus (RV39) challenge and to assess changes in gut and nasal microbiota due to treatment or viral challenge.

Methods: 152 seronegative volunteers treated for 28 days, 73 probiotic and 79 placebo, were challenged with RV39. Administration of study treatment continued for five days during collection of specimens for assessment of host response, infection, and symptoms. Fecal samples were collected at baseline and analysed by qPCR for Bl-04 and by sequencing of 16S rRNA gene for microbiota composition.

Results: Analysis of nasal lavage IL-8 concentration revealed significantly higher concentrations on Day 0 prior to virus challenge in the probiotic group. In contrast, the IL-8 response to RV39 challenge was significantly reduced in the probiotic group (geometric mean ratio for change, probiotic : placebo=0.65, p=0.03). The administration of probiotic was associated with reduced nasal lavage virus titer and the proportion of subjects shedding virus in nasal secretions (76% probiotic group, 91% placebo group, p=0.04). There was no effect of probiotic treatment on symptom severity, lower respiratory tract inflammation (eNO) or serum antibody responses to the virus. On Day 0, the supplemented Bl-04 was detected in 69% of probiotic group participants. The overall composition and diversity of intestinal microbiota remained stable through treatment and viral challenge. Results: **Conclusions:** This study demonstrates that ingestion of Bl-04 has effects on the baseline state of innate immunity in the nasal mucosa and on the subsequent response of the host to rhinovirus challenge. The gut microbiota appears resilient to both probiotic treatment and viral challenge. These findings provide first evidence in humans on the potential mechanisms behind reduced upper respiratory illness risk in healthy active adults by the probiotic Bl-04.

Keywords: probiotic, Bl-04, respiratory tract, rhinovirus, immunity

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144/1266

CHRONIC LEUCINE SUPPLEMENTATION REDUCED HYPERCHOLESTEROLEMIA AND HYPERTRIGLYCERIDEMIA, AND REVERSED INSULIN RESISTANCE IN DIABETIC RATS

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Background and objectives: Diabetes is characterized by hyperglycemia that can be associated or not with insulin resistance. Although the underlying mechanisms are not fully understood, leucine supplementation has been demonstrated to improve lipid and glucose metabolism, to reduce adipose tissue inflammation and to preserve lean body mass. We investigated the effects of leucine supplementation on lipid profile and glycemic control in diabetic rats.

Methods: Five days after birth, twenty four male Wistar rats received streptozotocin (120 mg/kg of body weight), and were randomly assigned into two groups at weaning: D – diabetic rats receiving a standard chow; DL – diabetic rats fed a diet supplemented with 5% leucine for nine weeks. A control group (C) consisted of twelve non-diabetics animals that received standard chow. Fasting glucose, insulin, triglycerides (TG), total cholesterol and HDL-cholesterol levels were analyzed in serum and homeostasis model of assessment-insulin resistance (HOMAIR) was calculated.

Results: Diabetic rats presented higher serum glucose, triglycerides and total cholesterol levels, and lower serum insulin when compared to control group ($p < 0.05$). Leucine supplementation significantly reduced serum glucose (131.80 ± 11.66 mg/dl versus 174.90 ± 12.55 mg/dl), total cholesterol (63.50 ± 3.40 mg/dl versus 74.67 ± 3.70 mg/dl), and TG (59.25 ± 3.39 mg/dl versus 86.90 ± 10.16 mg/dl) levels in diabetic rats when compared to D group. The HOMAIR was significantly higher in D group when compared to C group (14.07 ± 1.32, and 8.31 ± 1.55, respectively), indicating insulin resistance in diabetic animals. The HOMAIR was significantly lower in DL compared with D (8.66 ± 1.83 and 14.07 ± 1.32, respectively), but no difference was observed in comparison with C group.

Conclusions: We conclude that chronic leucine supplementation reversed insulin resistance and reduced hyperglycemia, hypertriglyceridemia, and hypercholesterolemia without improving hypoinsulinemia in diabetic rats.

Keywords: diabetes. insulin resistance. leucine. supplementation.

144/1267

FASTING AND CALORIC RESTRICTION IN ELDERLY WITH CARDIOVASCULAR DISEASE: A REVIEW

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Background and objectives: The main chronic diseases for the geriatric population are diabetes mellitus and cardiovascular disease, impacting quality of life and increasing the use of health resources. It has been shown that the main intervention for cardiovascular disease is a change of lifestyle, focused on weight control. The caloric restriction (CR) method has shown effectiveness in the treatment and reduction of costs of diabetes mellitus, obesity and hypertension. Also, it has been found that intermittent fasting has an important positive effect on weight, decreasing cardiovascular risk as a result. Although there are some cases and clinical trials that show the benefits obtained from fasting and CR, it has not been studied enough in elderly population. The objective of this review is to evaluate the clinical evidence of fasting and its benefits in elderly patients with cardiovascular disease.

Methods: We performed research using the PubMed database up to March 2017. We included clinical trials, metanalysis and systematic reviews. Search terms comprising Medical Subject Headings were as follows: "fasting", "caloric restriction", "cardiovascular disease", and "elderly". The included criteria were: studies of intervention in patients with cardiovascular disease (hypertension, dyslipidemia, coronary disease, and heart failure) with fasting or CR, where their outcomes were clinical parameters (blood pressure, lipid profile, weight, body mass index and fat mass). Adult men and women from 60 to 80 years and articles in English language were included in the research.

Results: We identified 27 potentially relevant studies. We excluded 10 studies for the following reasons: did not report clinical outcomes or patients of younger age. Finally, we included 11 studies, 4 systematic reviews, 2 metanalysis and 5 clinical trials, which will be evaluated for their full text. The preliminary results show that fasting and CR decreases cardiovascular risk in geriatric population, which is positively influenced by weight and serum lipid levels control.

Conclusions: Fasting as an intervention may have a benefit in geriatric patients with cardiovascular disease.

Keywords: fasting, caloric restriction, elderly, cardiovascular disease.

144/1274

THE DIET ADHERENCE IN CARDIOVASCULAR RISK FACTORS PATIENTS IN THE NORTH OF IRAN   BASED ON THE MEDITERRANEAN DIET ADHERENCE

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Background and objectives: Before any nutritional intervention, it is necessary to have the prospect of eating habits of people with cardiovascular risk factors. In this study we assessed the adherence of healthy diet and related factors.

Methods: This study was conducted on 550 men and women with cardiovascular risk factors that referred to Heshmat hospital in Rasht. Information was collected by interview and reading medical history and measuring anthropometric indexes. The Mediterranean Diet Adherence Screener was used for assessing dietary adherence, this screener was modified according to religious beliefs and culture of Iran.

Results: The mean age of participants was 58±0.38years. The mean of body mass index was 27±0.01kg/m2 and the mean of waist circumference was 98±0.2cm. The mean of dietary adherence was 5.76±0.07. Forty three percent of participants had low adherence and just 2% had suitable adherence. The mean of dietary adherence in men was significantly higher that women (p=0.07). There was no significant association between smoking and body mass index and dietary adherence. Participants in rural area and high educational participants insignificantly had an unsuitable dietary adherence

Conclusions: Education to different group about dietary intake correction and using a Mediterranean dietary pattern that is similar to dietary intake in the north of Iran, for controlling cardiovascular disease is necessary.

Keywords: Dietary adherence, Mediterranean dietary pattern, cardiovascular disease.

144/1281

ASSOCIATION BETWEEN DEPRESSIVE SYMPTOMS AND MEDITERIAN DIETARY ADHERENCE IN ADULTS WITH CARDIOVASCULAR DISEASE RISK FACTORS IN THE NORTH OF IRAN

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Background and objectives: Depression is prevalent in cardiovascular patients and may have important effects on patients' adherence to healthy diet that are necessary for their health. We examined the association between depression and dietary adherence in cardiovascular disease risk factors adults in the north of Iran.

Methods: This cross-sectional study was performed on 344 participants who were admitted to a tertiary hospital in Rasht. Demographic characteristics, blood pressure, anthropometrics indexes and blood factors were measured. For assessing dietary adherence, we used the 14-point Mediterranean Diet Adherence Screener (MEDAS) and for depression we used Beck Depression Inventory (BDI). All statistical tests were two-sided and P<.1 and P<.05 was used to indicate statistical significance

Results: Depressive symptoms was observed in 43% patients. Prevalence of patients with low, moderate and good diet adherence was 44%, 54% and 2%, respectively. In the univariate analysis, there was a relation between depression and diet adherence. Female sex, diabetes, higher waist circumference, higher HbA1C and lower level of hematocrit was associated with lower diet adherence. After controlling for confounders, there was no relation between depression and diet adherence (P=.249). So, odds ratio of the low diet adherence in patients with depression compared with patients without depression was 1.311 (95%CI: .827-2.079).

Conclusions: Study showed that depressive symptoms and dietary non-adherence were prevalent in our participants. Depressive symptoms were an independent predictor of dietary non-adherence. Studies are needed to increase our finding of the association between depressive symptoms and both perceived and objectively determined dietary adherence.

Keywords: Depressive symptoms, Dietary adherence, Cardiovascular risk factors, North of Iran

144/1305

THE INFLAMMATORY POTENTIAL OF DIET IS ASSOCIATED WITH BREAST CANCER RISK IN DIFFERENT CONTEXTS OF URBANIZATION: A MULTILEVEL ANALYSIS

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Background and objectives: Habitual dietary choices may influence chronic inflammation and several non-communicable diseases. The dietary inflammatory index (DII) was developed to assess the inflammatory potential of diet of diverse populations. The aim of the present study was to evaluate the association between the DII and breast cancer risk in Córdoba, Argentina.

Methods: A case-control study (317 women with BC and 526 controls) was conducted in Córdoba (Argentina) throughout 2008 to 2015. Dietary inflammatory index scores were computed based on dietary intake assessed by a validated food frequency questionnaire. Multi-level logistic regression models were fit to estimate the association between dietary inflammatory index scores and breast cancer. Age, Body Mass Index, age at menarche, number of children, socio-economic status and family history of BC were included as covariates at first level and level of urbanization (Capital city, cities with >30,000 inhabitants [except Capital city], and towns/rural populations with ≤30,000 inhabitants) as the second level variable.

Results: Increasing DII score (as continuous variable) showed significant positive associations with BC risk (OR 1.15; 95%CI 1.11 to 1.19). When the DII was used as a categorical variable, women at the third tertile of DII showed a 58% higher risk of BC (1.58; 95%CI 1.42 to 1.75) compared to women at the first tertile. A median OR around 2 indicated that for persons with the same individual-level covariates but belonging to more urbanized contexts, the risk of breast cancer increases, in median, 2 times.

Conclusions: Higher DII scores, were positively associated with breast cancer occurrence, suggesting that increasing intake of more anti-inflammatory dietary components, such as plant-based foods rich in fiber and phytochemicals, and reducing intake of pro-inflammatory factors, such as processed foods, or food rich in refined carbohydrates, saturated or trans fatty acids, may be a strategy for reducing BC risk in different contexts (or degree) of urbanization.

Conflict of Interest Disclosure: On behalf of all authors, the corresponding author states that there is no conflict of interest. Disclosure: Dr. Hébert owns controlling interest in Connecting Health Innovations LLC (CHI), a company planning to license the right to his invention of the dietary inflammatory index (DII) from the University of South Carolina in order to develop computer and smart phone applications for patient counseling and dietary intervention in clinical settings. Dr. Nitin Shivappa is an employee of CHI.

144/1317

GLUCOSE, INSULIN AND METABOLIC RESPONSE TO SOY AND WHEY PROTEIN AMONG NORMAL HEALTHY WEIGHT INDIANS

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Background and objectives: Incidence of metabolic syndrome and type2 diabetes in developing countries is increasing. Intervention strategies including increased physical activity and healthier dietary pattern are needed to improve health status. While high quality dietary protein intake has been linked to the growth and development of lean tissue; it could also be insulinogenic. Acute effect of consumption of different sources and amounts of protein, on glucose homeostasis, in South-Asian Indians, is unknown. This population group has a greater risk of developing diabetes, and a habitually low intake of high quality protein.

Methods: Study investigated effect protein type (soy vs. whey) and dose (15% vs. 30% Energy) on glucose homeostasis and energy metabolism, among healthy normal-weight Indians. The study tested Healthy adult males (20-35 years) (n=15) received four testmeals in random order. Energy expenditure (EE) and substrate oxidation (RQ) were measured every 30 minutes for 300 minutes post-meal. Satiety was estimated using visual analogue scale (VAS) at 0, 10, 40 min, and every half hour thereafter. Blood was collected at basal (- 10,-5 min), and post-meal (15, 30, 45, 60, 90, 120,180, 240,300 min) and incremental area under the curve (AUC) was measured for plasma glucose and insulin.

Results: There were no significant differences in mean weight and BMI between four intervention arms. EE, VCO_2, RQ, VAS and glucose did not differ with protein source or dose. AUC for plasma insulin was significantly higher for whey compared to soy at 30% dose (p<0.01). There was no difference in the insulinogenic response between whey and soy at 15% dose (p=0.07). Within a specific protein, only whey demonstrated a higher insulin response with a higher dose (p<0.01).

Conclusions: At lower doses, whey and soy do not elicit different insulinogenic responses. At higher doses, whey has greater insulinogenic response compared to soy, making soy a better source for those at greater risk for developing diabetes. Soy, as a source of high quality protein that is low in fat, saturated fat and cholesterol, makes it a good protein source to improve dietary patterns that could impact the development of type2 diabetes and metabolic syndrome.

Keywords: soy, whey, protein, glucose, insulin

Conflict of Interest Disclosure: Work was funded by DuPont Nutrition & Health and RM and MC were employed at the time of the study by DuPont Nutrition and Health.

144/1318

PROFILE CONSUMPTION OF SWEETENERS AND DIETETIC PRODUCTS BY INDIVIDUALS WITH TYPE 2 DIABETES MELLITUS FROM AN OUTPATIENT CLINIC IN THE CITY OF SÃO PAULO (BRAZIL)

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Background and objectives: The consumption of sweeteners and dietetic products is increasing in the last few years. These products play an important role in the diet of patients with diabetes mellitus since they can provide the taste of sweetness, without adding calories. Besides, they can also improve social life, psychological acceptance of the disease and the possibility of increasing the variety of foods. Therefore, the purpose of this work is to analyze the consumption of sweeteners and dietetic products among patients with type 2 diabetes (DM2).

Methods: This is a cross-sectional, descriptive study with primary data collection, sampling done by convenience, approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A structured questionnaire to characterize alternative sweeteners and dietetic products intake was developed for this research and applied to 82 individuals with DM2, both male and female, attending an outpatient clinic in São Paulo. Data analyses were performed using descriptive statistic, the Qui-square test with a level of significance of $p<0.05$.

Results: The majority of the participants consumes sweeteners (79%), usually chooses products according to its flavor (33,8%) and has the diagnosis of DM as the main determinant factor for its use (87,7%). Participants with a lower level of education presented a higher consumption of sweeteners, but this result was not statistically significant (p= 0,12). The higher consumption of sweeteners was found in the lowest-income group, however this result was also not statistically significant (p=0,78). Regarding the consumption of dietetic products, half of the individuals con-

sumes them, with gelatin (54%) and soft drinks (52%) being the most consumed products. Most reported consuming them due to the diagnosis of the disease (63,4%). Nutritionists (50%) and physicians (45,5%) were the professionals who oriented the use of sweeteners and dietetic products and almost 75% followed the guidance regarding these use.

Conclusions: The majority of individuals with DM2 consumes sweeteners and dietetic products because the diagnosis of the disease. These choices are mainly guided by a health professional, being extremely important to avoid inadequacies in food choices and to improve the quality of life of these patients.

Keywords: Diabetes mellitus. Sweeteners. Dietetic products. Nutritional education.

144/1323

ASSOCIATION BETWEEN THE PERCENTAGE OF FAT MASS AND ANTHROPOMETRIC AND METABOLIC INDICATORS: IN THE SEARCH FOR CLINICAL INDICATORS FOR CHILDHOOD OBESITY

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Background and objectives: In childrens, the general and visceral obesity are associated with an increased cardiometabolic risk. The measure of fat mass is the most objective indicator to diagnose obesity, however its high cost and low availability make it necessary to have new clinical indicators for its estimation. Insulin resistance is a co-morbidity present in most obese children but its measurement is expensive.The Single Point Insulin Sensitivity Estimator (SPISE) is a tool easy to use that includes circulating lipids and the BMI to estimate insulin resistance.The aim of this study was to determine the relationship between the percentage of fat mass with anthropometric and metabolic indicators to determine which variable can best predict the percentage of fat mass.

Methods: Correlation-causal design study in 40 children (12 females, 28 males), aged from de 11 to 14 years overweight and obese from an educational center in the province of Biobío.

Anthropometric measurements (weight, height, waist circumference, body fat percentage, body mass index (BMI) and Waist to height ratio (WHtR), were performed, fasting blood glucose,

insulin and lipid profile levels (TC, LDL, HDL and TG), were measured. Insulin sensivity was calculated using SPICE and Homeostasis Model Assessment – insulin resistance (HOMA-IR). The association between variables were assessed by Pearson correlation and linear regression.

Results: The means of fat mass was 36,1±5,9, from BMI 27.5±3.6, WHtR 0.6±0.1, TC 153.1±28.2, HDL choresterol 44.7±10.6, LDL choresterol 86.2±21.4, TG 108.1±61.1, fasting blood glucose 83.3±6.8, insulin levels 16.9±7.3, HOMA-IR 3.6±1.7 and 5.9±1.2 from SPISE. The percentage of fat mass presented a high correlation with WHtR (R=0.707;p=0.000) and a significant correlation with BMI (R=0.671;p=0.000), insulin levels (R=.409;p=0.009) and SPISE index(R=-0.558;p=0.000). The other variables did not present a significant correlation. In the multiple linear regression analysis, the model that included only the WHtR was the better predictor for changes in fat mass (50%).

Conclusions: The SPICE Index present a higher correlation with fat mass than insulin levels while WHtR present a high association with fat mass achieving a high percentage in its prediction, that suggest his possible application as a clinical predictor of obesity and cardiometabolic risk in Chilean childrens.

Keywords: Waist to height ratio (WHtR), childhood obesity, body fat, body mass index (BMI), The Single Point Insulin Sensitivity Estimator (SPISE)

144/1326

BOCAIUVA FLOUR (ACROCOMIA TOTAI MART.) REDUCES BODY FAT AND HEPATIC STEATOSIS OF RATS SUBMITTED TO A HYPERCALORIC DIET

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Background and objectives: The prevalence of people suffering from obesity and overweight has increased worldwide. In 2014, there were approximately 1.9 billion overweight adults, 600 million of which were obese. Thus, the purpose of this study is to evaluate the effects of bocaiuva flour on body fat and hepatic steatosis of rats submitted to a hypercaloric diet.

Methods: A total of 38 male Wistar rats were distributed in a control group on a hypercaloric diet: HC (n=9), and treatment groups on a hypercaloric diet supplemented with 5%, 10% and 15% bocaiuva flour (BF): HC5BF (n=10), HC10BF (n=9) and HC15BF (n=10), respectively. After the animals were euthanized, fat depots were obtained and weighed: retropreperitoneal, epididymal and visceral (omental, mesenteric and perirenal). To evaluate the density of steatosis in the liver, point-counting method was used in histological slides stained with H&E (haematoxylin and eosin). The data was interpreted using analysis of variance, followed by Tukey post hoc analysis, considering statistical significance p<0.05.

Results: Regarding body fat, there was a difference between groups (p=0.01), being: HC (12.99g), HC5BF (10.96g), HC10BF (9.10g) and HC15BF (8.36g). There was a significant difference between groups HC, HC5BF, HC10BF and HC15BF analyzing the following fat depots: epididymal 4.36g, 3.51g, 2.83g and 2.65g (p=0.01); mesenteric 3.54g, 3.19g, 2.64g and 2.58g (p=0.02) and retroperitoneal 3.45g, 2.94g, 2.45g and 2.04g (p=0.04), respectively. The following values were obtained from the histological analysis of the hepatic steatosis density: HC (17.32±3.63), HC5BF (13.72±2.42), HC10BF (7.08±2.47) and HC15FB (6.96±3.33). The animals of the HC10BF and HC15BF treatment groups were statistically different from the control group, since these animals showed a reduction of 59.12% and 59.82% of hepatic fat deposition when compared to the HC group.

Conclusions: The group that received the supplementation of 15% of bocaiuva flour showed a 35% reduction in body fat and preserved hepatic tissue when compared to the control group. In conclusion, these results are extremely important, since there is no other scientific evidence associating the consumption of bocaiuva flour for controlling damages caused by obesity.

Keywords: Obesity; Cerrado; Fruit.
Further collaborators:
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144/1336

EFFECT OF MORINGA OLEIFERA LEAF POWDER ON BIOCHEMICAL AND HAEMATOLOGICAL PARAMETERS OF WEANING WISTAR ALBINO RATS

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Background and objectives: The world is under the heavy yoke of malnutrition and in the developing world, the statistics are grim. The nutritional properties of Moringa are now so well known that there seems to be little doubt of its substantial health benefit. Nonetheless, the outcomes of well controlled and well documented clinical studies are still clearly of great value. Thus, the study was designed to evaluate the effect of Moringa oleifera

leaf powder on biochemical and hematological parameters of weaning wistar albino rats as a means of food diversification in terms of protein source.

Methods: Proximate and antinutrient components of the leaf were determined. Twenty four rats of three weeks old were obtained from the Animal House of the College of Health Sciences, University of Uyo and divided into four groups of six rats each with average weight of 52.58kg. The rats were assigned dietary treatment categorized as Moringa Diet (MD), Protein Free Diet (PF), Synthetic Diet (SD) and Normal Diet (ND) for 21 days and the effect of these diets were determined.

Results: Proximate composition of the leaf revealed protein content as 29.6%, and dietary fiber 22.6%. The presence of antinutrient showed: HCN 0.06mg/100g, Oxalate 2.85 mg/100g, Phytate 1.39 mg/100g and Tannin 0.13 mg/100g were at insignificant levels. Food intake rate of rats fed with synthetic and normal diet were significantly higher (P<0.05) than that of the rats fed moringa diet. Effect of the diet on body weight showed that rats on SD (126), ND (117.67), and MD (92.66) gained significantly (P<0.05) higher weight than those on PF 23.33). Haematological parameters showed no significant difference (P>0.05) in WBC, RBC, HGB, PCV, MCV, MCH, and MCHC of moringa diet with synthetic diet. Moreover, moringa diet was significantly (P<0.05) higher than synthetic in platelet value. However, these parameters were all significant (P<0.05) against the PF. Results: **Conclusions:** Moringa leaf powder is of high biological value and could serve as a nutritional complement against protein deficiency.

Keywords: Moringa, Proximate, Anti nutrient, Protein deficiency

Conflict of Interest Disclosure: We declare that this work has not been publish either in part or whole anywhere else and that this work was solely financed by the authors without any financial support from any organisation or the University.

144/1341

OBESITY PREVALENCE IN A MIGRANT POPULATION LIVING IN CASABLANCA, MOROCCO

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Background and objectives: Rural-Urban migration is known as a major factor associated with the increase of obesity prevalence in many countries. In Morocco, obesity prevalence is higher in cities.

In this study, we assess the influence of ethnicity and migration, through urbanity degree, on obesity prevalence variation, between the ethnic group of Soussi (native of the rural zone of Souss region) and Casablanca in Morocco.

Methods: We used a multi-stratified sampling including 615 subjects (305 subjects recruited in metropolitan Casablanca and 310 from the Souss region). The sampling was based on ethnicity, sex and age. We measured anthropometric parameters, using (i) body mass index (BMI), based on cut-off points recommended by the WHO, and (ii) body fat percentage (BF%), based on cut-off points taken from tables provided in the user's manual of a BIA meter (i.e., a bioelectrical impedance device)

Results: Obesity prevalence is greater in women than in men (22.5% vs. 19.8%). Women also presented an AO and a higher %BF risk than men (77.6% vs. 33.4% and 71.2% vs. 60.4%, respectively). Adjusted analysis of our data indicated that, in comparison with rural Soussi, the AO is significantly greater in the second generation migrants group (51.0%, OR=0.33, 95%CI [0.17–0.64], p<0.01); Obesity prevalence (BMI and %BF) is also more elevated in Soussi from Casablanca (21.3%, OR=0.53, 95%CI [0.30–0.92], p<0.05 and 71.3%, OR= 0.42, 95%CI [0.28 –0.76], p<0.01, respectively). Obesity prevalence and AO are higher in women from Casablanca than in women from Souss region (BMI: 31.0% %, OR= 0.54, 95%CI [0.37–0.92], p<0.05, and AO: 83.9%, OR=0.48, 95%CI [0.27–0.84], p<0.01).

Conclusions: Our study showed that anthropometric and body statuses of our study population depend on urbanity degree (second generation migrants) and ethnicity (Soussi from Casablanca) in men. However, in women, it is linked to their residence location (particularly, in Women from Casablanca).

Keywords: Obesity, migration, ethnicity, city

144/1351

IMPACT OF EARLY ENTERAL NUTRITION WITH IMMUNONUTRIENTS IN MORBIMORTALITY IN PATIENTS WITH TRAUMATIC BRAIN INJURY IN THE INTENSIVE CARE UNIT OF MEXICALI`S GENERAL HOSPITAL

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Background and objectives: Introduction: early enteral nutrition is initiated in the first 24-48 hours after injury or admission to the Intensive Care Unit (ICU), it is a method of nutritional support with beneficial effects for the patient that improve outcome. Traumatic brain injury (TBI) is the third cause of death in Mexico caused by accidents or violence, therefore it is considered a serious public health problem.

Objective: to determine if early enteral nutrition with immunonutrients (EENI) supplied to patients with TBI decreases morbimortality in the ICU of the General Hospital of Mexicali.

Methods: random systematic, longitudinal and comparative clinical study in 22 patients with severe TBI, 11 patients in the con-

trol group with Early enteral modular nutrition (EEMN) and 11 in the intervention group supplied with EENI, that were admitted to the ICU and complied with inclusion criteria, from August 1st, 2015 to June 30, 2016.

Results: 16 (72.7%) males and 6 (27.3%) females with a mean age of 34.7 years. The main causes of TBI were run over and motor vehicle accident in 54.6%. The group with EENI showed increase in weight (T of Student 23.737, p=.001), total proteins (T de Student 13.40, p=.001), leukocytes (T Student de 2.05, p =.002) and lymphocytes (T de Student 7.09, p=.001) at discharge from the ICU. Length of stay in the ICU, mechanical ventilation, infections, mortality and days of enteral nutrition were less in the EENI group.

Conclusions: EENI impacts in a positive way by decreasing the incidence of infectious complications as length of stay in the hospital by which it is possible to improve in less time patient`s health and diminish hospital costs.

Keywords: Early enteral nutrition, Enteral nutrition with immunonutrients, traumatic brain injury, Intensive Care Unit.

144/1354

FASTING, INTERMITTENT FASTING OR CALORIC RESTRICTION AS NUTRITIONAL MANAGEMENT OF ADULTS WITH TYPE 2 DIABETES. A SYSTEMATIC REVIEW (PRELIMINARY RESULTS)

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Background and objectives: Type 2 diabetes encompasses individuals who have insulin resistance and usually have relative insulin deficiency. Pharmacological treatment usually has adverse effects on the body in addition to the high cost it produces, so alternative strategies are necessary. Intermittent fasting improves metabolic health and many other physiological and molecular markers of health in animal and humans models. Also, recently it has been studied that patients with diabetes type 2 with continues caloric restriction show metabolic improvement. However, further studies are still needed to understand the effect of fasting on the physiological, metabolic and clinical mechanisms in the diabetic patient. The aim of this systematic review is to evaluate the clinical evidence that fasting is beneficial to patients with type 2 diabetes.

Methods: We performed a research of PubMed database up to February 2017. We included clinical trials, meta-analysis and systematic reviews. Search terms comprising Medical Subject Headings (MESH) as follows: "fasting", "intermittent fasting", "caloric restriction", "diabetes type 2" and "adult".

Results: According to the criteria established for the words MESH, we found 743 articles. However, 686 were excluded after reviewing the titles of these publications for the following reasons: did not report clinical outcomes about type 2 diabetes (fasting glucose and insulin, glycosylated hemoglobin, lipid profile and measures of weight, body mass index, fat and muscle mass) or without any intervention of fasting or caloric restriction. Actually, we are reviewing the abstracts of the remaining 57 studies. Publications that do not meet the established criteria will be excluded from the systematic review, while the remaining studies will be evaluated for their full text.

Conclusions: The preliminary results show the increased in recent years of clinical trials about the study of fasting as a possible intervention in patients with diabetes without negative consequences. It is recognized the cost-benefits of this therapy. Therefore, it is necessary to perform a systematic review of these studies as a tool for decision-making in evidence-based medical practice.

Keywords: fasting, caloric restriction, adult, type 2 diabetes

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144/1363

OBESITY AND CLINICAL OUTCOME OF HOSPITALIZED CHILDREN UNDER TWO YEARS OLD WITH LOWER RESPIRATORY TRACT INFECTIONS

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Background and objectives: Obesity is associated with increased morbidity and mortality in adults with respiratory infections.

Aim: To study an association between overweight and clinical evolution in children under two years old, hospitalized for lower respiratory tract infections (LRTI).

Methods: Retrospective study with clinical records review of children younger than two years old with LRTI hospitalized in Josefina Martinez Hospital, during winter (2009 to 2015). Demographic data, anthropometry, nutritional status (WHO 2006 reference) and clinical outcome were recorded: Hospital stay (days/hours), use and length (days) of oxygen and noninvasive ventilatory support (NIV), use of corticosteroids, and antibiotics.

Results: The sample was constituted by 678 children, 10.96 ± 5.65 months old, 62.3% younger than 12 months, 55% boys. The commonest admission diagnosis was viral pneumonia (67%), 54.7% received basic care, 98.7% oxygen therapy, 35.4% NIV, 26.1 antibiotics and 47.5% corticoids. Nutritional status: 10% had malnutrition and 34.8% overweight or obesity. Boys with overweight

or obesity had higher frequency of viral pneumonia (75.4% vs. 60.2%, p = 0.014), need for more complex care (27.7% vs. 19.9%, p = 0.018) and length of NIV (Median 4.5 (3 to 5.5) vs. 3.0 (2 to 5) days, p = 0.007), than eutrophic. Boys with malnutrition had higher need of NIV than eutrophic (56.2 % vs. 34.6%, p=0.02). In girls, there was no association between nutritional status and clinical outcome.

Conclusions: In this sample of children younger than two years old, hospitalized for LRTI, boys with malnutrition had a higher need of NIV but those with overweight or obesity needed a more complex care and longer NIV than the eutrophic ones.

Keywords: Obesity, overweight, lower respiratory tract infections, children, hospital.

Further collaborators:
Mireya Méndez

144/1369

CAN WHO GUIDELINES FOR MALNUTRITION REDUCED THE MORTALITY IN CHILDREN RECEIVING NUTRITION REHABILITATION AT THE HOSPITAL: CLINICAL STUDY IN MOROCCAN MALNOURISHED CHILDREN

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Background and objectives: Protein-energy malnutrition is a major cause of mortality among young children in Africa hospital. objective was to assess the outcome of children with protein-energy malnutrition after treatment by World Health Organization guidelines.

Methods: Eighty-three children with protein-energy malnutrition (PEM) and aged from 6-60 months were admitted to the paediatric service in University Hospital Hassan II, Fez, Setting: The study was carried out in the paediatric service at Hassan II University Hospital, Fez, Morocco, from 1 January 2002 to 30 July and 30 July 2005. Eighty-three children with protein-energy malnutrition (PEM) and aged from 6-60 months were admitted to the paediatric service in University Hospital Hassan II, Fez, Morocco, from 1 January 2002 to 30 July and 30 July 2005. Children were divided in two groups oedematous malnutrition (OM) and non-edematous malnutrition (NM). The main outcomes measures were the recovery rate, relapse post-discharge and rate death during treatment. All children received nutrition rehabilitation by using the World Health Organization protocol during 21days.

Dietary treatment was based on using a formula-fed (Guigoz 2) containing 498kcal/100g of energy, 9.9g/100g of protein and 23.5g/100g of fat. At initial phase we begin with energy density of 75Kcal/kg/day and 1.2g/kg/day of protein without stopping both breast-feeding and oral micronutrient supplement. At rehabilitation phase the energy dens 100-150Kcal/kg/day and 3g/kg/day of protein were used. A plasma concentration of CRP, AAG and Hemoglobin were assessed.

Results: The overall case fatality rate was 13(15.66%) split between the NM with (6.02%) and OM with a rate of 9.63% early death and late death. The recovery rate was (84.33%) and the relapse rate post-discharge was lower (4.81%). Overall rate recovery was divided among 38(45.78%) in the non-edematous group and 32(38.55%) in the oedematous. The overall weight gain was 7.16±0.62 and 58.57% gained over 5g/kg/day. 70.73% of oedamtous malnutrition gained over.

Conclusions: Despite the case fatality rate above target levels <5% of WHO, the use WHO guidelines provided an acceptable level of care indicated by high recovery rate (84.33%), lower relapse post-discharge 4(4.81%) and over half of children (58.57%) had weight gain >5g/kg/day.

Keywords: outcome, WHO guidelines, hospital, nutrition rehabilitation

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144/1373

CARDIOVASCULAR RISK IN CHILDREN AND ADOLESCENTS WITH CEREBRAL PALSY

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Background and objectives: Patients with Cerebral Palsy (CP) have a growing prevalence of overweight but evidence of associated cardiovascular risk factors is scarce.

Aim: To study metabolic complications of obesity in CP children and adolescents and look for an association to different conditions.

Methods: Cross-sectional study in 69 children with CP, under follow-up in units of special health care needs children (CSHCN) from two Public Hospitals (Padre Hurtado and Sótero del Rio, in Santiago, Chile). Demographic data were obtained, Anthropometry was performed (Brooks 2011 reference), gross motor function classification system (GMFCS) was applied and a fasting sample for measuring plasma triglycerides (TG), total cholesterol (TC), glycaemia (Gli) and insulinemia was obtened. HOMA index was

calculated. Frequency and association analysis of metabolic parameters with age, sex, neonatal history, nutritional status, GM-FCS, use of anticonvulsant drugs were studied. Approved by ethics SSMSO Committee, parents signed an informed consent.

Results: 69 patients were included, of 11.1 + 4.9 years old, 62.3% were boys. Motor function: 81.2% grade IV-V, 50.7% with enteral feeding, 83.9% receiving anticonvulsant treatment. Nutritional status (BMI /Age): 15.4% (Percentile, Pc<10), 73.8% (Pc10-75) and 10.8% (> Pc75). Metabolic parameters: 5.8% had CT≥200mg/dL, 20.3% TG≥110 or 130 mg/dL (according to age), 4.3% Gli≥100 mg/dL and 18.8% HOMA≥3. Children with a BMI > Pc90 had higher TC (ANOVA; p = 0.05), with a direct correlation between BMI and CT (Spearman, R=0.11, p = 0.036). Girls and patients with anticonvulsants had a higher prevalence of insulin resistance (p = 0, 001 and p = 0, 023) and those with less mobility, a higher prevalence of elevated TG (Chi2, p = 0.032).

Conclusions: The prevalence of hypercholesterolemia, hypertriglyceridemia and insulin resistance was high in this sample of children with CP; Hypercholesterolemia was associated with overweight, hypertriglyceridemia with immobility and insulin resistance was more frequent in girls and users of anticonvulsants.

Keywords: Cerebral Palsy, nutrition, children, obesity, metabolic complications.

Further collaborators:
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144/1392

RELATIONSHIP BETWEEN BODY MASS INDEX AND DECLINE OF COGNITIVE FUNCTION IN MIDDLE-AGED AND ELDER OBESE AND OVER-WEIGHT POPULATION

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Background and objectives: The correlation between body mass index (BMI) and cognitive function remains controversial. This study aimed to compare the cognitive function among normal weight, overweight and obese population and to explore the relationship between obesity and cognitive impairments in the midlife obese and overweight people in China.

Methods: A total of 676 adults, aged from 35 to 60, were recruited from Beijing, China. The mini-mental state examination (MMSE) and montreal cognitive assessment scale (MoCA) were carried out to assess the cognitive function of the subjects. We then compared the cognitive function among healthy, overweight and obese population using covariance analysis. The correlation between BMI and risk of cognitive impairments was assessed using the partial correlation, linear regression and multiple logistic regression models.

Results: No significant differences in MMSE and MoCA scores and scores of all domains in males among different BMI groups (p>0.05). However, in females, the MMSE score, language ability and language use ability were obviously different in different BMI groups (p<0.05) and the MoCA score, attention and abstract thinking ability were also different among groups (p<0.05). The partial correlation analysis revealed that hip circumference was negatively correlated with language skills (p<0.05), that the waist-to-hip ratio was negatively correlated with orientation but positively associated with language skills (p<0.05), and that BMI had a negative correlation with both memory and language skills (p<0.05) in the MMSE scale. In the MoCA scale, the wasit circumference was negatively correlated with orientation but positively associated with delayed memory (p<0.05); the hip circumference was positively associated with delayed memory (p<0.05); the waist-to-hip ratio was negatively correlated with both orientation and thinking ability (p<0.05). A cross-sectional linear correlation between BMI and MMSE and MoCA scores was established in females in a univariate linear regression analysis. In a univariate logistic regression analysis, a linear correlation between BMI and MMSE and MoCA scores was found in females. In multivariate logistic regression analysis, BMI was only correlated with MMSE score in women.

Conclusions: Overweight and obesity were associated with higher risk of cognitive decline among midlife population in China.

Keywords: overweight, obesity, cognitive function, body mass index, The mini-mental state examination, montreal cognitive assessment scale

144/1399

BODY COMPOSITION OF PEOPLE LIVING WITH HIV/AIDS WITH CLINICAL DIAGNOSES OH HIV-RELATED LIPODYSTROPHY SYNDROME

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Background and objectives: People living with HIV/AIDS (PLHA) may develop body composition alterations (or HIV-associated lipodystrophy syndrome - HALS), with body fat redis-

tribution related or not to metabolic alterations, classified among: lipohypertrophy (fat accumulation on abdominal area and/or localized), lipoatrophy (fat reduction in peripheral regions) and mixed lipodystrophy (association of both). The purpose was to characterize PLHA with HALS diagnoses according to their subtype, clinical-metabolic profile and body composition.

Methods: The study was observational and transversal, with its sample selected by convenience and performing clinical immunological characterization, anthropometric assessment, nutritional diagnosis, body composition of PLHA with a clinical HALS diagnosis from July 2015 to July 2016, in regular ART use for at least a year, ranging from 18 to 60 years old.

Results: Forty individuals were distributed equally by gender, with age of 45,5 ± 8,2 years, diagnostic time of 15,3 ± 6,2 years and antiretroviral therapy usage time of 13,8 ± 5,7 years. HALS mixed form was the most prevalent (n = 17; 42,5%). There was significant difference for TCD4+ cell counting (p=0,0115) when comparing mixed form and lipohypertrophy groups. The main differences found among subtypes are related to body composition and anthropometric measures: body mass index, abdominal and neck circumference comparing mixed form and lipohypertrophy groups (p = 0,0007; p = 0,0018; and p = 0,0062, respectively), as well as between mixed form and lipoatrophy groups (p < 0,0001; p < 0,0001; and p = 0,0019, respectively). Concerning body composition differences were observed for all analyzed parameters: lean body mass was different between mixed form and lipohypertrophy groups (p = 0,0252); fat body mass and percent of fat body mass were different between lipoatrophy and lipohypertrophy groups (p = 0,0008 for both variables); fat visceral area values were different both between mixed form and lipohypertrophy groups (p = 0,0025) and between lipoatrophy and lipohypertrophy (p < 0,0001).

Conclusions: The diagnoses, sub-classification and identification of metabolic alterations are important as specific strategies may be elaborated, since the body changes detected reaffirm that HALS must not be seen as an unique syndrome, but as three different impairments that should be managed in particular ways.

Keywords: People living with HIV/aids, lipodystrophy, body composition, metabolic syndrome.

Further collaborators: Support: FAPESP (process 2015/10103-7)

144/1403

TRIMETHYLAMINE N-OXIDE AGGRAVATES HEPATIC STEATOSIS THROUGH UP-REGULATION OF BILE ACIDS SYNTHESIS AND ACTIVATION OF ENDOGENOUS HEPATIC FARNESOID-X-RECEPTOR

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Background and objectives: Trimethylamine-N-oxide (TMAO), a gut-flora-dependent metabolite of choline, is associated with cardiovascular diseases and bile acids (BAs) metabolism. BAs played a critical role in lipid metabolism and increased plasma BAs level was found in NAFLD patients. The aim of this study was to identify potential interactions between TMAO and BAs metabolism in NAFLD.

Methods: We performed a case control study including 60 biopsy-proven NAFLD cases and 35 controls. Serum TMAO and BAs concentrations were quantified by high-performance liquid chromatography with online electrospray ionization tandem mass spectrometry (HPLC-MS/MS). The associations of TMAO and BAs with pathological progress of NAFLD were studied by covariance and receiver operating characteristic (ROC) calculation was used to elaborate the predictability of NAFLD. Male C57BL/6 mice were fed either a high-fat diet (HFD) or HFD supplemented with 0.2% TMAO in water (wt/vol) for 18 weeks. Serum biochemical parameters and genes expression were quantified and compared between groups.

Results: In the case control study, median serum TMAO level was 2.02μM (interquartile range, 1.15, 3.18) and median serum BAs level was 8.70μM (interquartile range,5.84, 12.79μM) in NAFLD patients, which were significantly higher than controls (median[interquartile range]: 0.98[0.33, 1.57]μM, 6.34[4.20, 8.63] μM, serum TMAO and BAs levels respectively). Higher scores for steatosis, inflammation and NAFLD activity were associated with greater ln-transformed levels of TMAO and BAs (all P trend <0.05). To predict NAFLD versus control, area under the ROC of serum TMAO and BAs combination was 0.767 (P<0.001). The mRNA expression of the key BAs synthetic enzyme cholesterol 7 alpha-hydroxylase (Cyp7a1) was significantly higher in NAFLD patients while the mRNA level of BAs transporters remained unchanged. In the animal study, TMAO supplemented accentuated hepatic steatosis and upregulated the mRNA levels of lipogenesis genes. Hepatic BAs level and the expression of Cyp7a1 were significantly increased in TMAO supplemented group. Increased hepatic BAs activated farnesoid-X-receptor (FXR) and resulted in the elevation of fatty-acid synthase expression.

Conclusions: Serum TMAO and BAs levels were elevated in NAFLD patients and positively correlated with disease severity in NAFLD. TMAO aggravated hepatic steatosis through up-regulation BAs synthesis and activation of FXR.

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BODY COMPOSITION, ANTHROPOMETRIC MEASURES AND CLINICAL-NUTRITIONAL PARAMETERS OF PEOPLE LIVING WITH HIV/AIDS WITH CLINICAL DIAGNOSES OF HIV-ASSOCIATED LIPODYSTROPHY SYNDROME SUBDIVIDED BY GENDER

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Background and objectives: HIV-associated lipodystrophy (HALS) is characterized by morphological changes due to fat tissue heterogeneous disorders, with body fat redistribution associated or not to metabolic alterations. Such alterations are consequences of the chronic inflammatory state due the viral infection and the usage of specific therapy to treat the sickness. The HALS is described as a syndrome which consider the fat loss and/or accumulation, classified in three subtypes. The impairments due these metabolic and morphological alterations go beyond esthetic consequences, once there may be an increased risk to the development of other disturbances, such as the Metabolic Syndrome. Considering the existence of body composition differences per gender, the objective of the present study was to verify, among genders, the clinical-nutritional and anthropometric differences of people living with HIV/AIDS (PLHA) with clinical diagnoses of HALS.

Methods: The study was observational and transversal, with its sample selected by convenience and performing clinical immunological characterization, anthropometric assessment, nutritional diagnosis, body composition of PLHA during the follow-up of specialized outpatient service in infectiology with a clinical HALS diagnosis from July 2015 to July 2016, in regular antiretroviral

therapy use for at least a year, ranging from 18 to 60 years old. Pregnant women, people with chronic kidney failure, nephrotic syndrome, B and C virus chronic infection, uncontrolled hypothyroidism were excluded from the study.

Results: Forty individuals were distributed equally by gender, with age of 45,5 ± 8,2 years, diagnostic time of 15,3 ± 6,2 years and antiretroviral therapy usage time of 13,8 ± 5,7 years. The results showed significant difference on lipid profile to female gender, with increased values, except for HDL-cholesterol. No statistical differences were observed for fasting blood glucose and clinical-immunological parameters between genders.

Conclusions: Despite the lack of differences, body fat and anthropometric indicators presented higher alterations among women living with HIV/AIDS. Lipid profile significant alterations and high body fat values (even without statistical significance) among women suggests an increased risk for cardiovascular diseases when compared to men in the aforementioned population, highlighting the importance to adopt different follow up strategies for those patients.

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GLYCEMIC INDICES OF STANDARDIZED TRADITIONAL COCOYAM AND CORN BASED DISHES CONSUMED IN NSUKKA LOCAL GOVERNMENT AREA OF ENUGU STATE, NIGERIA

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Background and objectives: Glycemic index (GI) is an important parameter of food quality that compares the hypoglycemic effect of a test meal with pure glucose. Low glycemic index diets have been recommended for diabetics. There is however scarcity of data on the glycemic index of traditional Nigerian diets. The study was to determine the glycemic indices (GIs) of standardized cocoyam and corn based traditional dishes consumed in southern Nigeria.

Methods: Focus group discussions were conducted in eight randomly selected communities in Nsukka LGA to document the variations of each dish and their recipes. These were standardized and prepared. Proximate compositions of the prepared dishes were determined using standard procedure. A serving portion of each dish containing 50g of available carbohydrate was served to ten healthy adult subjects. Glucose was used as the reference food. The postprandial blood glucose response of the test and the reference meals were measured over two hours at 30 minutes interval. Blood glucose curves were plotted, area under each curve

and corresponding glycemic index value for each dish determined. Data were analyzed using Statistical Product for Service Solution (SPSS). Analysis of variance was used to compare the means.

Results: Three variations of cocoyam-based dishes were documented: "achicha"(dried cocoyam chips, soaked and steamed) with pigeon pea", "achicha" with fresh "akidi"(fresh cowpea pod) and "achicha" with vegetable (Solanum melongena). The corn-based dish had two variations: "ayaraya oka"(coarsely ground soaked, steamed corn) with pigeon pea" and "ayaraya oka" with fresh "akidi". The dishes had appreciable proximate composition though the protein content of the cocoyam based dishes were low 0.7 – 1.0%. The GIs of the cocoyam based dishes were within the range of 38.7 and 78.1 being highest in "achicha with vegetable (78.1) and lowest in "achicha" with fresh "akidi" (38.7). "Ayaraya oka" with fresh "akidi" also had lower GI (51.0) when compared with "ayaraya oka" with pigeon pea (75.3).

Conclusions: "Achicha" with fresh cowpea pod and "ayaraya oka" with fresh cowpea pod had low and moderate glycemic indices, respectively and could be recommended for diabetics.

Keywords: Traditional dishes, glycemic index, diabetics, variation, Nigeria

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144/1432

NEUROPROTECTIVE EFFECTS OF VITAMIN D VIA THE MODULATION OF NLRP3 INFLAMMASOME ACTIVATION

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Background and objectives: Ischemic stroke (IS) accounts for approximately 70% of the total cases of strokes. Accumulating evidence suggests that inflammasome is involved in the pathogenesis of IR by regulating proinflammatory cytokine interleukin-1β (IL-1β) secretion following tissue ischemia. According to the link between stroke severity and vitamin D status has been clinically proven in studies. The object of this study was to investigate the neuroprotective effect of vitamin D on cerebral ischemia-reperfusion (IR) injury and the possible mechanism of action.

Methods: Eight-weeks-old male Sprague-Dawley rats were assigned to (1) control group (sham), (2) ischemia/reperfusion group (I/R) (3) vitamin D deficiency group (VDD), and (4) vitamin D supplements group (VDS). Transient cerebral ischemia was induced in rats by middle cerebral artery occlusion (MCAO) for 1 h followed by reperfusion to investigate the effect of vitamin D on brain IR injury. Cerebral infarct volume, and the levels of oxidative stress and inflammatory markers were evaluated.

Results: Results showed that vitamin D deficiency exacerbated the severity of brain damage, and the levels of IL-1β and lipid per-

oxidation. By contrast, intraperitoneal administration of vitamin D improved the brain injury and these results were accompanied by attenuated NLRP3 inflammasome signaling.

Conclusions: In conclusion, vitamin D might reduce cerebral ischemic-reperfusion injury, possibly via it anti-inflammatory activity.

Keywords: Ischemic stroke, vitamin D, inflammasome, oxidative stress, IL-1β

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BODY COMPOSITION PROFILES AND METABOLIC DISEASE RISK PATTERNS IN NEW ZEALAND WOMEN - THE WOMEN'S EXPLORE STUDY

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Background and objectives: In New Zealand, 31.6% of adults are obese. Significant ethnic inequalities exist where Pacific Islanders and Māori have the highest rates. Despite the association between obesity and metabolic dysfunction, there is limited research comparing body composition and metabolic health status for these groups. Understanding how their body composition relates to metabolic health will be an important part of determining avenues for improving the associated health inequalities. The aim of this study was to investigate the body compositional and metabolic health profiles of healthy NZ European, Pacific and Māori women participating in the women's EXPLORE study, and to identify ethnic specific patterns between these profiles.

Methods: In this cross sectional study we recruited 233 European, 91 Pacific and 84 Māori women. Different body mass index (BMI) and body fat % (BF%) defined body composition profiles were analysed for anthropometric measurements, body fat location, and metabolic biomarkers.

Results: Obese (BF%) Māori women had higher android fat mass than obese (BF%) NZ European women (2.53kg vs 2.23kg), with no difference in waist circumference. Non-obese (BMI) Māori women had higher waist circumference than non-obese (BMI) NZ European women (78cm vs 73.5cm) with android fat differences. Regardless of body composition grouping, no ethnic differences were found for BF%. Obese Pacific women had higher HOMA-IR (5.12-5.45) and insulin (24.28-23.28mU/L) than obese NZ Europeans (2.10-2.61 and 10.07-11.24mU/L respectively), as did obese Māori women (3.64-4.35 and 16.76-19.41mU/L respectively). Body composition measures with highest sensitivity across all biomarkers assessed were BF% ≥30 for NZ European, both BF% ≥30 and BMI ≥25 for Pacific, and BMI ≥25 for Māori women respectively.

Conclusions: Māori and Pacific women had significantly higher glucose metabolism markers than NZ Europeans despite

no differences in BF%. When comparing Māori to NZ European women, a higher waist circumference was not always related to a higher android fat mass or vice versa, suggesting that WC may not be an accurate representation of abdominal fat for Māori women. In spite of ethnic differences, BF% ≥30 and BMI ≥25 appear most sensitive to detect high biomarkers compared to abdominal measurements.

Keywords: Obesity, Metabolic health, Body fat, Body mass index, Women

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EFFECT OF INTRAVENOUS IRON SUCROSE ADMINISTRATION ON LEVEL OF ANTIOXIDANT STRESS MARKERS AMONG MODERATELY ANEMIC PREGNANT WOMEN ATTENDING A SUB-DISTRICT HOSPITAL, HARYANA

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Background and objectives: Oxidative stress is known to increase during pregnancy, and also after supplementation of iron. The free iron particles released into blood following iron administration are known to produce Reactive Oxygen Species (ROS) which could lead to destruction of cells. We measured the level of antioxidant stress markers following administration of intravenous iron sucrose (IVIS) to moderately anemic pregnant women.

Methods: A total of 66 women in 2ndor 3rd trimester of pregnancy with moderate anemia (Haemoglobin level between 7.0-9.9 gm/dL) attending a Sub District Hospital, Ballabgarh, Haryana were recruited. Total iron requirement was calculated using Ganzoni's formula. IVIS was administered as 300mg in 300mL of Normal Saline over 30 minuteson alternate days till complete dose. Antioxidant stress markers were measured at the time of recruitment (baseline) and 4 weeks after the last dose of IVIS (endline) and included serum malondialehyde (MDA), serum superoxide dismutase (SOD), and ferric reducing ability of plasma (FRAP)

Results: At baseline, mean(SD) levels of MDA, SOD and FRAP were 3.5(0.9) ng/mL, 2.1(0.4) U/mL and 655.9(178.6) μM/L respectively; and the same at endline were 3.1(0.9) ng/mL, 1.6(0.5) U/mL and 761.3(166.4) μM/L respectively. Paired follow-up information was available for 37, 39, and 39 women for MDA, SOD and FRAP respectively. Mean(SD) for MDA, SOD and FRAP changed from 3.3(0.9) ng/mL, 2.2(0.4) U/mL and 679.3(188.8) μM/L at baseline and to 3.1(0.9) ng/mL, 1.6(0.5) U/mL and 745.4(166.7) μM/L respectively; and with p values 0.6009, <0.001, and 0.1284 respectively. No serious adverse effects occurred during the study period

Conclusions: A significant decline in the level of SOD was seen at four weeks after IVIS administration. There was no significant change in the levels of MDA and FRAP after the admin-istration of IVIS. Hence, IVIS could be a safe alternative for the management of moderate anemia in pregnancy

Keywords: Anemia iron sucrose

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FRACTIONS FROM RUELLIA TUBEROSA L. EXTRACT IMPROVES GLUCOSE UPTAKE IN TNF-A INDUCED INSULIN RESISTANT MOUSE FL83B HEPATOCYTES

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Background and objectives: Diabetes mellitus (DM) is characterized by insulin resistance, caused by inadequate production of insulin or by the ineffectiveness of insulin activity. Ruellia tuberosa L. (RTL) is a plant herb and has been used as folk medicine for the treatment of diabetes in Asian countries for decades. The previous study confirmed that ethyl acetate extract of RTL possesses hypoglycemic potential in diabetic rabbits. However, the detail mechanism was still unclear. The aim of this study was to investigate the effect of the ethyl acetate fraction (EAF) from RTL methanol extract on cytotoxicity and glucose uptake in tumor necrosis factor-alpha (TNF-α) induced insulin resistant mouse FL83B hepatocytes.

Methods: RTL was first extracted with methanol, and followed by partitioned with n-hexane and ethyl acetate, respectively. The ethyl acetate layer was then isolated into eight fractions by sephadex LH20 column chromatography. The EAF containing eluents were collected and lyophilized to be powder samples. MTT assay was conducted to measure the cytotoxicity of EAF in FL83B cells. EAF was further co-incubated with TNF-α treated FL83B cells, and flow cytometry was used to assess glucose uptake ability in cells.

Results: The results showed that no significant cytotoxicity effect was observed for eight EAFs at the concentration of 25 μg/ml in FL83B cells. Moreover, EAF2, EAF3, EAF5 significantly enhances the uptake of 2-NBDG in TNF-α treated FL83B cells.

Conclusions: In conclusion, the present study suggests that RTL may alleviate insulin resistance without cytotoxicity and has potential for developing into anti-diabetic drugs or dietary supplements.

Keywords: Ruellia tuberosa L., glucose uptake, TNF-α, insulin resistance, FL83B hepatocytes

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EFFECT OF CONSUMING PRELOADS WITH DIFFERENT ENERGY DENSITY (LOW VS. HIGH) AND TASTE QUALITY (SAVOURY VS. SWEET) ON POSTPRANDIAL BLOOD GLUCOSE AND ENERGY INTAKE

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Background and objectives: Consumption of reduced energy dense foods and drink has potential to reduce energy intakes and reduce postprandial blood-glucose concentrations. Recent studies suggest a meals taste quality (e.g. savoury/sweet) may play a role in satiation and food intake. This study sought to examine the effect of consuming preloads with different energy density (low or high) and taste quality (savoury or sweet) on postprandial blood glucose response and energy intake.

Methods: Thirty-two healthy lean males participated in a randomised crossover study with four treatments: low energy dense sweet preload (50kcal), higher energy dense sweet preload (248kcal), low energy dense savoury preload (58kcal), and higher energy dense savoury preload (256kcal). On each test day, participants consumed a standardised breakfast in the morning and later received one of the study preloads an hour before eating an ad libitum lunch. Blood glucose concentrations were measured at baseline (just before preload) and 15, 30, 45, 60, 90, 120, 150, and 180 minutes after consumption. Participants left the lab 3-hours after preload consumption and completed a food diary for the rest of the day.

Results: There was a significant difference in ad libitum lunch intake between treatments (P = 0.012) with higher intake in sweet LED (763kcal) and savoury LED (762kcal) compared to sweet HED (722kcal) and savoury HED (693kcal). Energy intake at subsequent meals was not significantly different between the treatments (P = 0.284). The total daily energy intake was 2056kcal for sweet LED, 2197kcal for sweet HED, 2171kcal for savoury LED, and 2194kcal for savoury HED. The glucose response over three-hour period was 249mmol/L.min for sweet LED, 355 mmol/L.min for sweet HED, 253mmol/L.min for savoury LED, and 328mmol/L.min for savoury HED, representing a significant difference between treatments (P < 0.001).

Conclusions: Participants compensated primarily for energy differences and were less influenced by taste quality. Participants compensated for the energy in savoury LED preload, but not the energy in sweet LED preload. Consumption of high energy dense preloads resulted in a larger spike in postprandial glucose response compared with low energy dense preloads, irrespective of taste quality. Potential mechanisms and reasons for these differences will be discussed.

Keywords: Energy density. Taste. Glycaemic response. Energy intake

EFFECT OF WATER SUPPLEMENTATION ON COGNITIVE PERFORMANCES AND MOOD AMONG MALE COLLEGE STUDENTS IN CANGZHOU, CHINA

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Background and objectives: The effect of water-supplementation on cognitive performances was investigated.

Methods: Totally 68 male college students aged 18-25 years were randomly assigned into water-supplementation (WS) and no water-supplementation (NW) group. In the test day, urine osmolality, thirst, cognitive performances and mood were measured before water-supplementation. Then, subjects in WS group were asked to drink 400 mL purified water within 5 minutes. One hour later, same tests were measured. Mixed model of repeated measures analysis of variance were analyzed.

Results: Water-supplementation has effect on dehydration, Z = -2.63, P = 0.0086, with percentage of dehydration in NW group increased 5.8% without statistically significance, whilst decreased 50% in WS group, χ^2 = 17.752, P = 0.000. There were also interactions on fatigue, depression, vigor and TMD (total mood disturbance) between time and group, $F_{(1, 61)}$ = -4.93, P < 0.0001, $F_{(1, 61)}$ = -2.06, P = 0.0438, $F_{(1, 61)}$ = 5.56, P < 0.0001, $F_{(1, 61)}$ = -2.16, P = 0.0346. Significant interactions effect on total score of digit span, digit span forward and backward were found between time and group, $F_{(1, 61)}$ = 4.27, P < 0.0001, $F_{(1, 61)}$ = 2.26, P = 0.0275; $F_{(1, 61)}$ = 3.24, P = 0.0019. The total score of NW group decreased 0.03 without statistically significance, whilst increased 1.53 in WS group after water-supplementation, t (29) = -3.64, P = 0.0011.

Conclusions: In conclusion, water-supplementation has beneficial effect on hydration status, short-term memory, fatigue, depression, vigor and TMD among male college students.

Keywords: Hydration; Water supplementation; Cognitive performances

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EFFECTS OF DJULIS (CHENOPODIUM FORMOSANUM) ON COLITIS-ASSOCIATED COLON CANCER IN RATS

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Background and objectives: Colon cancer is a disease closely associated with diet and inflammation. Many studies have indicated that high consumption of whole grains may decrease the risk of colon cancer. Djulis (Chenopodium formosanum), a native cereal crop in Taiwan, is rich in betalains, polyphenols and dietary fiber. Previous studies showed that betalains in djulis had an anti-oxidative effect and both polyphenols and dietary fiber had anti-inflammation and anti-tumor activities. This study investigated the effect of djulis on colitis-associated colon cancer and its related mechanisms.

Methods: Experimental colitis-associated colon cancer was induced in F344 rats injected with 3 doses of 1,2-dimethylhydrazine (DMH, 40 mg/kg BW, i.p) during the first week and then fed with dextran sulfate sodium (DSS, 3% in drinking water) for 7 days. Djulis-treated groups were given AIN-93G diet containing 5, 10 or 20% djulis. Animals were sacrificed after 10 weeks of experimental period and colons were collected for analyses of preneoplastic lesions and inflammatory markers.

Results: Djulis at 5, 10 and 20% levels significantly decreased the numbers of aberrant crypt foci (ACF) and sialomucin-producing ACF (SIM-ACF). Mucin depleted foci (MDF), an advanced preneoplastic lesion of colon cancer, were also inhibited by djulis treatment. Furthermore, djulis at 5, 10 and 20% levels significantly decreased the expression of cyclooxygenase-2 (COX-2) in colonic mucosa.

Conclusions: Djulis may suppress the progression of colitis-associated colon cancer by reducing the formation of preneoplastic lesions and the expression of pro-inflammatory protein.

Keywords: djulis, colon cancer, aberrant crypt foci, mucin depleted foci, inflammation

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COMBINATION OF LACTOBACILLUS ACIDOPHILUS AND DJULIS REDUCED EARLY LESIONS OF COLON CANCER IN RATS

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Background and objectives: Colorectal cancer is the third commonly diagnosed cancer worldwide. Dietary pattern is strongly associated with cancer risk. Previous studies showed that synbiotics had an inhibitory effect on colon cancer. Djulis (Chenopodium formosanum) is a native cereal crop planted in Taiwan. It has been reported that djulis contains high level of prebiotic dietary fiber. The aim of this study was to investigate the anti-cancer effect of Lactobacillus acidophilus and djulis on 1,2-dimethylhydrazine (DMH)/dextran sulfate sodium (DSS)-induced colon cancer in a rat model.

Methods: Rats were randomized into 5 groups: B (AIG-93G), C (AIN-93G), D (10% djulis), DLA (10% djulis plus 0.083 g/kg of L. acidophilus) and DHA (10% djulis plus 0.83 g/kg of L. acidophilus). All rats except those in group B were given three i.p. injections of DMH (40 mg/kg) and 3% DSS in drinking water after DMH injection for one week. All rats were sacrificed after 10 weeks of feeding and colons were examined for cancer-related lesions and markers.

Results: D, DLA and DHA significantly increased the weights of cecum and its content compared with B and C. DMH/DSS treatment induced the formation of preneoplastic aberrant crypt foci (ACF), especially in the distal colon. D, DLA and DHA significantly decreased the numbers of ACF and sialomucin-producing ACF in the distal colon compared with C. In addition, DLA and DHA significantly decreased the expression of proliferating cell nuclear antigen (PCNA) in colons.

Conclusions: Combination of Lactobacillus acidophilus and djulis as synbiotics showed the best inhibitory effect on early lesions of colon cancer.

Keywords: Lactobacillus acidophilus, djulis, synbiotics, colon cancer, aberrant crypt foci

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EFFECT OF MATERNAL WEIGHT AND GESTATIONAL WEIGHT GAIN ON LOW GRADE INFLAMMATION DURING PREGNANCY

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Background and objectives: Early life exposure to low-grade inflammation has received extensive attention due to its association with developmental programming and neuro-development of offspring. We aimed to study the association between low-grade inflammation, maternal body mass index (BMI) and weight gain during pregnancy.

Methods: A cohort study was conducted among 110 women aged 18-36 years who were apparently healthy and attending the first antenatal community-based clinic in Colombo, Sri Lanka. Women of >12 weeks of gestation and already on nutritional supplements were excluded. To detect low-grade inflammation, high sensitive-C Reactive Protein (hs-CRP) was assessed at recruitment, third trimester (≥34 weeks POA) and at delivery in mother, and in cord blood using sensitive immunoturbidometric assay. Personal information, BMI and weight gain were also recorded at each visit.

Results: At baseline, the mean concentration of hs-CRP in women was 3.4 mg/L. Further, the overweight (BMI >25kg/m2) women had significantly higher mean concentration of hs-CRP (4.7 ± 3.3mg/L) than the normal weight women (2.9 ± 3.1mg/L) (p=0.04).

From baseline, the hs-CPR concentration was increased significantly to 6.1 ± 5.0mg/L by third trimester (p=0.03) and to 9.2 ± 6.2mg/L (p=0.019) at delivery.

The women who gained excessive weight during pregnancy had significantly higher hs-CRP concentration at third trimester (5.9 ± 2.5mg/L; p=0.03) compared to the women with recommended weight gain (3.5±2.8mg/L) by same time point. Similarly, the women who gained excessive weight had a significantly higher hs-CRP concentration at delivery (12.9±7.0mg/L; p=0.019) compared to women with recommended weight gain (7.8±5.4mg/L). The hs-CRP concentrations of cord blood were significantly correlated with mothers' blood at third trimester (Spearmen correlation; r=0.32, p=0.04) and at delivery (r=0.46, p=0.003).

Conclusions: Women with higher BMI at early pregnancy and excess weight gain during pregnancy have an increased tendency towards low-grade inflammation, which may create an inflammatory environment and thereby adverse health outcomes to the fetus.

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EFFECT OF NUTRIENT QUALITY ON VISCERAL AND SUBCUTANEOUS ADIPOSE TISSUE MASS AND INTRAHEPATIC LIPID ACCUMULATION DURING 12 WEEKS OF ENERGY-RESTRICTION IN ABDOMINAL OBESE MAN AND WOMEN

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Background and objectives: Excessive abdominal fat, e.g. visceral and subcutaneous adipose tissue (VAT and SAT), and intrahepatic lipid (IHL) accumulation are closely associated to insulin resistance and glycaemic control. Weight-loss via energy restriction (ER) results in a reduction in abdominal fat and intrahepatic fat accumulation, but whether enhancing nutrient quality of an ER-diet might further improve this is not well established.

Methods: We examined the additional effects of nutrient quality over ER on abdominal fat distribution and IHL in a 12-week intervention study, in which participants with abdominal obesity were randomized over three groups; a Western-type (WD n=40) or Targeted (TD n=40) 25%ER dietary advice group, or a control group (no advice, no energy restriction; n=30,). VAT and SAT were measured with MRI; IHL was evaluated with 1H MRS. Body weight and metabolic parameters (insulin, glucose and HOMA-IR) were assessed before and after intervention in the fasted state. The Targeted Diet aimed to improve health beyond weight-loss by including MUFA, n-3 PUFAs, soy protein and dietary fibres.

Results: Although the same level of ER was applied in both groups, weight loss was enhanced in the TD (-6.3 and -8.3 kg for WD-ER and TD-ER respectively; p<0.05), while the control group was weight stable. VAT, SAT and IHL were dramatically reduced in both ER groups, with no difference between TD and WD (VAT:-44.1 and -61.5 cm2; SAT:-45.3 and -54.1 cm2;IHL -3.5 and -4.1% of H2O peak for WD-ER and TD-ER respectively. p=NS). Also the VAT/SAT ratio was significantly reduced in both ER-groups, indicating a preferential loss of VAT over SAT, without a clear effect of nutrient quality of the diet. Reductions in VAT and IHL, but not SAT, were strongly correlated with improvements in metabolic parameters, i.e. fasting insulin, fasting glucose and insulin resistance (HOMA-IR).

Conclusions: Energy restriction is the most important factor for reducing abdominal fat and intrahepatic lipid accumulation. There was no additional beneficial effect of nutrient quality on fat accumulation beyond weight-loss. VAT turned out to be more responsive to weight-loss than SAT; and changes in VAT and IHL were associated with improvements in metabolic parameters.

Keywords: Energy restriction, Weight-loss, abdominal fat, intrahepatic lipids, nutrient quality

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THE ROLE OF YOGHURT FERMENTED BY BIFIDUS ESSENSIS IN THE PREVENTION AND TREATMENT OF OBESITY AND RELATED DISEASES

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Background and objectives: The role of yoghurt, respectively probiotics, in the treatment and prevention of obesity has been discussed. The aim of our study was to investigate the effect of yoghurt fermented by Bifidus essensis (0.5% fat) in the treatment of patients with obesity.

Methods: A total of 57 subjects with central type obesity (21 men and 36 women) were enrolled in the study. Baseline mean subject characteristics were: age-46.2 year old, body mass index (BMI)-35.4, fat mass- 39.4%, visceral fat-14.1, waist circumference-109 cm, hip circumference-120.2, and sagittal diameter-27 cm. All obese patients underwent a dietary regimen, included 290 g yoghurt fermented by Bifidus essensis for dinner for a 6-month period. The product consisted of proteins-4.3 g, carbohydrates (lactose)-3.9 g, fat-0.5 g, and 37 kilocalories per 100 g product. At the beginning and at the end of the study several anthropometric parameters have been measured by bioimpedance device (Tanita 420).

Results: The study demonstrated a decrease of BMI with 9.8%, of fat mass with 9.6%, of visceral fat with 14% as well as a decrease of waist circumference-11.9%, hip circumference-5.8%, and sagittal diameter-10.3%.

Conclusions: The regular consumption of yoghurt fermented by Bifidus essensis (0.5% fat) in the diet of obese patients leads to improvement of the studied anthropometric parameters as well as to significant decrease in the cardio-vascular risk.

Keywords: Yoghurt, obesity, metabolic syndrome

NUTRITION-RELATED CONCERNS OF THE PRIMARY CAREGIVER REGARDING CHILDREN WITH SPASTIC CEREBRAL PALSY: A CROSS-SECTIONAL, QUANTITATIVE RESEARCH STUDY

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Background and objectives: Parents with children suffering from spastic cerebral palsy (CP) face various challenges regarding their child's health, nutritional status, growth, development and quality of life (QOL). The nutrition-related challenges that these children encounter are not well described in the South African setting. These concerns, its management, current feeding practices and parental perspectives were investigated.

Methods: This cross-sectional, quantitative research study made use of a self-administered, validated questionnaire to obtain information from participants at three various facilities: the Pretoria Centre for Cerebral Palsy (PCCP), the Baby Therapy Centre (BTC) and New Hope School (NHS) situated in the Gauteng Province in South Africa. Recruitment and data collection took place over a period of three months. Data was captured and the information was statistically analysed and extracted for interpretation.

Results: Thirty-four questionnaires were completed by parents and returned. The most common nutrition-related concerns reported were constipation (47.1%), underweight (32.4%) and poor appetite (20.6%). Nutrition-related problems were mostly managed by consulting a healthcare professional (HCP). Most children were seen by a multidisciplinary team (MDT) of therapists, but only 44% consulted a registered dietitian (RD). Information pertaining to the current feeding practices showed that most children required assistance at mealtimes (61.8%). Nutritionally poor food choices such as deep fried food and sugary drinks were reported. Solids (64.7%) and pureed food (23.5%) were mostly tolerated. Most parents (55.9%) spent less than two hours daily on feeding their child. Parents lacked confidence when dealing with nutrition-related problems. Most were, however, content when preparing meals, feeding their child and with how their child was growing, developing and their overall health.

Conclusions: Nutrition-related concerns that these parents encountered with their spastic CP child were common concerns. The role of the RD in addressing and managing nutrition-related problems, advising on healthy feeding practices and parental support needs to be emphasized and remains a crucial part of treatment in this group of disabled children.

Keywords: Cerebral palsy, nutrition-related problems, feeding practices, parental concerns, dietitian

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INFLAMMATORY BIOMARKERS IN CHILDREN AND ADOLESCENTS WITH AND WITHOUT DOWN SYNDROME

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Background and objectives: Inflammation has been related to cardiovascular and metabolic diseases such as atherosclerosis and type 2 diabetes. An excess of adipose tissue is well known to produce an elevation in inflammatory biomarkers, although these alterations have been less studied among children and adolescents, particularly in a very special group such as individuals with Down syndrome. Therefore, the aim of the current study was to evaluate possible associations between inflammatory biomarkers [C3 and C4 complement factors and C-reactive protein (CRP)] and fatness in a relatively large sample of children and adolescents without and with Down syndrome (DS).

Methods: A total of 355 children and adolescents (101 with DS) aged 10–20 years-old, were recruited in the UP&DOWN study. C3 and C4 complement factors and C-reactive protein (CRP) were selected as inflammatory biomarkers. Height, weight and skinfolds were measured and waist-to-height ratio (WHtR), Body Mass Index (BMI) and body fat percentage were calculated. A multivariable analysis was executed to take confounder variables into account (age, gender, waist perimeter, birth weight, triceps and subscapular skinfolds). The relationship between the main and secondary variables was made by multivariable regression model.

Results: C3 complement factor level was higher in the whole sample of children and adolescents with a higher WHtR (p<0.001). In addition, C4 complement factor level was higher in all these subjects with a higher WHtR and BMI (p<0.001). The same result for CRP was found in relation to body fat percentage (p<0.001). However, these inflammatory biomarkers were higher in subjects with DS, independently of their percentage of body fat, WHtR or Body Mass Index (p<0.001) according to the ANOVA test.

Conclusions: These results point out that anthropometric measurements such as WHtR, BMI or body fat percentage could be a useful tool to screening possible alterations in some inflammatory biomarkers in children and adolescents. Nevertheless, in the case of DS subjects, these inflammatory biomarkers are elevated, independently of their anthropometric values, leading consequently, to be at a higher risk of chronic diseases.

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THE ROLE OF SALVIA HISPANICA L AS IMMUNO-NUTRITONAL MODULATOR OF HEPATIC LIPID HOMEOSTASIS

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Background and objectives: Chia (Salvia hispanica L.) has been regarded as an important source of nutrients as well as several different bioactive compounds. This study aims to evaluate the potential of Salvia hispanica L (Chia) to selectively modulate innate immune TLR4-mediated signaling restraining the growth of hepatoblastoma cells and metabolic programming of macrophages.

Methods: A preclinical diet-induced innate immune toll-like receptor (TLR)-4 conditioned model was used to identify innate immune potential of Chia. Mechanistic studies were further performed using hepatoblastoma (HepG2, HB-8965®) cells and the humanized macrophage-like HB-8902® cell line to prove the TLR4 activation potential of the salt-soluble fraction (SSFch) from Chia seeds (defatted).

Results: Feeding an innovative Chia-containing bread formulation to a preclinical model with dietary iron-conditioned TLR4 signaling was shown effective to upregulate the hepatic expression of peroxisome proliferator-activated receptor-gamma (PPARγ), which has been shown to suppress inflammation and limit tumor progression in vivo. This observation was accompanied of a restrained production of hepatic hepcidin associated to TLR4 activation. HepG2 cells revealed that upregulation of TLR4 expression (mRNA) was not reflected on IL-6 production that can explain the in vivo hamp levels. Thus, salt-soluble proteins from chia prevent the impairment of hepatic fatty acid oxidation. Measurements of the oxygen consumption rate by HB-8902 cells in presence of SSFch clearly showed increased oxygen consumption by non-mitochondrial enzymes. Lipid mediator profiles (epoxyoctadecenoic acids known as leukotoxins) change with macrophage phenotype.

Conclusions: It is concluded that Chia, as ingredient in bread-making, and particularly SSFch promoted beneficial innate immune TLR4-mediated metabolic changes for the regulation of lipid mediators under inflammatory circumstances.

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IMMUNONUTRITIONAL PROTEASE INHIBITORS FROM CEREALS PROMOTE LIVER INFLAMMATION AND DRIVEN POLARIZATION OF MACROPHAGES

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Background and objectives: Innate immune Toll-like receptor (TLR)-4 has been identified to play a key role in hepatocellular cancer promotion and macrophage priming. This study aims to characterize TLR4-mediated innate and metabolic changes, caused by protease inhibitors found in the salt-soluble fraction of different cereals (TA, Triticum aestivum; AS, Avena sativa and OS, Oryza sativa), in hepatoblastoma (HB-8965®) and humanized macrophage-like (HB-8902®) cells.

Methods: The salt-soluble fraction from cereals was isolated (10 mM phosphate buffer, pH 7,5, containing 0.1 M NaCl) and purified (ammonium sulphate 90% saturation) as described elsewhere. Then, isolated proteins were subjected to HPLC-RP-ESI-Ms/Ms characterization. Mechanistic studies were further performed using hepatoblastoma (HepG2, HB-8965®) cells and the humanized macrophage-like HB-8902® cell line.

Results: All tested grains contain protease inhibitors that display a relatively high similarity between their amino acid sequences (20-40%). Taking advantage of the known specificity of major proteolytic enzymes involved in the gastrointestinal digestion it was identified a key role for pepsin allowing to solubilize up to 80% of these proteins. Protease inhibitors receive clinical attention because of their innate immunogenic potential. Protease inhibitors from cereals activated TLR4 in hepatoblastoma cells mediating innate immune responses (IL-6 and TNFα) that influence tumor cell growth and migration. A mitostress assay in hepatoblastoma cells revealed significant differences in oxygen consumption rate (OCR, pmol/min) as a function of the cereal considered according to the following treatment: TA<OS<AS. Similarly, macrophages exhibited a same order in increased non-mitochondrial respiration when challenged to these treatments. These metabolic changes were associated to increased endosomal acidification due to impairment of lysosomes maturation that can promote different dimerization modes for TLR4. Innate immune TLR4 activation leads to a metabolic switch to fatty acid oxidation (FAO) required for M2 macrophage phenotype development.

Conclusions: Orally ingested protease inhibitors from dietary cereals are partially resistant to digestive enzymes and can increase hepatic inflammation by activating intrahepatic macrophages and causing metabolic changes in liver cells.

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THE POSITIONAL DISTRIBUTION OF FATTY ACIDS ON THE GLYCEROL BACKBONE OF TRIACYLGLYCEROL (TAG) MOLECULES MAY AFFECT LIPID RESPONSES TO DIETARY FATS – A RANDOMISED CONTROLLED CROSS-OVER TRIAL

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Background and objectives: Reducing saturated fatty acid (SFA) intake is a key recommendation for hypercholesterolaemia. But cholesterolaemic effects of SFA may be influenced not only by chain length but also by their positional distribution within the triacylglycerol (TAG) molecule. The "sn-2 hypothesis" is based on the premise that fatty acids located in the centre (sn-2) of TAG are preferentially absorbed and transported to the liver where it may influence cholesterol homeostasis differently compared to when occupying outer (sn-1,3) positions. The present study examined the hypothesis that dietary fats high in SFA, but containing mostly unsaturated fatty acids in the sn-2 position with most SFA in sn-1 and -3 (palm olein [PO] and cocoa butter [CB]) will have similar outcomes to unsaturated olive oil [OO] in terms of effects on lipid profiles.

Methods: Thirty eight (38) men and women (20-40 yr, 18.5-≤27.5 kg/m2) completed a 4-week randomised 3x3 crossover feeding intervention, separated by 2-week washout periods and preceded by a 2-week run-in phase. Participants consumed the same background diet (35%E fat, 18%E protein, 48%E carbohydrate) differing in test fats only. Test fats provided 20%E as either PO, OO or CB and were delivered through meals and snacks. Total cholesterol (TC)/HDL-C ratio (primary outcome) and other lipid variables (total cholesterol, HDL-C, LDL-C, TAG, apolipoprotein A1 [apoA1], apolipoprotein B [ApoB], ApoA1/ApoB, lipoprotein(a) [Lp(a)], non-esterified fatty acids [NEFA]) were assessed pre- and post-dietary intervention. Mixed effects longitudinal models were used to analyse the data.

Results: Changes in plasma fatty acids reflected the source fat composition confirming compliance: C18:1 (oleic) increased with OO compared to PO and CB; C16:0 (palmitic) decreased with OO compared to PO; and C18:0 (stearic) increased with CB compared to PO. No differences were seen between test fats for TC/HDL-C (mean [95%CI] change for PO, 0.08[0.00, 0.15] mmol/L; CB, 0.06[-0.05, 0.16] mmol/L; and OO, -0.01[-0.15, 0.13] mmol/L; P=0.53) or any other lipid outcome.

Conclusions: Consistent with the hypothesis, PO and CB both rich in SFA, but containing primarily unsaturated fatty acid in the

sn-2 position of TAG, did not differ from OO with regard to their effects on lipid profiles.

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Keywords: Palm olein, olive oil, cocoa butter, lipids, TC/HDL-C, sn-2 hypothesis

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THE RELATIONSHIP BETWEEN P53 TUMOR SUPPRESSOR PROTEIN AND ANTI-APOPTOTIC BCL-2 PROTEIN IN COLORECTAL ADENOCARCINOMA ASSOCIATED WITH TYPE 2 DIABETES AND OBESITY

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Background and objectives: The relationship between cancer and metabolic disorders (obesity, diabetes and metabolic syndrome) is well known from multiple studies Obesity is associated with various types of cancer the most common being the liver, the breast in postmenopausal women, endometrial, esophageal and colorectal cancer before the pancreatic cancer. The aim of our study was to compare the frequency of obesity associated with cancer in type 2 diabetic patients vs obese and non-obese subjects, taking as markers the colorectal p53 protein (considered to be a guard of the genome) and anti-apoptotic Bcl-2 protein.

Methods: In a retrospective study we identified 1307 cases with diagnosis of colorectal cancer hospitalized between 2012-2015 in Bucharest Emergency Hospital, from which we random selected 95 cases for immunohistochemical analysis of p53 and Bcl-2 protein from colorectal adenocarcinoma samples using an automatic platform Bench Mark XT Ventana applying the dual protocol Bcl-2-p53 in the department of histopathology of laboratory center. From this 95 cases 52 were type 2 diabetic patients (33 males /19 females, mean age 70.2 years) and 43 non-diabetics (30 males /13 females mean age 69.5 years). There were 15vs2 obese subjects in diabetic/non-diabetic patients compared to 37vs41 with normal weight.

Results: Our data showed that the hiperexpression of p53 protein has been found more often in diabetic obese patients in the 80% (12/15 of cases) comparative with non-obese diabetic patients 40.5% (15/37 cases) or non-diabetics and non-obese controls 36.6% (15/41 cases p=0.024). No changes in Bcl-2 protein expression has been found.

Conclusions: It is known that the protein p53 is a powerful transcriptor factor acting as checkpoint controlling the differentiation of the various cells including adipocytes and also possible enterocytes (explaining the higher frequency of colorectal cancer which has been associated with the increased proliferation of adipocytes number and volume characterizing the obesity). Due to the protection conferred by a normal p53 protein its upregulation could be a new target for the treatment of obesity.

Keywords: obesity, type 2 diabetes, colorectal adenocarcinoma, immunochemistry, p53 and Bcl2

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ROLE OF MICRORNAS ON HEPATIC THYROID HORMONE ACTION IN DIFFERENT PROPENSITIES TO OBESITY IN MICE

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Background and objectives: The mechanisms that individuals on the same genetic background showed different propensities to obesity were largely unknown. Considering the role of microRNAs (miRs) in the function of thyroid hormones (THs) and TH in energy homeostasis, this study was designed to investigate the possible mechanisms of hepatic microRNAs (miRs) in regulating local thyroid hormone (TH) action and ultimately different propensities to high-fat diet (HFD) induced obesity.

Methods: C57Bl/6 male mice were randomly divided into a control (Con) group and a HFD group. In the 7th week, HFD-fed mice were designated as obesity-prone (OP) and obesity-resistant (OR). Half of the mice were sacrificed and the remaining mice were kept on feeding until the 17th week. Small RNA sequencing was used to find the differentially expressed miRs between OP and OR mice in the early phase of HFD feeding, and bioinformatics algorithms was used to screen the miRs that target on hepatic Dio1 or TRb.

Results: In the 7th week, OR mice showed significantly lower body weight and higher hepatic thyroid hormone receptor b (TRb) expression and type 1 deiodinase (DIO1) activity than OP mice. Small RNA sequencing results showed that 13 miRs in liver were dysregulated between the two phenotypes, of which 8 miRs were predicted to target on Dio1 or TRb. In the 17th week, OR mice had mild hepatic steatosis and increased Dio1 and TRb expression than OP mice, with up-regulation of T3 target genes involved in fatty acid oxidation (Pparα, Cyp7a1, and Cpt1α) and down-regulation

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of lipid synthesis related genes (Srebp1c, Acc1, and Fasn). A stem-loop qRT-PCR analysis confirmed that the tendency of miR-383 expression was contrary to Dio1 mRNA expression between the two phenotypes, while miR-34a and miR-146b expression was opposite to TRb expression at both periods.

Conclusions: Thus, Hepatic miR-383, miR-146b, and miR-34a might act on Dio1 and TRb, leading to dysregulation of TH responsive gene expression, and ultimately the different propensities to HFD-induced obesity.

Keywords: obesity-prone, obesity-resistant, microRNA, type 1 deiodinase, TRb

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PREVENTION OF GESTATIONAL DIABETES MELLITUS (GDM): WHERE WE STAND AND WHERE TO GO?

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Background and objectives: GDM develops in 1 in 25 pregnancies worldwide, affecting 1 in 7 births and is associated with pregnancy/ postpartum complications, short/long term morbidities and the transgenerational transmission of risk for type 2 diabetes, obesity and metabolic syndrome. This review provides a comprehensive assessment of intervention studies to inform GDM prevention strategies.

Methods: We reviewed studies on GDM prevention until 2017.

Results: Intervention studies have largely focused on the efficacy of dietary and/or lifestyle measures, and to a limited extent nutrients/bio actives, starting second trimester of pregnancy. Diet and/ or lifestyle based approaches, including complex large scale interventions in at risk women have shown limited success, inconsistent results, and have many limitations such as variations in intervention type, population characteristics, outcome definitions and low adherence to protocol. Recent evidence suggest a promising role for bio-actives (probiotics and myo-inositol) in reducing the incidence of GDM, however their efficacy needs to be investigated in large randomized intervention trials, involving a range of healthy women with and without known risk factors, such as overweight/obesity, family risk of diabetes and advanced age. The limited success of GDM prevention trials starting mid or late pregnancy together with the demonstrated associations between pre pregnancy and early pregnancy diet and lifestyle factors and increased GDM risk, indicates that metabolic alterations may occur prior to changes in the maternal phenotype, making the pre-conception period a critical time frame to intervene and interrupt the vicious cycle of GDM and childhood obesity and diabetes.

Conclusions: Considering the heterogeneity in GDM, large scale pre-conception prevention trials should investigate the impact of dietary, behaviour, nutrient and/or bioactive based interventions on both short and long term health outcomes in the mother and child in different ethnicities and in better defined risk groups, with an aim to identify novel and tailored preventive strategies. Additionally, such studies should adopt a single set of criteria for GDM diagnosis to enable comparisons across studies to draw meaningful inferences.

Keywords: Gestational Diabetes mellites, prevention, pre-conception

Conflict of Interest Disclosure: All authors are employees of Nestec Ltd

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144/1534

RELATIONSHIP OF VITAMIN D WITH HYPERTENSION AMONG CHILDREN FROM HIGH ALTITUDE REGIONS IN INDIA

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Background and objectives: Vitamin D deficiency (VDD) is pandemic and has recently been associated with extra skeletal health disorders. Both hypertension and VDD are highly prevalent worldwide, establishing an association between these two may potentially have major public health implications. Objective: To assess the relationship of Vitamin D with hypertension and risk factors associated with VDD amongst children.

Methods: A cross sectional study was conducted among rural school children aged 12-18y from two high altitude regions (>1000 meters) of Himachal Pradesh, India. A total of 513 children [242(47.17%) boys] were enrolled in the study. Blood pressure was measured using standard mercury sphygmomanometer and hypertension was defined as per WHO 2007 criteria. Validated questionnaire were utilized to elicit information on socioeconomic status (SES), physical activity, sunlight exposure and dietary pattern of children. Laboratory investigations were undertaken for serum 25-hydroxyvitamin D(25-OHD), parathyroid hormone (PTH), calcium, phosphorus, alkaline phosphatase (ALP) and Albumin levels using standard laboratory procedures. The relationship of 25-OHD and various parameters were assessed using statistical methods carried out on STATA (version 11) software.

Results: A total of 423(82.3%) subjects had VDD with levels less than 20ng/ml. The prevalence of pre-hypertension and hypertension was found to be 11.3% and 10.3% respectively. An increasing trend in blood pressure was observed with the increase in the severity of VDD. The correlation coefficient and p value [r(p)] between 25-OHD and SBP/DBP was noted as -0.08(0.058)/-0.13(0.002).Serum 25-OHD level was found significantly lower in subjects with pre-hypertension and hypertension compared to those having normal blood pressure. Regression model revealed that unadjusted β coefficient (95% CI) of SBP (mmHg) and DBP (mmHg) was -0.059(-0.117 to -0.001) (p=0.045) and -0.098(-0.171

to -0.026) (p<0.007), respectively. SBP and female sex had negative, whereas physical activity level, sunshine exposure and non vegetarian diet had positive impact on serum 25-OHD level as indicated in multivariable regression analysis.

Conclusions: The present study supports that Vitamin D plays an important role in the regulation of normal blood pressure homeostasis and VDD is a risk factor for the development of hypertension in children.

Keywords: Vitamin D, Hypertension, Children.

144/1535

TIME-RELATED CHANGES IN HEPATIC ANTIOXIDANT CAPABILITY AND MITOCHONDRIAL ENERGY METABOLISM BETWEEN OBESITY-PRONE AND OBESITY-RESISTANT RATS

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Background and objectives: The role of oxidative stress in energy metabolism during obesity is still unclear. The aim of the present study is to reveal the regulation of energy metabolism by oxidative stress between obesity prone (OP) and obesity resistant (OR) rats after short-term and long-term high-fat diet (HFD) feeding.

Methods: Male Sprague–Dawley rats were randomly divided into two groups: the control group and the HFD group. Delineation of OP and OR was based on body weight gain (upper 30% for OP; lower 30% for OR) after 8 weeks on HFD. Rats were sacrificed at 8th and 20th week, and serum and liver were collected for ELISA assays and oxidative stress biomarkers determination by appropriate kits.

Results: Body weight gain and liver index, as well as triglycerides (TG) and total cholesterol (TC) levels increased significantly in OP group compared with control group and OR group during the experimental period. In the 8th week, compared with control group, OP group showed a significant decrease in oxygen consumption (VO2), energy expenditure (EE) and spontaneous physical activity, whereas OR group had a normal body weight gain and energy metabolism. In the 20th week, OR group had a significant increase in superoxide dismutase (SOD) activity, GSH/GSSG ratio and total antioxidant capacity (T-AOC) in liver as compared with OP group. A remarkable reduced production of reactive oxygen species (ROS) and malonaldehyde (MDA) content were also observed in OR group. Furthermore, OP group had higher accumulation of acetyl-CoA, with down-regulation of ATP production and NADH/NAD+ ratio and reduction of mitochondrial transmembrane potential involved in mitochondrial energy metabolism.

Conclusions: Mitochondrial function and antioxidant defense might be involved in propensities to obesity and the ability of OR rats to resist obesity was the maintance of mitochondrial energy and redox balance.

Keywords: high-fat diet, obesity prone, obesity resistant, mitochondrial energy metabolism, antioxidant capacity.

144/1574

ASSESSMENT OF HEPATIC NON- INVASIVE BIOMARKERS IN DIABETIC AND NON DIABETIC SUBJECTS: A CROSS SECTIONAL STUDY

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Background and objectives: The prevalence of Non-alcoholic fatty liver disease (NAFLD) is estimated at 30% on the western population being the most common cause of chronic liver disease worldwide. Moreover, this pathological condition accompanying by the presence of obesity and diabetes. In this sense, the aim of the study was to evaluate the presence of NAFLD by using non- invasive hepatic indexes as well as its association with anthropometric, biochemical and lifestyle variables in diabetic and non diabetic subjects.

Methods: We conducted a baseline cross-sectional study about 300 participants recruited in Navarra. Patients were categorized according to baseline diagnostic of diabetes based on American Diabetes Association criteria, non diabetic (n=197) and diabetic (n=116). Baseline anthropometric, biochemical and non-invasive hepatic indexes were compared. A validated food frequency questionnaire was carried out in order to measure current intake.

Results: Diabetic patients exhibited significant higher levels in serum triglyceride (p= 0.012), VLDL-c

(p= 0.013) and lower levels of HDL-c concentration (p= 0.003) compared with non diabetic patients. Non significant differences in AST, ALT and GGT levels were found. Moreover, multiple non-invasive hepatic indexes (LAP, BAAT score and TYG index) were higher in the diabetic group. Interestingly, associations between general biochemical and dietetic variables with non- invasive hepatic indexes were identified.

Conclusions: Our results show that diabetic patients are at higher risk for developing NAFLD. These non- invasive hepatic

indexes might be useful to assess the hepatic status in diabetic subjects.

Further collaborators: PREDIMED- PLUS investigators.

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NON-ALCOHOLIC FATTY LIVER DISEASE IN OVERWEIGHT AND OBESE PEOPLE UNDER NUTRITIONAL AND LIFESTYLE FOLLOW-UP: PRELIMINARY RESULTS

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Background and objectives: Non-alcoholic fatty liver disease (NAFLD) is a condition defined by an excessive accumulation of fat in hepatocytes, with prevalence rates of 57-98% in obesity. NAFLD treatment is based on lifestyle modifications. Nevertheless, there is no a well characterized dietary pattern and further studies are necessary. The objective of this study is to increase knowledge on nutritional/lifestyle interventions in obese patients with NAFLD.

Methods: A subsample of sixty-three overweight or obese patients with NAFLD (age: 49.33±9.33 years old; BMI; 33.9±3.95 kg/m2) following a personalized energy-restricted diet (-30% individual needs) under healthy lifestyle advice (FLiO: Fatty Liver in Obesity study), was evaluated. Blood pressure, body composition (DXA), lipid and glycemic profile, as well as liver non-invasive biomarkers and scores were measured at baseline and when all the patients achieved 5% of weight loss according to American Association for the Study of Liver Diseases (AASLD). Furthermore, liver stiffness was assessed by transient elastography.

Results: In addition to weight loss, participants showed a significant reduction in waist circumference, total and android fat, blood pressure, glucose, ALT, total-cholesterol, LDL-c as well as in LDL-c/HDL-c, HOMA-IR, AST/ALT and FLI indexes. Interestingly, a significant improvement in liver stiffness was obtained (-5.11%; p<0.01).

Conclusions: These results support that well-designed dietary lifestyle interventions and weight loss are key factors in the management of obesity and NAFLD.

Further collaborators:

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ROLE OF DIETARY PROTEIN INTAKE LEVEL ON EPITHELIAL REPAIR AFTER ACUTE INTESTINAL INFLAMMATION IN A MURINE MODEL OF COLITIS

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Background and objectives: After an acute intestinal inflammatory episode, the specific protein requirement needed for the healing of injured areas remains largely unknown.

The objective of this study was to assess the effect of different protein intake levels on the mucosal healing (MH) process in a mouse model of dextran sodium sulfate (DSS, 3,5%, 5 days)-induced colitis.

Methods: After the inflammatory flare, mice were divided into three groups, each group receiving an isocaloric diet with different levels of whole-milk protein: 14% (P14), 30% (P30) and 55% (P55). The MH process was assessed macroscopically in colon in combination with functional approaches (permeability tests), biochemical measurements (protein and gene expressions of inflammatory and repairing factors) and histological analysis.

Results: While P14- and P30-fed mice started to regain weight after colitis induction at d7, the weight-gain was delayed in P55-fed mice. The colon inflammatory score was higher in this latter group during the resolution phase and was associated with an increased colon protein expression of IL-1β and IL-6 at d28 (vs P30). However, no difference in the histological score was noticed between groups at day 10 and 13. In contrast, DSS-induced colon permeability was reduced in P30-fed mice at d9 and d12 (vs P14), as well as the myeloperoxidase activity at d28 (vs P55). In addition, the colon gene expression of the anti-inflammatory cytokine Tgf-β1 (at d10) and of the tight junction-related protein

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Cldn1 (at d13) was specifically increased in P30-fed mice. Moreover, high-protein intake (P30 and P55) seemed to improve restoration of goblet cells according to the observed increase in the goblet cell-associated gene expression Muc2 and Tff3 at d13 in these both groups compared to P14.

Conclusions: This study revealed that the level of protein intake might exert different effect after an acute colon inflammatory episode, P55 being rather deleterious, while P30 diet showed an apparent beneficial effect during the MH process when compared to the normoproteic diet P14. Ongoing analysis of colon epithelial restitution and adherent microbiota composition, as well as protein metabolism in different organs, will help to decipher the impact of dietary protein intake level on the MH process and the peripheral consequences.

Keywords: Dietary Protein. Colitis. Mucosal Healing

144/1621

ADVISING OVERWEIGHT PERSONS TO CONTROL WEIGHT BY LITHUANIAN HEALTH CARE PROFESSIONALS IN 2000-2014

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Background and objectives: Health care professionals are in a unique position to help patients prevent or manage chronic diseases.

The study objective is to assess changes in advising overweight persons to lose weight by health care professionals over fourteen years and to determine whether reported attempts to lose weight were associated with the advices.

Methods: The data were obtained from eight biennial cross-sectional postal surveys of Lithuanian health behaviours carried out between 2000 and 2014 using the same methodology. For every survey, a nationally representative random sample of 3000 individuals aged 20-64 was drawn from the National Population Register. In total, 8738 men and 11822 women participated in these surveys. Self-reported body weight and height were used to calculate BMI. Information on whether health professionals advised overweight or obese persons to increase physical activity or to change dietary habits was obtained. The odds of receiving advices were calculated using multiple logistic regression analyses.

Results: During fourteen years the proportion of overweight increased only in men from 50.6% to 58.6%, the prevalence of overweight in women showed decreasing trends. The prevalence of obesity in men increased from 11.3% to 19.5% and has not changed among women remaining 17.3% in 2014.

During study period proportion of overweight persons being advised by health care professionals to change their diet increased from 24.2% in 2000 to 38.4% in 2010, afterwards slightly decreasing trends were observed, reaching 29.4% in 2014. In 2014, 11.6% of overweight respondents reported that their health care professionals advised them to increase physical activity.

Older and better educated women, those having higher BMI, higher number of chronic conditions and more frequent visits to health care professional office were more likely to receive advices to lose weight.

Overweight men and women who reported receiving advices were more likely to report attempts to change diet and physical activity trying to lose weight than those who were not advised.

Conclusions: Providing advice on diet and physical activity are not yet a routine part of every Lithuanian physician. Still existing barriers to counselling need to be identified and strategies put in place to overcome them.

Keywords: overweight, weight control, health care professionals

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A CLUSTER RANDOMISED EVALUATION OF MOBILE APPLICATION TO SUPPORT THE TREATMENT OF ACUTELY MALNOURISHED CHILDREN IN WAJIR COUNTY, KENYA

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Background and objectives: Community Management of Acute Malnutrition (CMAM) is a proven approach in the treatment of acute malnutrition, however its effectiveness is limited by Health Workers failing to adhere to standard CMAM treatment protocol, due in part to poor monitoring and support, relying on paper based systems. A mobile health application was developed by World Vision and Dimagi and piloted by Save the Children in Wajir, Kenya to help health workers follow national CMAM treatment protocols and to provide more timely and accurate data for decision making. A cluster randomized trial was conducted to evaluate the impact of the application on CMAM reporting and treatment outcomes.

Methods: Forty health facilities in Wajir were randomly allocated to an intervention and control group. Intervention facilities received a tablet with the mobile health application adapted to the Kenyan context and CMAM protocol, control sites continued to use the paper based system. Data gathered through the mobile application from intervention health facilities for a period of twelve months was compared to data gathered from paper based registers over the same period in control facilities. Data from paper based

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registers on treatment of acute malnutrition was also collected for all forty facilities for twelve pre intervention to serve as a baseline for comparison. Two observations of treatment were conducted in a sub sample of facilities to assess adherence to treatment protocol.

Results: Data analysis is still underway and results will be available by July 2017. These will compare data quality, completeness and timeliness for decision making, adherence to treatment protocol, and treatment outcomes between the two groups.

Conclusions: The CMAM mobile application has huge potential to improve CMAM services in Kenya and other countries. Results: **Keywords:** management of acute malnutrition, mobile health, data quality

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ACUTE SLEEP RESTRICTION INCREASES ENERGY EXPENDITURE IN OBESE MEN

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Background and objectives: In recent years, experimental studies have shown that sleep restriction is associated with a greater propensity for obesity and its comorbidities in normal weight adults. However little is known about how repeated nights of insufficient sleep influence energy expenditure in obese subjects. The present study aimed at analyzing the effect of sleep restriction on energy expenditure of normal weight and obese volunteers subjected to two protocols of sleep restriction.

Methods: Fifteen healthy obese and normal weight young adults (22.43 ± 1.72 and 24.13 ± 2.90 y; BMI: 33.11 ± 2.58 and 22.22 ± 2.54, respectively) were submitted to three crossover randomized conditions of sleep for three consecutive nights: normal sleep (11.00pm–7.00am); restriction at the beginning of the night (RBN, 3.00am–7.00am); and restriction at the end of the night (REN, 11.00pm–3.00am). Participants consumed a weight-maintenance diet with fixed meal times in each condition. Body weight was measured daily at the same time in each condition. Concentration of leptin and ghrelin were monitored hourly for 24 hours after the second night. Resting metabolic rate (RMR) was measured after the third night using an indirect calorimetry.

Results: Body weight was stable in all sleep conditions and washout period. In comparison with normal sleep, RMR was 15% higher in the obese group after REN (1973 ± 364kcal compared with 2332 ± 357kcal, ≈ 300kcal, p=0.03). Sleep restriction significantly increased the morning and afternoon plasma concentrations of leptin in the obesity group (p<0.05), especially under SBN

condition. The basal and 24h concentration of ghrelin significantly reduced during sleep restriction in normal weight group (p<0.05).

Conclusions: Acute sleep restriction, especially at the end of the night, increased RMR as well as leptin concentration in obese subjects, which suggests that sleep is involved in the acute regulation of daytime energy expenditure. These physiological findings might be relevant for better understanding the multiple metabolic pathways that link sleep restriction and obesity.

Keywords: sleep restriction, obesity, metabolism, leptin, ghrelin.

144/1644

ANTI-INFLAMMATORY DIETARY COMPOUNDS, INFLAMMATION BIOMARKERS AND CARDIOMETABOLIC RISK FACTORS

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Background and objectives: Dietary phenolic compounds (PC) are involved in regulation of inflammatory processes such as in cardiometabolic diseases (CMD). The aim was to analyze the association between dietary PC, inflammatory biomarkers and risk factors of CMD.

Methods: Observational and correlational study. Participated 120 adults, both sex (60 women and 60 men), attended at the Non-Invasive Cardiology Division of the National Hospital of Clinics, Córdoba, Argentina, period 2014-2016. A clinical history, a validated food intake questionnaire, a physical activity questionnaire, smoking habits, systolic (SBP) and diastolic (DBP) blood pressure, nutritional status, waist circumference (WC), triglycerides (TG), serum lipid profile (total cholesterol, HDLc and LDLc) and ultrasensitive C-reactive protein (hs-CRP) were evaluated. Interfood v.1.3 software was employed to estimate fruits, vegetables and PC (isoflavones, flavones, flavonones, flavonols, flavanones,

anthocyanins) intake. Spearman correlation test was used for the correlation analysis.

Results: Average age was 61±1.43 years old, body mass-index (BMI) 28.76 ± 0.96 kg/m2 and WC 100.50 ± 2.35 cm. About risk factors, BMI was associated with SBP and DBP (r=0.22, p <0.01, r=0.26, p <0.05, respectively), and total cholesterol and BMI with TG concentration (r=0.31, p<0.05; r=0.33, p<0.05, respectively). Fruits and vegetables intake, source of PC, was 897.62 ± 89.45 gr/day. A correlation between genistein and LDLc and TG (r=-0.49, p <0.05, r=0.47, p<0.05, respectively), was observed. Other correlations were found among isoflavones and HDLc (r=0.36, p<0.05), and between flavonols and flavanones with fruits and vegetables (r=0.71, p<0.01; r=0.38, p<0.01, respectively).

Conclusions: These results showed preliminary evidence about PC intake and CMD risk factors.

Keywords: Phenolic compounds, risk factors, cardiometabolic diseases, biomarkers

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144/1645

LEVELS AND VITAMIN D INTAKE IN CHILDREN AND ADOLESCENTS WITH PHENYLKETONURIA

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Background and objectives: Vitamin D has a broad role on bone metabolism, cardiovascular, neurological and immunomodulation. Active vitamin D [1,25 (OH) 2 D3] can be provided from the diet or skin. It has been reported that children with phenylketonuria are at risk for vitamin D deficiency and the same applies in Chilean population. The objetives of the study was to study the levels of 25-OH Vit D and vitamin D intake in patients with phenylketonuria, mild hyperphenylalaninemia and control group.

Methods: The study was conducted in the laboratory of the Institute of Metabolic Diseases and Nutrition Food Technology (INTA), the variables collected for each patient included levels of 25-OH-VIT D and intake of vitamin D. The study included a total of 48 Chilean patients, aged 6-23 years, of both sexes; 16 patients were included for group. The Kruskal-Wallis statistical test was applied.

Results: Were statistically significant differences (p <0.05) levels of 25-OH-vitamin D between PKU and HFA group (PKU: 38.9 ng / ml; HFA: 28 ng / ml) (VN> 32 ng / ml). The PKU group consumed 440 IU of Vit D, the HFA: 150 IU / day and control group: 145 IU / day, with statistically significant differences between the PKU group and groups HFA and control.

Conclusions: This study showed that the vitamin D intake in the PKU group was bigger than the control and HFA group, be-

cause PKU consume special formulas from birth to 25 years. They contain 400-500 IU/100 g of product and are delivered by the Ministry of Health. HFA and control group consumed a low amount of Vitamin D, because dietary sources of vitamin D are scarce and the Chilean market has not fortified foods. Thus adequate intake of vitamin D protects of vitamin D deficiency in PKU patients. Is important to create a protocol of fortification for domestic consumption, as it has been documented a high prevalence of vitamin D deficiency in the Chilean population.

Keywords: Vitamin d, Phenylketonuria

144/1646

THE EFFECTS OF POLYUNSATURATED FATTY ACIDS AND RUMINANT TRANS FATTY ACIDS ON ALLERGIC DISEASES IN EARLY LIFE: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Background and objectives: The nutrition status in early life could influence the future development of allergic diseases. Although both polyunsaturated fatty acids (PUFAs) and ruminant trans fatty acids (R-TFAs) modulated immune functions in allergic subjects, their effects on allergic diseases in early life remained unclear. Thus, we conducted a systematic review and meta-analysis to determine whether PUFAs and R-TFAs could reduce the risk of allergic diseases in early life.

Methods: We searched PubMed, EMBASE, PsycINFO, Scopus, the Cochrane Library, and ClinicalTrials.gov from inception through January 2, 2017 for relevant full-text articles in English. Observational studies were selected if they examined the effects of PUFAs or R-TFAs on allergic diseases (eczema, asthma, wheeze and allergic rhinitis) or sensitization in early life. The period of early life is restricted to the first 1,000 days from conception to age 2 years. We excluded studies if they included participants with medical conditions. The quality of studies was examined by Newcastle-Ottawa Scale for assessing risk of bias, and a best evidence synthesis (BES) was applied. Random-effects models were used in the meta-analysis.

Results: Among the 3434 identified articles, we included 23 observational studies, and seven of them showed high quality. BES suggested that a moderate evidence for the protective effect of vaccenic acid on eczema in early life, while insufficient or no evidences were found in the relationship of other R-TFAs and PUFAs with allergic diseases. In the meta-analysis of 18 cohort studies, vaccenic acid was inversely associated with the risk of eczema (pooled odds ratio [OR] =0.43, 95% confidence intervals [95% CI]: 0.26-0.72). A-linolenic acid and linoleic acid also showed protective effects on allergic rhinitis and sensitization (pooled OR=0.77, 95% CI: 0.60-0.98; 0.86, 95% CI: 0.76-0.99). Meanwhile, higher n-6/n-3 PUFAs ratio and linoleic acid were associated with higher risk of eczema (pooled OR=1.08, 95% CI: 1.01-1.16; 1.08, 95% CI: 1.01-1.15).

Conclusions: Our systematic review and meta-analysis suggested that vaccenic acid showed benefit on decreasing the risk of eczema in early life, while PUFAs and other R-TFAs showed limited effects on allergic diseases because of insufficient evidences. More robust studies especially for R-TFAs are required in the future.

Keywords: polyunsaturated fatty acids, ruminant trans fatty acids, allergic disease, meta-analysis

144/1670

ASSOCIATION OF DIET QUALITY WITH ANTIOXIDANT CAPACITY OF PLASMA OF WOMEN WITH BREAST CANCER BEFORE AND AFTER ANTINEOPLASTIC TREATMENT

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Background and objectives: Reactive oxygen species (ROS) are important in regulating normal cellular processes, but deregulated ROS contributes to the development of diseases, including cancers. In addition to maintain body weight, a balanced diet rich in antioxidant nutrients can positively affect the effectiveness of antineoplastic treatment by reducing the physiological and oxidative damage caused by treatment. It is suggested that a diet rich in fats can stimulate lipid peroxidation, favoring the increase of ROS in cancer patients. The objective of this study was to verify the association between diet quality and antioxidant capacity of plasma in women with breast cancer before and after antineoplastic treatment.

Methods: Sociodemographic, clinical, anthropometric and therapeutic data of 70 women were collected. Food consumption was assessed by food frequency questionnaire. The diet quality was evaluated using the Brazilian Healthy Eating Index Revised (BHEI-R) and its components. The antioxidant capacity of plasma was evaluated biochemically from the determination of iron reducing antioxidant potential (FRAP). Food consumption assessment and antioxidant capacity of plasma were conducted before and after the treatment. Multiple linear regression was used to assess the relationship between diet quality and FRAP before and after treatment. Logistic regression model was used to verify the association between change in diet quality and change in FRAP during treatment.

Results: The median total score of the BHEI-R before and after treatment was similar (p=0.684) (median=76.2 e 76.5, respectively). No association was found between the FRAP before and after treatment (μ=629.5, DP=19.1 and μ=573.8, DP=22.7, respectively

p=0.051). Patients classified in the third tertile of diet quality (better quality) significantly increased the FRAP (β=106.78, p=0.019) before the treatment, however no association was found after the treatment. In prospective analyses, the association between change in diet quality and change in FRAP was not statistically significant (p= 0.260).

Conclusions: Women with breast cancer with better quality of diet had better concentrations of plasma antioxidants before treatment. However, the diet did not change the antioxidant capacity of plasma after treatment. Increase quality of diet is not enough to improve the antioxidant capacity of plasma in patients undergoing treatment for breast cancer in this sample of Brazilian women.

Keywords: oxidative stress; breast cancer; diet quality

144/1674

IMPORTANCE OF C-REACTIVE PROTEIN (C-RP) DETERMINATION AS A PREDICTOR OF RISK IN AN OVERWEIGHT OR OBESE POPULATION

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Background and objectives: To analyze the ability of C-RP to predict death or cardiovascular events (myocardial infarction or stroke) or development of diabetes, after 3 years, in an overweight or obese population, with or without metabolic syndrome (MS) defined by ATPIII and IDF.

Methods: In the framework of a research project on the relationship between nutritional deficiencies and obesity, 175 overweight or obese adults (mean age: 52.3 + 13.8), both genders were studied. We evaluated C-RP and the presence of MS at time 0 (T0). These patients then entered a weight loss program characterized by healthy eating and exercise guidelines for 6 months. After 3 years, 109 of the patients were contacted again by telephone and major events they suffered during that period were recorded.

Results: Among the 13 patients who had events, 53.8% had MS, and 46.15% lacked this condition. The difference was not statistically significant (p=0.5524).

In T0 it was observed that, among patients with and without MS, there was no statistically significant difference in the C-RP value (p=0.2352 and p=0.1478 defined by ATPIII and IDF, respectively).

Among patients who developed events, a prevalence of elevated C-RP was observed. We performed the ROC curve between

C-RP and event development and observed an AUC of 0.734. Analyzing the cut-off points it was found that a C-RP > 5 predicted the occurrence of events in a statistically significant way (p=0.0095; RR: 4.388, CI: 95%: 1.444 to 13.277; Sensitivity: 69.2%; Specificity: 70.8%).

Among the 109 patients who were contacted after 3 years, 24.32 % of the ones who had C-RP > 5 developed events; and just 5.55 % of the ones who had C-RP <5 developed events.

Conclusions: MS did not predict the occurrence of events in this population; on the other hand, C-RP > 5, did.

The definition of MS according to ATPIII and IDF is associated with insulin resistance and obesity, but is not necessarily related to C-RP levels. Therefore, seeing that events are significantly related to a C-RP > 5, we consider that a better definition of MS as a prognostic marker should incorporate it.

Keywords: Overweight, Obesity, C-Reactive Protein, Metabolic Syndrome

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144/1700

CHRONIC USE OF PROTON-PUMP INHIBITORS IS ASSOCIATED WITH LOWER MAGNESIUM AND IRON STATUS AND MORTALITY IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Proton-pump inhibitors (PPI) are commonly prescribed in renal transplant recipients (RTR) to prevent gastro-intestinal complaints and complications from immune-suppressants. However, chronic PPI use may induce magnesium and iron deficiencies and increase the risk of mortality. We investigated the association of PPI use with magnesium- and iron- status and mortality in a large single-center cohort of RTR.

Methods: We included 706 RTR with a functioning graft ≥ 1 year. Medication use was verified from medical records. Magnesium intake was assessed using a FFQ. Serum ferritin, magnesium and 24-h urinary magnesium excretion were measured with standard methods. Associations of PPI use on magnesium and ferritin were analyzed by linear regression. Logistic regression was used to assess association with iron deficiency (serum ferritin <100 µg/l) and magnesium insufficiency (<0.75 mmol/l). Cox regression was used to analyze the association of PPI use with mortality.

Results: At a median[IQR] of 5.4 [1.9-12.0] years after transplantation, mean±SD age was 53±13 years, 56.8% were male and 53% used PPI. Mean magnesium intake was 330±85 mg/day and was similar between users and non-users of PPI (P=0.204). PPI use was inversely associated with magnesium excretion (St.β:-0.21, P<0.001), serum magnesium (St.β:-0.08, P=0.046) and serum ferritin (St.β:-0.16, P<0.001), independent of age, gender, BMI, CRP, renal function and calcineurin inhibitor use. Iron deficiency and magnesium insufficiency were present in 208 (29.7%) and 26 (3.7%) RTR, respectively. PPI use was associated with iron deficiency (OR 1.98; 95%CI 1.44-2.73, P<0.001) and magnesium insufficiency (OR 3.25; 95%CI 1.26-8.39, P=0.015). During median follow-up of 5.4 [4.8-6.1] years, 152 RTR died. PPI use was associated with higher risk of mortality (HR 2.0; 95%CI 1.43-2.8, P<0.001), independent of potential confounders (HR 1.94; 95%CI 1.32-2.88, P=0.001).

Conclusions: PPI use is associated with low urinary magnesium excretion and serum magnesium, reflecting magnesium status, despite similar intake between PPI-users and non-users. It also seems to adversely influence iron status, together indicating impaired gastro-intestinal absorption, potentially related to the reduced gastric acid secretion. Moreover PPI use appears independently associated with increased risk of mortality in RTR, suggesting PPI use is not without danger in RTR and treatment indication may need to be revisited.

Keywords: proton pump inhibitors, magnesium, iron, all-cause mortality, renal transplantation.

144/1713

EFFECTS OF LOW FAT DIET ON BODY COMPOSITION AND BLOOD PARAMETERS IN NON-ALCOHOLIC FATTY LIVER DISEASE: A PILOT STUDY

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Background and objectives: Non-alcoholic fatty liver disease (NAFLD) is the most widespread reason of chronic liver diseases in Western countries. Enhanced diet and increased physical activity is crucial for the treatment of NAFLD. The purpose of this study is to determine the effects of nutrition on body composition and some biochemical parameters in non-alcoholic fatty liver disease.

Methods: A total of 9 sedentary adults aged between 19 to 64 years participated in this study. Subjects were evaluated at the beginning of the study and 4 weeks later. Data collected during each visit included height, weight, body fat mass, fat free mass, total body water and waist, hip and neck circumference. Anthropometric measurements were collected using bioelectrical impedance analysis (TANITA TBF-215). Serum blood samples were obtained from participants at the beginning and after 4 weeks to assess liver enzymes. During these measurements subjects were instructed to be fasted for at least 10 hours prior to testing. Diet which

compatible with NAFLD was prescribed to each participant at the beginning. 2-day food records and physical activity records were collected from participants each week. Statistical significance was set at p<0.05.

Results: A total of 6 female and 3 male subjects participated in this pilot study. Energy intakes of participants were found 1357±337 kcal/day. 3 of 9 subjects were exceed the daily fat limit. A statistically significant reduction in body weight (-2,32±2,19 kg, p<0,05), body mass index (-0,91±0,85 kg/m2, p<0,05), fat mass (-1,87±1,91 kg, p<0,05), waist circumference (-3,33±2,92 cm, p<0,01), waist to hip ratio (-0,03, p<0,05) and neck circumference (-1,00 cm, p<0,05) was observed after 4 weeks of diet treatment. Also there is a decline in liver enzymes (Alanine aminotransferase (ALT): -21,20±13,41 U/L, p<0,05; Aspartate aminotransferase (AST): -8,40±4,39 U/L, p<0,05; Alkaline phosphatase (ALP): -11,60±20,74 U/L, p>0,05; Gamma-glutamyl transferase (GGT): -28,00±33,79 U/L, p>0,05), however difference in ALP and GGT levels were not statistically significant.

Conclusions: In conclusion, low fat diet can provide weight reduction, improvement in body composition and enhance in liver enzymes in NAFLD.

Keywords: NAFLD, body composition, low fat diet

144/1714

AN EXPERIMENTAL STUDY OF SUBSTITUTING SUGAR IN INDIAN TRADITIONAL SWEET WITH DRY FRUITS

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Background and objectives: Ramaiah et al 1990 suggested that in an epidemiological study of diabetes in Asians of the Indian sub continent, steady migration of people from rural to urban areas coinciding with the economic boom, corresponding lifestyle changes are leading to steady rise in incidence of Type II Diabetes. Moreover an ethnic susceptibility to diabetes among Indians was quoted. Thomas (2015) reported an all time high prevalence of T2DM. In this context the food and dietary patterns have undergone changes leading to consumption of predominantly high glycemic foods, one of which is the sweets,made of cane sugar or sugar syrup.

Objective of the study: To experiment on developing a low glycemic sweet by incorporating fresh and dry fruits in the place of cane sugar.

Methods: A traditional sweet Gulab jamun was selected for the experiment. The standard recipe of the sweet suitable for four servings was chosen from recipe book. In the experiment , the cane sugar alone was substituted with banana fruit and dry grapes, to keep the sweetness as close as possible to original sweet. Both the recipes were administered to a panel of diabetic patients, dieti-

tians and normal subjects people, to evaluate the acceptance of the sweet without cane sugar.

Results: The nutritive value of the original and experimental recipe of the sweet Gulab jamun was calculated. It was observed that the energy value of the experiment recipe reduced by 120 K. calories while the carbohydrate content reduced by 30%. The acceptance of the recipe was satisfactory with excellent scoring by 50% dietitians,70% diabetics and 80 % normal subjects.

Conclusions: The experiment recipe of the sweet Gulab Jamun was well accepted and was observed to be an encouraging alternative for the diabetic subjects who crave for the consumption of sweets in parties,weddings , festive occasions etc. which are very common in the Indian society.

Keywords: Type 2 Diabetes Mellitus , recipe , glycemic index, Indian sweet, Gulab jamun,energy, carbohydrate, dietitians.

Conflict of Interest Disclosure: This is to disclose that the study is a dissertation work undertaken by the co-author during Graduate study under my supervision.

144/1716

LOW VEGETABLE INTAKE IS ASSOCIATED WITH HIGH RISK OF NEW-ONSET DIABETES AFTER RENAL TRANSPLANTATION

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Background and objectives: New-Onset Diabetes After Transplantation (NODAT) occurs in 4-25% of renal transplant recipients (RTR) and increases risk of cardiovascular disease, graft failure and mortality in this population. NODAT is generally attributed to adverse effects of immune-suppressants (i.e. steroids and tacrolimus). Little is known about whether the risk of NODAT is modifiable by dietary factors, such as fruit and vegetable intake. We investigated whether fruit and vegetable intake is associated with risk of NODAT in RTR.

Methods: In this prospective observational study we included adult RTR with a functioning graft for ≥ 1 year. Dietary intake was assessed using a validated Food Frequency Questionnaire consisting of 177 food items. RTR with a medical history of diabetes or diabetes at baseline or RTR missing dietary data were excluded, leaving 473 RTR eligible for analyses. RTR were considered to have NODAT when ≥ 1 of the following criteria was met: repeated fasting plasma glucose ≥ 7.0 mmol/l, HbA1c ≥ 6.5%, or anti-diabetic drug use

Results: Mean ± SD age was 51.3 ± 13.2 years, 57% were male. Median [IQR] vegetable and fruit intake was 108 [72-154] and 99

[44-192] g/d, respectively. Only 11% met the recommended intake for vegetables (200g/d), and only 22% met the recommended intake for fruit (200g/d). During median follow-up of 5.3 years, 52 RTR (7%) developed NODAT. Vegetable intake was inversely associated with NODAT (HR 0.77 [95%CI 0.63-0.94] per 2log g/d). When divided in tertiles, RTR in the lowest tertile of vegetable intake (median intake: 54 [34-72] g/d) had higher risk of NODAT compared to RTR in the highest tertile (median intake: 175 [153-216] g/d) independent of age, sex, time after transplantation, total energy intake and physical activity (HR 2.2 [95%CI 1.11-4.52]) . Fruit intake was not associated with risk of NODAT (HR 0.91 [95%CI 0.80-1.04] per 2log g/d).

Conclusions: The majority of RTR do not meet the recommended intake of vegetable and fruit. Low vegetable intake is associated with higher risk of NODAT. Stimulating vegetable intake may reduce the risk for NODAT in RTR. This study shows that even in the context of allegedly iatrogenic diabetes, dietary factors are important.

Keywords: New Onset Diabetes After Transplantation. Renal Transplant Recipients. Vegetable Intake. Fruit Intake.

144/1719

PREVALENCE OF THE METABOLICALLY HEALTHY PHENOTYPE IN PEDIATRIC OBESITY AND ITS ASSOCIATION WITH CLINICAL, METABOLIC AND FAMILY HISTORY PARAMETERS

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Background and objectives: Identifying the presence of the metabolically healthy (MH) phenotype and the factors to which it is associated in pediatric obesity, allows early detection of those who have a lower risk of future cardiometabolic complication and treatment adequation. Therefore, the objective of this study is to estimate the prevalence of MH phenotype in overweight/obesity children and adolescents and its association with clinical, metabolic and family history parameters.

Methods: 203 patients were studied, age range 8-14 years, both sexes, overweight (n=59) and obese (n=144), according to z score BMI (OMS), in the section of Pediatric Nutrition, February 2005-October 2016. Exclusion criteria: patients with endogenous obesity. The design was descriptive, observational, prospective, cross-sectional and comparison of independent samples. Evaluated variables: age, sex, z score BMI, pubertal development, HOMA-IR, family history (FH) of obesity, type 2 diabetes, arterial hypertension, dyslipidemia and early acute myocardial infarct. The MH phenotype was defined by the absence of any components of the metabolic syndrome (MS) according to the criteria of the Argentine Society of Pediatrics. Fisher's test was performed and p-value <0,05 was considerared statistically significant.

Results: 70,9% (CI 95% 64,1-77) were obese, 50,2% (CI 95% 43,2-57,3%) pubescent and 50,7% (CI95% 43,7-57,8%) females. MS frequency was 15,3% (CI 95% 10,8-21,1%). Prevalence of MH phenotype was 31% (CI 95% 24,8-38) and its was associated significantly with age range 11-14 years: 39,8% (CI 95% 29,9-50,5) vs 8-10 years: 23,6% (CI 95% 16,3-32,9) (p =0,01), overweight: 67,8% (CI 95% 54,2-79) vs obesity: 16% (CI 95% 10,6-23,2) (p=0), HOMA-IR< 3: 41,7% (CI 95% 32,7-51,3) vs HOMA-IR ≥ 3: 17% (CI 95% 10,2-26,9) (p=0,0001) and absence FH of type 2 Diabetes: 38% (CI 95% 28,6-48,3) vs presence FH of type 2 Diabetes: 24,3% (CI 95%16,6-33,9) (p=0,024). The non-associated parameters were sex (p=0,443), pubertal development (p=0,287), FH of obesity (p=0,089), FH of arterial hypertension (p=0,396), FH of dyslipidemia (p=0,435) and FH of early acute myocardial infarct (p=0,539).

Conclusions: The MH phenotype was present in 1 out of 3 patients with overweight/obesity. It was significantly associated with age range 11-14 years, overweight, HOMA- IR < 3, and absence FH of type 2 diabetes.

Keywords: children, adolescents, obesity, metabolically healthy phenotype.

144/1726

HIGHER ADHERENCE TO THE MEDITERREAN DIET IS ASSOCIATED WITH LOWER RISK OF GRAFT FAILURE IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Renal transplantation is considered the preferred treatment in end-stage renal disease. Despite improved short-term graft survival over recent years, long-term graft survival after renal transplantation has not improved. Research in this field is traditionally dominated by immunological evaluation and treatment, however non-immunological causes including diet and lifestyle are often overlooked. In the general population the Mediterranean Diet is associated with better cardiovascular and renal outcomes. We investigated whether adherence to the Mediterranean Diet is associated with graft failure in a large cohort of renal transplant recipients (RTR).

Methods: In this prospective observational cohort study we included all adult RTR with a functioning graft for ≥ 1 year who

visited the outpatient clinic. Dietary intake was assessed using a validated Food Frequency Questionnaire of 177 food items. RTR missing dietary data were excluded, leaving 632 RTR eligible for analyses. Adherence to the Mediterranean Diet was calculated using the nine-point Mediterranean Diet Score (MDS) by Trichopoulou based on intake of legumes, nuts, soy products, cereals, fruit, vegetables, meat , dairy, fish, alcohol and fat. Cox regression was used to analyze the association of MDS on death-censored graft failure.

Results: Mean ± SD age was 53 ± 13 years, 57% were male. Mean MDS was 4.7 ± 1.7. During median [IQR] follow-up of 5.3 [4.5-6.0] years, 76 RTR developed graft failure. MDS was inversely associated with graft failure (HR 0.88 [95%CI 0.77-0.99] per MDS-point increase). Adjustment for potential confounders including age, sex, time after transplantation, primary renal disease, eGFR, urinary protein excretion, smoking status and physical activity did not materially alter this association (HR 0.84 [95%CI 0.73-0.98] per MDS-point increase). When divided in tertiles, risk of graft failure was twice as high in RTR in the lowest tertile of MDS compared to RTR in the highest tertile of MDS (HR 2.0 [95%CI 1.05-3.84]), independent of potential confounders.

Conclusions: Higher adherence to the Mediterranean Diet is associated with lower risk of graft failure, independent of potential confounders. These findings suggest increasing Mediterranean Diet adherence may be a novel measure to improve long-term graft survival in RTR.

Keywords: Renal Transplantation. Graft Failure. Mediterranean Diet.

that responds to both iron status and inflammation in the regulation of iron absorption and sequestration. Our objective was to determine if enteric inflammatory activity is associated with an increase in systemic inflammation and hepcidin concentrations.

Methods: Serum and fecal samples were collected from 435 children aged 22-34 months. Hepcidin, C-reactive protein (CRP), and alpha-1-acid glycoprotein (AGP) concentrations were quantified in serum, while the EED biomarkers neopterin (NEO), alpha-1-antitrypsin (AAT), and myeloperoxidase (MPO) were analyzed in stool. We also measured serum ferritin, soluble transferrin receptor, hemoglobin and the presence of a hemoglobinopathy (β-thalassemia or Hemoglobin E) and considered these factors in multivariable adjusted models.

Results: In this sample, 8.0% had inflammation (CRP≥5mg/L or AGP≥1), 11.0% had anemia (Hb< 110g/L), and 27.2% were iron deficient (serum ferritin < 12 μg/L, corrected for inflammation). The median concentrations of NEO, AAT, and MPO were 581 nmol/L, 0.3 mg/g, and 2584 ng/mL, respectively, and the median hepcidin concentration was 13.4 ng/mL. Using a generalized linear mixed model, and adjusting for serum ferritin, age, and sex, we found no associations between hepcidin and any of the fecal inflammatory biomarkers. Though hepcidin was positively correlated with systemic inflammatory biomarkers CRP and AGP, none of the fecal inflammatory biomarkers was associated with CRP or AGP.

Conclusions: These data suggest that these markers of EED were not associated with a strong enough systemic inflammatory response to stimulate a response in hepcidin. Further research is needed to better understand whether EED may influence iron absorption through other pathways

Keywords: Environmental Enteric Dysfunction, iron, hepcidin

144/1733

FECAL INFLAMMATORY BIOMARKERS OF ENVIRONMENTAL ENTERIC DYSFUNCTION ARE NOT ASSOCIATED WITH HEPCIDIN CONCENTRATIONS IN YOUNG BANGLADESHI CHILDREN

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Background and objectives: Environmental Enteric Dysfunction, or EED, is an inflammatory condition of the gut that afflicts many infants and children in low- and middle-income countries. EED is characterized by increased inflammatory cell activity in the small intestine, a reduced absorptive capacity, and reduced barrier function. Hepcidin is an iron-regulatory hormone

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144/1749

RED MEAT CONSUMPTION AND SELECTED GASTROINTESTINAL CANCERS MORBIDITY IN POLAND IN THE YEARS 1990-2014

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Background and objectives: Red meat is a source of some compounds which could promote carcinogenesis. It is characterized by high haem content that increases levels of N-nitroso compounds in the body. Processed meat contains nitrite that can react with the degradation products of amino acids to form N-nitroso compounds. During cooking at high temperate heterocyclic amines or polycyclic aromatic hydrocarbons can be formed. Red

meat is also rich in animal fat and high consumption of such products can lead to obesity.

The aim of the study was to examine the relationship between trends in red meat consumption after the economic transformation and some cancers (colorectal, pancreatic and oesophageal) morbidity in Poland.

Methods: The study was based on colorectal, pancreatic and oesophageal cancer incidence rates derived from the National Cancer Registry in 1990-2014. Data on red meat consumption (in kg/person/year) were derived from the national food balance sheets. Analysis includes the consumption of pork, beef, lamb and goat from domesticated animals. Spearman correlation coefficients were used to estimate the relationship between the examined variables.

Results: In 1990-2014 red meat consumption in Poland decreased from 56.1 to 41.3 kg/person/year. In the analyzed period the incidence of pancreatic and oesophageal cancer increased initially, however since the mid-90s of the twentieth century a marked decline began to be observed.

The colorectal cancer morbidity continues to grow, but to a lesser degree than in previous years.

Positive correlations were found between red meat consumption and pancreatic (0.74 for males and 0.48 for females) and oesophageal cancer (0.64 for males, correlation coefficient not statistically significant for females) incidence rates. There was no positive correlation between red meat consumption and colorectal cancer morbidity during analyzed period.

Conclusions: The decrease in red meat consumption in Poland could favourably affect some gastrointestinal cancers such as pancreatic and oesophageal cancer morbidity in Poland and probably was one of the reasons of the observed decline in these cancers incidence in recent years.

Furthermore smaller proportion of red meat in the diet could influence on the reduction in the rate of increase of colorectal cancer incidence.

Keywords: red meat, gastrointestinal cancers, morbidity

144/1751

RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND CARDIOVASCULAR RISK IN PATIENTS WITH CHRONIC HEPATITIS C AND METABOLIC SYNDROME

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Background and objectives: The objective of this study was to evaluate the nutritional status of patients with chronic hepatitis C virus (HCV) and metabolic syndrome (MetS) by various methods, and assessment of nutritional status and mutual relations of cardiovascular risk in this population.

Methods: This study is transversal and included 171 patients with HCV 60 HCV infected patients without MS and 111 patients with HCV and MetS. The nutritional status was assessed using body mass index (BMI) score MNA (Mini Nutritional Assessment), nutritional assessment score instantly - (instant nutritional assessment - INA) and nutritional risk index (NRI). We also calculated a combined score thus malnutrition: MNA results have merged, NRI, INA and BMI in a single combined score. We considered patients with malnutrition rezutatul based on the combined score, so it is considered malnourished individual score indicates if any is present. The diagnosis of MS was established using a modified IDF definition. Cardiovascular risk was assessed for each patient using software UKPDS-CHD.

Results: The age of patients with malnutrition and MetS was higher than that of the MetS without malnutrition (57.75±6.16 years vs. 51.85±9.65 years, p=0.125). Using the combined score of the total number of patients, malnutrition was present in 18 patients (10.5%). Of these, 12 patients (66.7%) belong to the group of those with MetS. The combination of malnutrition - moderate cardiovascular risk level, was observed in a small number of patients, most of the malnutrition associating with a low cardiovascular risk (n=2). Cardiovascular risk among those with only 6 patients had moderate malnutrition, and among those at high risk, only 4 associated malnutrition. The presence of Obesity was present in 122 patients (71.3%) - 58 women and 64 men. Of these, 8 patients (4.7%) had malnutrition based on the combined score.

Conclusions: Assessment of nutritional status in patients with HCV and MetS brings significant benefits by identifying malnutrition risk and to which they are exposed. Assessing the relationship of cardiovascular risk - malnutrition, has placed patients with malnutrition among those with low cardiovascular risk (n=2) or moderate (n=6), only a small number of people with malnutrition (n=4) with a high cardiovascular risk .

Keywords: nutritional status, cardiovascular risk, metabolc syndrome, chronic hepatitis C

144/1757

COFFEE CONSUMPTION AND SELECTED GASTROINTESTINAL CANCERS MORBIDITY IN POLAND

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Background and objectives: Coffee has been shown to induce the endogenous defense system, DNA repair capacity and to reduce the expression of genes involved in inflammation.

According to recent reports higher consumption of coffee probably protects against liver cancer. Some data from the literature suggest that it may reduce also the risk of gallbladder and colorectal cancer.

The aim of the study was to examine the relationship between trends in coffee consumption and liver, gallbladder and colorectal cancer morbidity in the past decades in Poland.

Methods: The study was based on liver (in 1980-2014), gallbladder (in 1970-2014) and colorectal (in 1960-2014) cancer incidence rates derived from the National Cancer Registry. Coffee consumption was determined on the basis of data on imports of coffee derived from the national statistics and converted into kg / person/year quantities.

Spearman correlation coefficients were used to estimate the relationship between the examined variables.

Results: In 1960-2014 imports of coffee to Poland increased from 0.13 to 3.02 kg/person/year.

Liver cancer incidence rates were rather stable in the decade of the 80's of the 20th century, whilst since the beginning of the 90's downward trends were observed. Gallbladder cancer incidence rates were stable between 1970 and the half of the 90's of the 20th century and then the decrease was noted. The colorectal cancer morbidity has increased over the whole period, but since the mid-90s of the 20th century to a lesser degree than in previous years.

Adverse correlations were found between coffee consumption and liver (-0.68 for males and -0.80 for females), and gallbladder cancer (-0.71 for males and -0.74 for females). There was no adverse correlation between coffee consumption and colorectal cancer morbidity during analyzed period.

Conclusions: The increase in coffee consumption in Poland could favourably affect some gastrointestinal cancers such as liver and gallbladder cancer morbidity rates in Poland and probably was one of the reasons of the observed decline in these cancers incidence in recent years.

Furthermore positive (growing) trends in coffee consumption could influence the reduction in colorectal cancer incidence rate.

Keywords: coffee, gastrointestinal cancers, morbidity

144/1762

RELATION OF THE PERCEPTION AND SATISFACTION OF BODY IMAGE OF CHILDREN AND ADOLESCENTS WITH DOWN SYNDROME

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Background and objectives: Due to the greater predisposition to weight gain and excess body fat in children and adolescents with Down Syndrome (DS), care regarding feeding and weight gain should be doubled. When this process does not happen naturally, it can contribute to young people assessing yourselfel in an inaccurate way, these changes contribute to the body image also being reformulated. The objective of this study to identify the perception and satisfaction of body image of children and adolescents with DS and to associate it with anthropometric characteristics of this population.

Methods: It deals with a cross-sectional and observational study with 27 children and adolescents aged 7 to 18 years old with DS, in an interior town in São Paulo state. It was applied the Figure Rating Scale and it was realized the nutritional assessment using anthropometry, electrical impedance analysis.

Results: It was possible to observe that the classification of body weight by age showed the following result: 11.11% underweight, 48.14% of adequacy and 40.74% above the recommended weight. The ratio of height for age showed that 55.5 % of youth had adequate linear growth. The average waist circumference was 86.33cm. The examination of electrical impedance analysis showed good hydration, muscle mass below the minimum limit and body fat above the recommended maximum. Regarding the perception of body image, there was no statistically significant difference (p>0.05), while the satisfaction of body image, indicated statistical difference (p<0.05) between the actual BMI and the desired BMI. By correlating the waist circumference was statistically different (p<0.0001).

Conclusions: Children and adolescents with DS are not satisfied with their body image because they wish to have a slimmer body and how bigger the waist circumference is much bigger they will notice them self's. It is necessary to have further studies in order to add new values and knowledge of the perception and satisfaction with body image of individuals with DS.

Keywords: Down Syndrome, Nutrition Assessment, Body Image, Nutricional Status

Further collaborators:

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144/1774

A META-ANALYSIS OF THE ROLE OF A PRIORI DIETARY INDICES IN DEPRESSION AMONG 7 COHORTS; THE MOODFOOD PROJECT

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Background and objectives: Depression will be the second leading cause of disability globally by 2020. There is increasing evidence that dietary patterns play a role in depression but recent reviews have failed to find consistent associations and have speculated that this might be due to differences in study designs and assessment methods.

We aimed to examine the association between dietary patterns and depression across a number of cohorts using a standardised protocol, and to meta-analyse the findings of these studies.

Methods: We developed a standardised protocol to assess the association between four a priori dietary patterns: AHEI-2010 (Chuive et al); Mediterranean diet score (Panagiotakos 2007); DASH diet (Fung 2008); The MooDFOOD diet.

Included were data of more than 20,000 participants from seven cohorts that have measured both diet and depression at different time points: InCHIANTI (Italy), LASA , NESDA, HELIUS (all three Netherlands), ALSWH (Australia), Whitehall and NSHD (both UK). Four cohorts had repeated measures allowing prospective analysis (Whitehall, InCHIANTI, ALSWH, NSHD).

Predictor and outcome variables were standardised to enable comparison between studies. The association between dietary pattern and continuous depressive symptom scores was investigated using linear regression analysis and the association with a dichotomous 'depression' outcome using logistic regression. Analyses were conducted by researchers from the individual cohorts and meta-analyses were conducted centrally.

Results: Analyses will be completed by the end of May 2017. Preliminary findings of cross-sectional data show a statistically significant protective effect of the Mediterranean diet score on continuous depressive symptoms in most cohorts. Random effects meta-analysis also yielded a statistically significant protective effect, standardized B -0.08 (95%CI -0.12; -0.04, p-value<0.01).

Conclusions: There are indications that healthy dietary patterns are associated with fewer depressive symptoms. The full findings of this study will provide important insights that can help answer the question "Can diet contribute to the prevention of depression?"

Keywords: Dietary patterns. Depression. Meta-analysis.

Further collaborators:

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HYPERTENSION, NUTRITION STATUS, DIETARY INTAKE AND PHYSICAL ACTIVITIES OF KENYATTA UNIVERSITY EMPLOYEES: THE ROLE OF NUTRITION AND PHYSICAL ACTIVITY IN CATCHING UP THE SILENT KILLER

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Background and objectives: Background: Non communicable diseases contribute to 59% deaths worldwide annually of which 16.7% are as a result of cardiovascular diseases. It was estimated that, in 2000, up to 80 million African were hypertensive and this figure is expected to double by the year 2025. In Kenya 23.8% adults are hypertensive and out of these 91.8% are not on medication. Hypertension is referred to as a "Silent Killer" as it often goes unrecognized and undiagnosed. It may drain the country to economic and social stagnation due to related mortality, costs of treatment and absenteeism from work.

Objectives: To determine the prevalence of hypertension, nutrition status and dietary intake and its relationship to socio demographic characteristics among Kenyatta University (KU) Employees.

Methods: The target respondents were employees aged 25 to 75 years. A total of 236 subjects were selected using multistage sampling. A self administered questionnaire was used to collect data. Blood pressure (BP) and weight were measured in the respondent's offices.

Results: of the 236 employees, 39.4% had hypertension (BP≥140/90mmHg/taking antihypertensive medicine). However, 36.7% of respondents with hypertension were unaware. 35.6% were overweight, 16.9% were obese 1 and 3.4% were obese 2. Diets of most employees (70%) needed improvement, whereas 10% had a good diet while 20% had poor dietary intake. Only 14.6% met the daily recommended allowances for 6 key micronutrients. Majority of subjects rarely participated in sporting activities and 95% were never involved in leisure time activities. Mean diastolic BP of moderately active normal weight men (118mm/Hg) as well as the moderately active overweight men (119mm/Hg) were lower than the BP of inactive normal weight (130mm/Hg) and overweight men (137mm/Hg). There was a strong positive relationship between obesity and hypertension p value 0.000 at 95% confidence interval

Conclusions: Conclusion: Employee's dietary intake is wanting and therefore institutions should take action to protect health of their populations. The low intake of micronutrients and physical activity is a health risk and preventive measures need to be put in place. Despite being overweight, physical activity is key in controlling BP.

Keywords: Key words: hypertension, diastolic, systolic

THE EFFECT OF HIGH AND LOW DAIRY CONSUMPTION ON CARDIO-METABOLIC RISK FACTORS IN OVERWEIGHT ADULTS

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Background and objectives: Dairy products contain many nutritious components that benefit health. An inverse dose-response relationship between dairy consumption and the risk of metabolic syndrome was recently reported based on a meta-analysis. There are indications that dairy intake decreases the risk for type 2 diabetes and improves glucose metabolism and insulin sensitivity which is generally disturbed in overweight and obese individuals. This study aimed to investigate the effects of high and low dairy intake on cardio-metabolic health parameters.

Methods: 47 overweight males and postmenopausal females [age 58.7 ± 4.5 y, BMI 27.9 ± 1.9 kg/m2 (mean±SD)] completed this randomized, cross-over, intervention study. Each person consumed an isocaloric high and low dairy diet (HDD (5-6 portions) and LDD (≤1 portion), respectively; 200 g semi-skimmed yoghurt, 30g low-fat (30+) cheese, 250 mL semi-skimmed milk and buttermilk) for 6 weeks in a cross-over design, with a wash-out period of 4 weeks. After each 6-week intervention period blood pressure was measured, and blood samples were collected, both fasted and during challenge tests. The tests were a 75 g OGTT (13C-labeled and combined with 2H-labeled glucose infusion to study glucose kinetics) and a subsequent fasting challenge.

Results: After HDD compared to LDD there were significant decreases in blood pressure [127/79 mmHg vs 132/82 mmHg, respectively $(p<0.01)$] and uric acid [0.29 ± 0.06 vs 0.31 ± 0.07 mM, respectively $(p<0.001)$]. Fasting glucose concentrations were similar, whereas fasting insulin concentrations were lower after the LDD [10 ± 4 mU/L after HDD vs 9 ± 4 mU/L after LDD $(p<0.05)$]. In addition, there was a small difference in HDL concentrations [1.40 ± 0.34 mM after HDD, 1.44 ± 0.38 mM after LDD, $(p<0.05)$],

but the cholesterol/HDL-ratio was not different after the intervention periods [4.0 vs 3.9 (p=0.14)]. Postprandial glucose and insulin responses as well as glucose kinetics were similar after both diets.

Conclusions: High dairy intake had a positive effect on blood pressure, which may be related to the decreased plasma uric acid concentration. Results: **Keywords:** Dairy consumption, metabolic syndrome, cardio-vascular health, blood pressure, overweight

Conflict of Interest Disclosure: Cecile M. Singh-Povel and Jan Geurts are employed at FrieslandCampina.

144/1789

DIETARY SUPPLEMENTATION OF OMEGA-3 POL-YUNSATURATED FATTY ACIDS MANIPULATE LIPID HOMEOSTASIS VIA BROWNING OF WHITE ADIPOSE IN ALREADY INDUCED OBESE MICE

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Background and objectives: Obesity and related metabolic disorders has reached pandemic levels. Previous studies have showed the ameliorative effect of omega-3 fatty acids on the development of obesity. But it is still unclear how omega-3 fatty acids improve lipid homeostatic imbalance in already existing obesity. Here we assessed the biological effects of eicosapentaenoic acid (EPA; 20:5n3) and docosahexaenoic acid (DHA; 22:6n3) from long-term dietary intake on lipid and energy homeostasis in high-fat-diet (HFD) induced obese (DIO) mice.

Methods: Four-week-old C57Bl/6 mice were fed with HFD (45% fat) for 10 weeks to introduce obesity. The HFD fed mice were then trisected and fed with DHA or EPA enriched HFD (HFD+DHA or HFD+EPA; 1% wt/wt) or HFD for 15 weeks. Systemic adiposity, hypothalamic feeding regulators, browning process of adipocytes and risk factors of hepatosteatosis were investigated. In vitro, 3T3-L1 adipocytes at different stages of differentiation were treated with EPA or DHA, and expressions of browning programme markers and mitochondrial biogenesis were investigated.

Results: After long-term supplementation with EPA or DHA in DIO mice, the body weight of mice did not decline (HFD+DHA or HFD+EPA vs. HFD) whereas DHA-fed female mice gained more weight if compared with the mice in HFD group. Interestingly, DHA or EPA administration improved hypercholesterolemia but aggravated hypertriglyceridemia. Nonetheless, DHA significantly reduced subcutaneous fat of male mice and both DHA and EPA improved fatty liver in female mice via down-regulating expressions of triglyceride synthesis genes and promoting β-oxidation relative genes expression. Moreover, EPA inhibited the appetite of female mice by controlling hypothalamic inflammation. Importantly, DHA or EPA significantly lowered the respiratory exchange

ratio of DIO mice, suggesting enhanced lipid mobilization. These effects may result from promoted thermogenesis of brown adipose tissue in all mice except DHA-fed female mice. In vitro, preadipocytes treated with DHA induced a phenotypic white-to-brown shift whereas EPA elevated uncoupling protein 1 expression and mitochondrial biogenesis in 3T3-L1 adipocytes at differentiation and also in mature adipocytes.

Conclusions: Our findings reveal the effect of DHA and EPA on lipid and energy homeostasis in already existing obesity and further clinical investigations are warranted to formulate recommendations of DHA and EPA intakes for obese subjects.

Keywords: Obesity, Lipid metabolism, EPA, DHA, Browning of white adipose

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144/1810

CONSUMPTION OF MACRONUTRIENTS BY CELIAC CHILDREN AND COMPOSITION OF MIXES GLUTEN FREE FLOURS

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Background and objectives: The gluten-free diet is the only treatment indicated for people with celiac disease. International studies indicate high intake of carbohydrates with protein and dietary fiber deficiencies. Since in Argentina there are no topic information, it was considered of interest to highlight the intake of macronutrients in celiac children and the composition of mixes gluten free flours (GFF).

Methods: We studied 40 children (group A: 22 children 6-8 years, group B: 18 children 9-11 years), who attended in a public hospital. Food consumption was recorded for two days and macronutrient intake was calculated using national composition tables. Simultaneously it was analyzed the composition of 4 commercial mixes GFF most commonly used by families to make bread, pasta, cookies, cakes, etc. Protein, total fat, dietary fiber, carbohydrate by difference and energy were determined.

Results: Intake for groups of children A and B were respectively: 1670 and 2348 Kcal; 236 and 311 g carbohydrates; 59 and 91g protein; 55 and 76g fat and 9 and 13g dietary fiber. When comparing these values with the recommendations of the Institute of Medicine, National Academies of Sciences (2005), high consumption of carbohydrates and proteins, adequate amount of fats and low of fiber was evidenced.

The analytical results of mixes GFF showed low protein content (3.1-8.5%), fat (0.2-5.4%), fiber (2.1-5.0%) and high carbohydrate

content (72,1 - 82.4%) and energy (348-359Kcal%). The ingredients used in the mixes formulation were similar with prevalence of starchy compounds (maize starch, rice flour and potato starch / cassava).

Conclusions: The diversification of the formulation of mixes GFF with high fiber ingredients, would favor the intake of a more balanced diet in celiac children with a decrease in high carbohydrate intake and increase in dietary fiber.

Keywords: Celiac Disease, Children, Macronutrients, Gluten Free Flours, Chemical Composition

144/1819

NUTRITIONAL STATUS IN RECENTLY DIAGNOSED HIV-INFECTED PEOPLE

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Background and objectives: Despite the benefits from highly active antiretroviral therapy (HAART), malnutrition remains as a problem among HIV-infected individuals specially in newly diagnosed, in whom HAART does not start o just started few weeks ago. Objective: To assess nutritional risk and/or nutritional status from different indicators, in a group of HIV patients.

Methods: Cross-sectional, descriptive study. Patients diagnosed with HIV infection no more than 6 months ago were included. Malnutrition screening tool (MST) was performed. Anthropometry: weight, height and mid-upper arm circumference. BMI, % of involuntary weight loss (UWL) and significantly UWL, were calculated. It was considered BMI at risk between 18,5-20 kg/m2 (Wanke MD, et al. 2004). Total cholesterol (TC) and albumin levels were collected from medical records. Transferrin and ultrasensitive C-reactive protein were determined by quantitative radial immunodiffussion on plates and immunoturbidimetry, respectively. Nutritional assessment (NA) was performed by 2 registered dietitian specialized in HIV infection. Values were considered statistically significant at p<0.05. Software STATA 11,1.

Results: 53 patients were included. Regarded MST, 28% presented moderate and 16% had high nutritional risk. In relation to BMI, 6% were between 18,5-20kg/m2 and 4% were <18,5kg/m2. Nutritional assessment diagnosed 30% at nutritional risk and 14% with undernutrition. 36% showed a significant UWL. There is statistical significantly association between NA and MST (p≤0.0001) and BMI (p≤0.001) but not all undernourished people were identified by BMI. 73.4% of patients with BMI in normal range were diagnosed with undernutrition by NA. Biochemical analysis showed, a media of TC of 142mg/dL (IQR 102,7;192.2) and transferrin of 205,8mg/dL (RIQ 167,2;240,4), but albumin level in normal range: 3,9g/dL (RIQ 3,5;4,4). The average value of CRP was 27,4g/L. (RIQ 14,4;47,0)

Conclusions: There are several malnourished patients to consider in the first 6 months since diagnosis. BMI is the nutritional indicator most commonly used by physicians. MST detected a number of people at risk similar to the diagnoses of nutritional assessment not BMI. So, BMI could underdiagnose malnourished people by delaying an opportune nutritional care in persons suffering HIV infection.

Keywords: HIV, nutritional assessment, MST, BMI, malnutrition.

144/1820

WALNUT SUPPLEMENTATION FOR 2 YEARS IN OLDER INDIVIDUALS REDUCES LDL-CHOLESTEROL WITHOUT ADVERSE EFFECTS ON ADIPOSITY. A SUB-STUDY OF THE WALNUTS AND HEALTHY AGING (WAHA) STUDY

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Background and objectives: Nuts are long known to have a cholesterol-lowering effect. Because nuts are fat-rich, energy-dense foods, there is a widespread concern that their regular consumption may lead to unwanted weigh gain, but there are no long-term (>24 weeks) data on lipids and adiposity changes after nut-supplemented diets. We hypothesized that incorporating daily doses of walnuts to the habitual diet of older free-living individuals for 2 years would lower blood cholesterol without adverse effects on adiposity.

Methods: WAHA is a dual-center randomized controlled trial aimed at assessing the effects of walnuts on age-related diseases in individuals aged 63 to 79 years. In the Barcelona node, 352 participants (108 men/244 women) were assigned to either usual

diet without nuts (control group, CG) or usual diet with walnuts at ≈15% of energy (30-60 g/day depending on energy requirements) (walnut group, WG). Fasting serum lipids, body weight, waist circumference and body fat distribution by DEXA were assessed at baseline and at the end of the trial. We used changes in the red blood cell proportion of alpha-linolenic acid (ALA) as a biomarker of adherence to the intervention. Differences in outcomes were assessed by ANCOVA adjusting for sex, age, and baseline values; lipid changes were additionally adjusted for in-trial changes in statin treatment.

Results: 2-year data were available for 329 subjects (165 WG, 164 CG). RBC ALA increased in the WG by 0.236 % (95% confidence interval [0.219 to 0.263]; P<0.001 vs. CG). LDL-cholesterol changes in the WG and CG were -8.36 [-11.90 to -4.82] vs. -2.90 [-6.55 to 0.75] mg/dl, respectively (P=0.036). No between-group differences were observed for other lipids, body weight, body mass index, waist circumference, or body fat distribution.

Conclusions: 2-y supplementation with walnuts decreased LDL-cholesterol. This concurs with prior evidence observed in smaller trials conducted in younger individuals treated for up to 24 weeks. The results help dispel the notion that nuts are obesogenic foods, a still common constraint to recommend their consumption as a cost-effective strategy to prevent cardiovascular disease.

Keywords: adiposity, cholesterol, walnuts.

Conflict of Interest Disclosure: ER has received research funding from the California Walnut Commission and is a nonpaid member of its Scientific Advisory Committee.

144/1832

NUTRITIONAL STATUS REGARDING IRON AND ZINC IN CELÍAC CHILDREN AND MINERAL CONTRIBUTION OF MIXES FLOURS

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Background and objectives: In order to mitigate iron (Fe) deficiency in Argentina, 3 mg / 100g of Fe is added to wheat flour (WF). Nevertheless, Gluten Free Flours (GFF) are not added to Fe. Deficiencies of Fe and zinc (Zn) have been reported in celiac people even though they may consume red meat.

In this paper we studied Fe and Zn reserves in celiac children attending a public hospital and mineral content of the mixes GFF most commonly used at home.

Methods: As reserve indicators, serum Ferritin and Zn were determined in 40 children (age 8.8 ± 2.0 years, 67.5% female,

32.5% male). In 4 most used commercial mixes GFF, Fe and Zn were analyzed by atomic absorption spectrometry.

Results: The serum ferritin concentration was 23.0 ± 15.0 µg/L, where 37.5% (n=15) presented levels below the limit (≤15 µg/L), while 62.5% (n=25) presented normal iron deposits (> 15 µg/L).

For Zn, serum levels were 121.7 ± 36.0 µg/dL, where 12.5% (n = 5) presented deficiency (<0.82 µg/dL) while 87.5% (n=35) had adequate reserves (>0.82 µg/dL).

In commercial mixes GFF, Fe concentration was very low: not detectable in two samples and low in the remaining (0.10 ± 0.06 mg%, 0.60 ± 0.04 mg%). These values were very low compared to enriched WF (3mg / 100g)

Regarding Zn, the range found in mixes GFF (0.30 ± 0.01 - 0.70 ± 0.01 mg%), exceeded the results found in WF (not detectable - 0.36 ± 0.04 mg%).

Conclusions: In the studied population, the third part presented deficiency respect to the Fe, and the tenth part respect to the Zn. Compared to WF, the mixes GFF were very poor Fe contributors and adequate in Zn. This would indicate the importance of Fe addition to GFF flours.

Keywords: Celiac Disease, Children, Ferritin, Serum Zinc, Gluten Free Flours

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144/1833

NUTRITIONAL STATUS OF FEMALE PATIENTS WITH BREAST CANCER ATTENDING THE RADIOTHERAPY DEPARTMENT OF THE UNIVERSITY COLLEGE HOSPITAL, IBADAN, NIGERIA

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Background and objectives: Nutritional status of cancer patients can be compromised in direct response to tumor induced alterations in metabolism. There is dearth of information on the nutritional status of female Nigerian patients with breast cancer. This study was carried out to access the nutritional status of female patients with breast cancer attending the Radiotherapy Department of the University College Hospital, Ibadan, Nigeria.

Methods: Thirty-five female patients with breast cancer were assessed. A semi-structured interviewer administered questionnaire and food frequency questionnaire were used to obtain information on the socio-demographic characteristics, medical history and frequency of food consumed by the patients. The body mass index (BMI in kg/m2) of the patients was determined. Data were analyzed using descriptive statistics and chi-square at p<0.05.

Results: The mean age of the patients was 47.3± 9.58 years. Most (70.2%) of the patients were Yoruba, 60.0% had secondary or tertiary education, 91.4% were married and 82.9% had ≥ 3 children. Majority (80.0%) were diagnosed with breast cancer less than 2 years. Their main sources of staple were cereals, grains,

roots and tubers and their protein sources were meat fish and legumes. Fruits were only consumed occasionally as snacks and vegetables were only consumed as accompaniment to staples. The mean height (m), weight (kg) and BMI (kg/m2) of the patients were 1.57±0.040m, 69.57±11.56kg/m2 and 29.15±4.79kg/m2. None of the patients was underweight, 20.0% had normal weight while others were overweight (45.75%), obese (31.4%) or grossly obese (2.9%). A significant association was observed between the patient BMI and occurrence of breast cancer.

Conclusions: Overweight and obesity were prevalent among the patients. The patients need proper nutritional counseling on adequate consumption of fruits and vegetables as well as maintenance of normal body weight for better health.

Keywords: Nutritional status, Female patients with breast cancer, Ibadan, Nigeria

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144/1870

CD36 GENOTYPE DOES NOT AFFECT FAT SENSITIVITY IN NONOBESE SUBJECTS

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Background and objectives: A single nucleotide polymorphism of the CD36 gene (rs1761667; A/G) has been proposed to be one of the main determinants of fatty acid sensitivity. The relationships between fat intake, sensitivity to fat, and body weight and composition are still debatable. The aim of this study was to analyze whether the CD36 genotype affects oral fatty acid sensitivity and whether fat intake or body composition may modify this relation.

Methods: 131 people (88 women and 43 men) aged 20–40 were enrolled in the so-called Fat Taste Project. Body weight was measured using the electronic scale and body composition was analyzed using a BodPod (Cosmed, Italy). Food intake was assessed with dietary records and the intake of nutrients was calculated using the Dieta 5.0 program (National Food and Nutrition Institute). The ability to discriminate samples containing different amounts of fatty acids was investigated using salad dressings with different concentrations of canola oil. An ascending forced-choice triangle procedure was applied. The subjects were divided into three subgroups: with low, medium, and high sensitivity. The CD36 genotype (rs1761667) was analyzed using hybridizing probes.

Results: In women, the mean body mass was 62.1 ± 1.1 kg, the mean BMI was 22.4 ± 0.3 kg/m2, and the mean percentage body fat was 26.7% ± 1.0%; in men, these parameters were respectively 81.2 ± 2.3 kg, 25.1 ± 0.7 kg/m2, and 25.4% ± 1.4%. The average daily fat intake was 78.6 ± 3.0 g in women and 77.8 ± 3.0 g in men. The average percent energy from fat was 32.3% ± 0.6% in women and 32.2% ± 1.1% in men. The CD36 gene frequencies were 0.5 for both alleles. The CD36 genotype did not affect the ability to discriminate fat content in the test samples, irrespective of body composition. People with the AA genotype, who are genetically less sensitive to fat, were able to detect lower concentrations of fat when their diets contained more fat, this tendency was however not statistically significant.

Conclusions: The CD36 genotype does not affect oral fatty acid sensitivity in nonobese adults.

Keywords: fat taste, CD36, body composition, fat intake

144/1886

QUALITY NUTRITIONAL COMPARISON OF PRE-HISPANIC DIET, DASH DIET, FAST METABOLISM DIET, GLUTEN FREE DIET & ALCALINE DIET AS A CONTRIBUTORY TREATMENT OPTION FOR CANCER

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Background and objectives: During the development of this task quality nutrition was made of different diets which have been recommended as nutrition treatment contributories in patients who suffer from cancer, and also from energy protein nutritional deterioration on account of losing weight, emaciation, stress and malnutrition. Therefore, nutritional treatment is an essential pillar due to the nutritional requirements that are more specified and must be complemented.

Methods: Five different diets were selected taking into consideration five dietary events for a week with an estimated energy waste 30-35 kilocalories gram per day for 20-40 year-old adult woman with cancer. From the elaborated menus a calculi was made for each nutriment according to food composition table for Mexicans, taking into account the main nutrient compounds for cancer. The 7 weekdays results were achieved and was compared with the suggested diary ingested established for the healthy Mexican population according to age and gender.

Results: Cancer patient diet must include important nutriments as dietetic fiber, 25 – 35 grams per day, monounsaturated fatty acids, polyunsaturated, antioxidants, vitamins as ascorbic acid 75 mg/per day, retinol 800 μg - 1.000 μg, gamma tocopherol 15

mg/ día, phytoestrogens like isoflavons, oligometals like selenium, calcium and polyphenols. Diet with majority of these nutriments is prehispanic diet, which meets diary ingested requirements in comparison to alcaline, despite being richer in antioxidants but it does not meet the suggested requirements especially in macro nutriments. Obtained aminoacids quantities suggest epigenetic action as genomic modificators, acting as anti- cancerigen for supresor actions of tumoral genes.

Conclusions: It was observed that not all suggested menus meet the nutritional requirements for the oncologic aspects as a possible treatment. It is important to do more nutritional research to meet treatments and patient benefits. Nowadays, there are many diets with different characteristics, however, a diet it cannot be generalized for a nutritional treatment, it must be individualized according to patient to provide a more completed and specific nutritional support.

Keywords: nutrition, clinical, nutrition quality, diets, cancer

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144/1896

HIGH 24-H URINARY SULFATE EXCRETION IS ASSOCIATED WITH LOW RISK OF GRAFT FAILURE IN RENAL TRANSPLANT RECIPIENTS

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Background and objectives: Hydrogen sulfide (H_2S) is a cytoprotective compound, which is an intermediate in the metabolic pathway between dietary sulfur-containing amino acids and the end-metabolite of this pathway, sulfate. High 24-h urinary excretion of sulfate (UExS) may therefore reflect high H_2S bioavailability and thereby be associated with protection against organ damage. We therefore aimed to investigate the association of UExS is associated with graft failure in renal transplant recipients.

Methods: We included 687 stable RTR that were recruited at least 1 year after transplantation. UExS was measured from 24-h urine samples at baseline. Cox regression analyses have been performed to study association of UExS with outcome.

Results: In our cohort, median age was 55 years, 57% were males, mean eGFR was 45 ml/min, and median time between transplantation and baseline was 5.5 (interquartile range 4.5 –

6.0) years. Median 24-h UExS was 17.1 mmol/24-h. Over a median follow-up of 5.3 (interquartile range: 4.5 – 6.0) years 81 RTR experienced graft failure. UExS was significantly associated with decreased graft failure (HR: 0.44 per log2 increment, 95% CI: 0.33-0.59, P<0.001). The association remained significant (HR: 0.50 per log2 increment, 95% CI: 0.27-0.95, P=0.03) after adjustment for age, sex, eGFR, proteinuria, BMI, physical activity, protein intake, alcohol intake, smoking behavior, transplantation-related factors (e.g. cold ischemia time, early rejection), immunosuppressive drug usage, antidiabetic drug usage, antihypertensive drug usage, and blood urea level. Additional adjustment for 24-h urinary creatinine excretion (reflecting muscle mass) did not materially change the association, although it became slightly less significant (HR: 0.52 per log2 increment, 95% CI: 0.27-1.00, P=0.05).

Conclusions: The results of this study demonstrate a significant inverse association of UExS with graft failure in RTR and suggests a protective effect of increased sulfur intake. An underlying mechanism of this association may be increased H_2S pathway activity. Additionally, the association may be explained by beneficial effects of increased muscle mass related to higher sulfuric amino acid intake and in general higher dietary protein intake. For future research, it is interesting to study what the effects are of specific dietary sources of sulfate on graft failure.

Keywords: sulfate; graft survival; renal transplantation, amino acids

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144/1919

RELATIONSHIP BETWEEN FAT MASS AND WAIST CIRCUMFERENCE WITH THE TRANS FATTY ACIDS INTAKE ON WOMEN OF CHILDBEARING AGE. PRELIMINARY STUDY

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Background and objectives: The childbearing years are an important life stage for women, where the obesity can have health consequences in the medium and long term. Intake of trans fatty acids (TFA) from diet has been associated with the development of abdominal obesity and consequently with cardiovascular disease and diabetes, these are currently considered risk factors. The aim of the work was to explore the relationship between the consumption of TFA and fat mass (FM), visceral fat (VF) and waist circumference (WC) on a population of childbearing women from

Facultad de Ciencias Químicas (FCQ) of the Universidad Nacional de Asunción.

Methods: Three outcome measures have been examined in women students (n=56): The percentage of FM and VF, by the Omrom BF500 Body Composition Monitor with Bioimpedance (NIH/WHO guidelines for BMI- Gallagher et al). The WC, following the WHO Physical Measurement Guide. (3) Consumption of TFA per day (g/TFA/day) by a Food Consumption Frequency (FCA) survey. For statistical analysis; the Spearman correlation was applied and the Kolmogorov-Smirnov and Kruskal-Wallis Z tests were used for the comparison of means.

Results: The mean age was 21.8±2.4 years. The median of caloric intake by TFA was 3.3% of total energy (IC95%: 3.11-4.5%) and 7.3g g/TFA/day (IC95%: 6.9-9.8 g/TFA/day). The mean of the anthropometric measurements was 31.5% (IC95%: 30.8-33.9%) for FM, 3.7 (IC95%: 3.4-4.0) for VF and 72.8cm (IC95% 70.8-74.8cm) for WC. The mean TFA consumption was increasing according to the FM classification, 8.4gTFA/d (Normal), 7.1gAGT/d (High) and 8.8gAGT/d (Very high), although the differences was not significant (p=0.278). The mean consumption of TFA was 6.8gTFA/day in women with WC not increased, whereas 9.5 gTFA/day with WC increased (p=0.092). All evaluated women had adequate VF. TFA consumption showed a proportional trend with FM (r=0.001) and WC (r=0.104), although not significant (p≤0.05).

Conclusions: A trend between FM, WC and the TFA intake was observed.

Keywords: Childbearing women, fat mass, waist circumference, trans fatty acids, intake.

144/1941

THE EFFECT OF CORNELIAN CHERRY AND HONEYSUCKLE ADDED TO DIET ON SELECTED BIOCHEMICAL PARAMETERS IN WISTAR RATS

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Background and objectives: Fruits of cornelian cherry (Cornus mas L.) and berries of honeysuckle (Lonicera caerulea L. var. kamtschatica) are a valuable source of phenolic compounds (1). These compounds show many properties beneficial for human organism (2). The fruits can also contain other biologically active compounds, like iridoids, which exhibit antibiotic, anti-inflammatory or hypertensive activities (3).

Methods: The experiments were conducted on 60 male Wistar rats divided into 8 groups. Rats were fed with diets: group 1- C – a control diet; group 2 - CC– a control diet with Cornelian cherry powder (300 mg/100 g); group 3 - HLC– a control diet with honeyberry Lonicera caerulea powder (300 mg/100 g); group 4 – CC+HLC - a control diet with HLC powder (300 mg/100 g) and CC powder (300 mg/100 g); group; 5 – HF- a high fat diet containing 15% of animal fat (lard); group 6 – HF+CC– a HF diet with CC powder (300 mg/100 g); group 7 – HF+HLC– a control diet with HLC powder (300 mg/100 g); group 8 – HF+CC+HLC - a control diet HLC (300 mg/100 g) and CC powder (300 mg/100 g).

Results: CC and HLC did not significantly affect on morphological parameters in blood in experimental rats. It significantly affected on liver enzyme activity ALAT, which decreased significantly in CC+HLC animals regardless of fat content in diet (41.3 vs 33.8 U / l). Comparing the effect of CC vs HLC a higher reduction in addition of honeyberry were observed. Similar results in blood TG levels were observed. The addition of one of dried fruits caused TG reduction - 11% for CC, 19% for HLC and 38% for both of them. Polyphenols have a protective effect on the liver, which is related to its ability to block both inflammatory processes in the liver and activation of stellate cells. Addition of CC and HLC caused lowering Phosphorus, Calcium and Sodium level. The effect of the supplement is independent of the fat content in the diet.

Conclusions: Cornelian cherry and honeyberry Lonicera caerulea can be addet as an element of functional food to protect liver and reduce TG level.

Keywords: Cornelian cherry honeysuckle Lonicera caerulea, biochemical parameters, rats

Further collaborators: DORIAN NOWACKI

144/1947

EXPERIMENTAL, PROSPECTIVE, RANDOMIZED AND DOUBLE BLIND STUDY ABOUT SAFETY AND EFFICACY OF MAZINDOL AS A TREATMENT AGAINST OBESITY

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Background and objectives: Background: since 1980, obesity has more being increasing in all over the world. It is an incurable but controllable chronic metabolic disease, aggravating other conditions, which is currently the major public health problem in many countries. At present, pharmacological therapy is one of the most used tools along with diet and exercise. Mazindol (MZ1mg) is a drug approved by the FDA and ANMAT, in therapy as anorexigenic.

Objective: to evaluate for the first time in our country, the efficacy and safety of the MZ1 1mg (Laboratory Produmedix Argentina SA) as an adjuvant in the treatment of obesity in the staff

of the Police of Tucumán (18-60 years) with a diagnosis of obesity (BMI ≥30).

Methods: We conducted a randomized double-blind study of 100 patients, divided in placebo group (GP) and active drug group (AD) for a period of 3 months. Previously patients were evaluated clinically and through laboratory screening as method of exclusion by having other diseases and/or pregnancy. The drug was administrated as one pill daily and subjects controlled every 15 days from the clinical-nutritional and mental health point of view.

Results: AD reflected an average loss of weight of 9kg, with a 9% reduction in fat mass percentage. On the average BMI was reduced to 4 points and the circumference of the waist was 9cm for men and 11cm in women. The insulin in blood was reduced by 8 units and the homeostasis model assessment (HOMA) 2 units. GOT were reduced 8 units and the GPT 9 units. Systolic pressure decreased 12 units and diastolic pressure 6 units in women; in men was 7 and 3 respectively. Hemoglobin, glycemia, TC, HDL, LDL, and TG did not reflect significant reductions.

Ultrasound Hepato-biliary reported: Of 22 patients with fatty liver, 30% recovered normal function while 12 AD patients recovered its 50% of their normal hepatic function. There were no adverse effects of importance during the study.

Conclusions: The use of Mazindol among Policy members of Tucuman, Argentina, improved their quality and life expectancy by the weight reduction with the reduction the risk factors in relation with the overweight and obesity.

Keywords: Mazindol, Obesity, Police, Weight, Cholesterol

144/1948

DIETARY MAGNESIUM RESTRICTION PROMOTES INSULIN RESISTANCE IN RATS FED A HIGH-FAT DIET

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Background and objectives: Magnesium (Mg) deficiency has been related to pre-diabetic conditions in experimental and human studies. Here, we evaluated in rats, for 24 weeks, the effects of dietary Mg restriction (90% of recommendations) and lipid-overload (a recognized dietary experimental model of obesity) on Mg status and whole body insulin sensitivity.

Methods: Male Wistar rats (n = 24; initial body weight 97-123 g) were fed ad libitum semipurified AIN-93-based control (CT) or high-fat (HF) diets (adequate or Mg-restricted; 500 [Mg500] and 50 [Mg50] mg Mg/kg diet, respectively). Magnesium concentrations in plasma, erythrocyte, bone, muscle, urine and feces) were measured by atomic absorption spectrophotometry. An intraperitoneal insulin tolerance test (ipITT) was performed at weeks 8, 12, 16 and 24. TRPM6 expression in the kidney was analyzed by Western-blot.

Results: HF intake increased adiposity and body weight gain ($p < 0.05$), irrespective of Mg restriction. Also as expected, Mg concentrations were decreased in plasma ($p < 0.01$), urine ($p < 0.01$) feces ($p < 0.001$) and bone ($p < 0.001$) of rats fed Mg-restricted diets. However, HF [Mg50] rats presents higher concentration of Mg erythrocyte. Compared to controls, HF Mg [50] rats developed insulin resistance ($p = 0.007$ and $p = 0.02$ at 16 and 24 weeks, respectively). Preliminary results indicate that dietary Mg restriction enhances kidney expression of TRPM6, regardless of insulin sensitivity.

Conclusions: In our experimental model, whole body insulin resistance altered the Mg compartimentalization in response to its dietary restriction without modifiy the kidney abundancy of the major Mg reabsortion channel. The evaluation of the insulin signaling pathway and other Mg channels in key compartments linked to Mg homeostasis (kidney, intestine) may elucidate the relationship between insulin resistance and Mg status.

Keywords: Magnesium deficiency. Lipids. Insulin sensitivity. TRPM6.

Further collaborators:

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144/1965

ADHERENCE TO THE MEDITERRANEAN AND THE CENTRAL EUROPEAN DIETS IN RELATION TO WEIGHT LOSS CHANGES IN POSTMENOPAUSAL WOMEN WITH DIAGNOSED METABOLIC SYNDROME

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Background and objectives: It has been demonstrated that the Mediterranean diet (MED) can improve body weight and reduce the incidence of diabetes mellitus and metabolic syndrome. On the other hand, it has also been stated that the adoption of this dietary regimen by populations other than Southern European is difficult, on account of the high cost and limited availability of these unfamiliar food items, as well as cultural differences in food preference. The aim of this study was to assess the level of adherence to MED and the Central European diet (CED) and to examine its association with weight loss changes.

Methods: Data were used from 130 free-living postmenopausal women with diagnosed metabolic syndrome (mean (SD); age: 61.0 (5.0) years; body mass index: 33.5 (4.6) kg/m2) participating in 16-week randomized dietary interventions aimed at comparing the effect of hypocaloric MED or CED with different macronutrient compositions on body weight loss. Dietary adherence was calculated as a difference between the reported and recommended distributions of energy intake from macronutrients using a Mahalanobis distance equation. This equation generates an adherence score that represents the degree of deviation from the prescribed goals for macronutrients intake; lower scores show better adherence and higher scores indicate greater non-adherence.

Results: In both groups, the adherence to dietary regimen tended to worsen over time. The 16-week body weight changes in the most and least adherent participants, irrespective of assigned dietary intervention were -9.4 ± 3.7 and -5.8 ± 3.2 kg (p < 0.001).

Conclusions: Adherence to the dietary regimen is a stronger predictor of weight loss success than the diet used.

Keywords: Adherence, Central-European diet, Dietary intervention, Mediterranean diet, Weight loss,

Conflict of Interest Disclosure: The authors declare that they have no conflict of interest.

144/1983

EFFECTS OF A 16-WEEK DIETARY INTERVENTION WITH EITHER A MEDITERRANEAN DIET OR A CENTRAL EUROPEAN DIET ON ANTHROPOMETRIC PARAMETERS IN OBESE POSTMENOPAUSAL WITH DIAGNOSED METABOLIC SYNDROME

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Background and objectives: The high-vegetable-fat Mediterranean diet (MED) is associated with a lower risk of diabetes mellitus and metabolic syndrome. In the Central European region, we can also find traditional beneficial foods items (i.e., apples, plums, black chokeberries, herring, linseed, rapeseed oil, oats, buckwheat, and rye bread), which may have a favorable effect on all features of metabolic syndrome. The aim of this study was to compare the effects of MED and the Central-European diet (CED), based on local healthy foods items, on changes in anthropometric parameters associated with metabolic abnormalities.

Methods: One hundred and forty-four free-living postmenopausal women with diagnosed metabolic syndrome (mean (SD); age: 61.0 (5.0) years; body mass index: 37.7 (4.9) kg/m2) were randomly assigned to the hypocaloric MED or CED for 16 weeks. The nutrient goals for the compared diets were: MED: 40% energy from fat, 20% energy from protein, and 45% energy from carbohydrates; CED: 25% energy from fat, 20% energy from protein, and 55% energy from carbohydrates. Body weight, body composition, and waist circumference were assessed before the intervention and 4, 8, 12 and 16 weeks after it.

Results: One hundred and thirty participants completed the study (MED, n = 67; CED, n = 63). At 16 weeks, both groups experienced similar reductions in body weight (MED -7.57 (3.6) kg; CED, -7.59 (4.2) kg; P = 0.94 time × group interaction), waist circumference (MED, 9.20 (3.7) cm; CED, -9.31 (4.5); P = 0.15 time

× group interaction) and fat mass (MED, -7.03 (3.4) kg, CED, -7.01 (3.7) kg; P = 0.91 time × group interaction and fat mass).

Conclusions: The results of this study show that both MED and CED diets result in significant reductions in body weight, waist circumference, and fat mass over 16 weeks of dietary intervention trial.

Keywords: Body weight, Central-European diet, Dietary intervention, Fat mass, Mediterranean diet, Waist circumferences

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144/2010

IMPACT OF THE CONSUMPTION OF TAMARIND FLOUR (TAMARINDUS INDICA L.) IN METABOLIC SYNDROME AMONG TYPE 2 DIABETIC PATIENTS

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Background and objectives: To investigate the effect of the consumption of tamarind flour on the components of metabolic syndrome (MS) among patients with type 2 diabetes mellitus treated by a reference health center of the Brazilian Unified Health System.

Methods: This is a randomized, double-blind clinical trial, placebo controlled. Of the 164 randomly treated diabetic patients, 152 were diagnosed with MS and divided into two groups: placebo and intervention group that received tamarind flour for consumption for a period of 4 weeks. A semi-structured questionnaire was applied to evaluate demographic, socioeconomic, anthropometric, biochemical and food consumption data. SPSS version 20.0 was used for data analysis with descriptive level of test of 0.05.

Results: The usual diet of the participants was inadequate with an excess of cholesterol and sodium and low amount of fiber. Regarding the indicators of MS, it was observed a reduction in the waist circumference (p = 0.003) and in triacylglycerol levels (p = 0.016) in the intervention group. Comparing placebo and intervention group, patients who received tamarind flour presented reduction in their triacylglycerol levels.

Conclusions: The consumption of tamarind flour was effective in improving two important indicators of MS, with a reduction in WC and in triacylglycerol. This fact evidences a potential role of tamarind meal as an adjuvant in the management of MS indicators among diabetic patients.

Keywords: metabolic syndrome. diabetes mellitus. tamarind. cardiovascular diseases.

144/2011

GLUTEN-FREE NOODLES MADE WITH REGIONAL FLOURS: CONTENT, DIALYZABILITY AND POTENTIAL CONTRIBUTION OF IRON CALCIUM AND ZINC

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Background and objectives: Today, celiac disease is the most frequent chronic intestinal disease in Argentina; the official statistic is 1 in 79 for children. The need to have a diet without T.A.C.C. is imperative for celiacs, as well as the incorporation of natural and industrialized apt foods, with good contribution of nutrients. This work aimed to determine the mineral content in noodles made with regional flours without gluten and cooked, as well as dialyzability and potential contribution of them.

Methods: MyM: Four prototypes of noodles made with rice flour, control (C) and three formulations, cooked 5 and 7 minutes respectively, were analyzed; In the proportions of flours that are detailed:

F1: Rice flour 66.00%, Quinoa 20.00%, Amaranth 10.00%, Algarroba 3.00%.

F2: Rice flour 66.00%; Quinoa 10.00%, Amaranth 20.00%, Algarroba 3.00%.

F3: Rice flour 56.00%, Quinoa 20.00%, Amaranth 20.00%, Algarroba 3.00%.

Results: The total mineral concentration was determined by atomic absorption spectrometry. The mineral bioaccessibility (D%) was determined in vitro under controlled conditions of pH, after a digestion that simulates the physiological processes. The potential contribution (AP) of minerals was calculated. The determinations were made in quadruplicate, and the statistical analysis was performed using ANOVA, with Tukey's test as a posteriori test. According to the results obtained it was observed that the D% for Fe is higher in F2; For Zn and Ca F1 and F3 with all formula-

tions being greater than C. The AP of Fe was higher in F2 (1.299 ± 0.032 mg%); For Zn there were no significant differences between the three formulations, however the AP was significantly higher than C. Regarding the AP of Ca there was no significant difference between F2 and F3 (33.28 ± 0.55 mg%).

Conclusions: From the above, it is concluded that F2 is the formulation that presents the best contribution of the minerals studied. All the proposed formulations constitute a valid alternative to supply the micronutrients Fe, Ca and Zn since they show significant differences with C.

Keywords: minerals - bioaccessibility - regional flours - noodles

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144/2019

NUTRITIONAL STATUS AND QUALITY OF LIFE OF BREAST CANCER PATIENTS ATTENDING A TERTIARY HOSPITAL IN IBADAN, SOUTHWEST NIGERIA

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Background and objectives: Cancer diagnosis in Nigeria is similar to death sentence as survival rates are very low. Attention is mostly focused on the treatment with little or no attention is paid on long term survival and quality of life of the breast cancer patients. Hence, this study was designed to evaluate the relationship between the nutritional status and quality of life (QOL) of the breast cancer patients.

Methods: The descriptive cross-sectional study was carried out at the University College Hospital, Ibadan, Southwest, Nigeria among 120 breast cancer patients. Data on sociodemographic and medical history was collected using semi-structured interviewer-administered questionnaires. Weight and height were measured and body mass index (BMI) was determined. Dietary intake was assessed using 24-hour dietary recall. QOL was evaluated using EORTC QLQ-C30 and BR23. Data obtained on dietary intake was analysed using the Total Dietary Assessment software. Chi square test, student-t test and ANOVA were used as appropriate to determine the relationship between variables at $p < 0.05$.

Results: The mean age of the participants was 51.7 ±10.9 years, 48.3% were at premenopausal stage, 81.7% were married, 5% had no formal education and 80.0% were employed. About 38.0% were in stage I and 58.7% were in stage II. Approximately 54.0% had chemotherapy + radiotherapy + surgery, 23.7% had surgery only, 10.2% had chemotherapy only while 11.9% had chemotherapy + surgery. Many of the participants were either overweight (32.7%) or obese (38.4%). BMI was observed to have significant relationship with the stage of the disease, treatment option and menopausal status ($p < 0.05$). QOL of the participants was also found to have significant relationship with treatment option, BMI, menopausal status and stage of the disease ($p < 0.05$). Daily energy, protein and fibre intakes were inadequate among 64.7%, 37.26% and 70.6% respectively and vitamin A, C, folate, zinc, calcium and iron intakes were also inadequate among 33.3%, 60.8%, 66.7%, 54.9%, 96.1% and 23.5% respectively.

Conclusions: QOL has relationship with BMI, menopausal status, treatment option and the stage of the disease. Dietary intake is mostly inadequate among the participants.

Keywords: breast cancer, BMI, Nutritional status, Nigeria

144/2037

THE PREVALENCE OF OBESITY IN A MIGRANT POPULATION LIVING IN CASABLANCA, MOROCCO

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Background and objectives: Rural-Urban migration is known as a major factor associated with the increase of obesity prevalence in many countries. In Morocco, obesity prevalence is higher in cities.

In this study, we assessed the influence of ethnicity and migration, through urbanity degree, on obesity prevalence variation, between the ethnic group of Soussi (native of the rural zone of Souss region) and Casablanca in Morocco.

Methods: We used a multi-stratified sampling including 615 subjects (305 subjects recruited in metropolitan Casablanca and 310 from the Souss region). The sampling was based on ethnicity, sex and age. We measured anthropometric parameters, using (i) body mass index (BMI), based on cut-off points recommended by the WHO, and (ii) body fat percentage (BF%), based on cut-off points taken from tables provided in the user's manual of a BIA meter (i.e., a bioelectrical impedance device).

Results: Obesity prevalence is greater in women than in men (22.5% vs. 19.8%). Women also presented an AO and a higher %BF risk than men (77.6% vs. 33.4% and 71.2% vs. 60.4%, respectively). Adjusted analysis of our data indicated that, in comparison with rural Soussi, the AO is significantly greater in the second generation migrants group (51.0%, OR=0.33, 95%CI [0.17–0.64], p<0.01); Obesity prevalence (BMI and %BF) is also more elevated in Soussi from Casablanca (21.3%, OR=0.53, 95%CI [0.30–0.92], p<0.05 and 71.3%, OR= 0.42, 95%CI [0.28 –0.76], p<0.01, respectively). Obesity prevalence and AO are higher in women from Casablanca than in women from Souss region (BMI: 31.0% %, OR= 0.54, 95%CI [0.37–0.92], p<0.05, and AO: 83.9%, OR=0.48, 95%CI [0.27–0.84], p<0.01).

Conclusions: Our study showed that anthropometric and body statuses of our study population depend on urbanity degree (second generation migrants) and ethnicity (Soussi from Casablanca) in men. However, in women, it is linked to their residence location (particularly, in Women from Casablanca).

Keywords: Obesity. migration. ethnicity. city

144/2055

ALCOHOL CONSUMPTION AMONG ALTERNATING SHIFT WORKERS IS INFLUENCE BY WORK SCHEDULE AND ABDOMINAL OBESITY: A LONGITUDINAL STUDY

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Background and objectives: Some evidences from the literature have showed that shift workers consume high alcohol intake to compensate for sleep difficulties associated with work schedules. However, the pattern of alcohol consumption and its association with obesity is little explored between shift workers. The purpose of the study was to investigate the effects of different work schedules, rest periods and abdominal obesity on alcohol consumption in rotating shift workers.

Methods: The study included 30 males shift workers (37±5.68 years old; 90% working in shifts for more than 5 years). The working schedule was organized in the following sequence: two first days working in the morning shift (8:00a.m|.- 4:00p.m.); two days in evening shift (4:00p.m. – 0:00a.m.), one day in a break after evening shift, two days in night shift (0:00a.m. – 6:00a.m.) and 72 hours of rest. Height, weight, abdominal circumference (AC) and blood pressure were measured. The alcohol consumption was assessed using the 24-hour recall questionnaire for all shift days and days off (total=10 days). Generalized estimating equations (GEE) was used to examine the association between alcohol consumption, work schedule and abdominal obesity.

Results: GEE analyses showed a higher daily alcohol consumption in the days off (51.07g), when compared with day, evening, break between evening/night and night shifts (22.09g, 1.42g, 1.50g, 12.26g, respectively (p<005). Individuals who had high abdominal circumference consumed more alcohol than those who had normal abdominal circumference in the evening shift as well as in the break between evening/night shifts (p<0.05). Also, very high abdominal circumference individual consumed more alcohol than those with normal abdominal circumference in the break between evening/night shifts (p<0.05).

Conclusions: Rotating shift-work schedules and abdominal circumference had an effect on alcohol consumption among shift workers. These results should be confirmed in future studies.

Keywords: Shift-work, abdominal circumference, alcohol consumption.

144/2063

HEMODIAFILTRATION: IMPACT ON PROTEIN-ENERGY WASTING AMONG DIALYSIS PATIENTS

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Background and objectives: Hemodiafiltration (HDF) therapy is used in end stage renal disease (ESRD) patients under dialysis and combines the mechanisms of diffusion and convection, unlike conventional hemodialysis, based on diffusion transport. This therapy allows, among other things, an improvement in the hemodynamic stability, a lower resistance to the use of erythropoiesis stimulating agents (ESA) and a better clearance of inflammatory markers. There are no Latin American reports that assess nutritional parameters in this group of patients. Therefore we aimed to determine if HDF could have any impact on the protein-energy wasting characteristic of this population evaluated through biochemical and anthropometric nutritional variables.

Methods: We performed a retrospective study with a total of 45 patients, comparing albumin, cholesterol, transferrin, hemoglobin, phosphorus, C-RP, erythropoietin resistance index (ERI) and dialysis dose (Kt/V) at the beginning of HDF treatment and

six months later. 39 of these patients were also measured with high frequency bioimpedanciometry in order to determine the lean tissue index and the fat tissue index.

Results: We analized data of 30 men and 15 women >18 years, with a mean age of 52.9 ± 18.22 years, and with a dialysis time of 57.6 ± 46.8 months.

No statistically significant differences were found at baseline and six months after HDF treatment was started for the analyzed nutritional variables. Statistically significant differences were found for Kt/V and ERI (p<0.05).

Conclusions: According to what is published internationally, HDF improves the dialysis dose and decreases the use of erythropoiesis-stimulating agents, but no significant impact was observed in the protein-energy wasting of this population.

Keywords: Hemodiafiltration, Nutritional Parameters, Inflammation, End Stage Renal Disease

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144/2068

NUTRITIONAL PROFILE OF PATIENTS IN THE SECONDARY PREVENTION OF CARDIOVASCULAR DISEASES

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Background and objectives: Aging is accompanied by several pathological conditions, such as chronic noncommunicable diseases (CDNT) and, in particular, cardiovascular diseases. The objective of the study was to describe the nutritional, laboratory, food consumption and risk factors of patients who suffered from a cardiovascular event at the collaborating Heart Hospital Center (HCor).

Methods: This was a descriptive cross-sectional study in which secondary data from 50 cardiac subjects were used in the study "Effect of the Cardioprotective Food Program on the reduction of events and risk factors in secondary prevention for cardiovascular disease: A Randomized Clinical Trial", known as DICA Br, a project coordinated by the Research Institute of the Heart Hospital and the Support Program for Institutional Development of SUS (PROADI-SUS) of the Ministry of Health.

Results: Regarding the nutritional status, 36% (n=18) of the evaluated individuals presented obesity, 18% (n=9) overweight and 6% (n=3) underweight. The majority of the evaluated patients had hypertension, followed by dyslipidemia. In addition, 48% (n=24) of cardiac patients are former smokers and 55% (n=26) lead sedentary lives. Waist circumference values were increased for both genders (100,87cm and 105,28cm for women and men, respectively), as were means of fasting glycemia (103,89mg/dL; EP=4,37 and 108,44mg/dL; EP=4,25) and triglycerides (168,3mg/dL; EP=28,0 and 170,6mg/dL; EP=29,10). The mean cholesterol level for women was high (172.8mg/dL; EP=15.6) compared to men (145.39; EP=5.33), presenting a significant difference (p=0.045). In addition, the value of HDL was very low for women (42,13mg/dL; EP=2,91), being below the recommended level. Men seem to consume more fatty acid omega 3 and omega 6, sodium, fiber, calcium, selenium and energy when compared to women.

Conclusions: Apparently, there was no change in the improvement of the nutritional status of the patients analyzed after the occurrence of a cardiovascular event. It is necessary to carry out more studies aimed at this type of public, for better interventions for treatment secondary to cardiovascular diseases.

Keywords: Aging; Cardiovascular diseases; Nutritional profile; Food consumption.

144/2085

IMPACT OF OVERWEIGHT ON LDL OXIDATION AND PLASMA LEVELS OF VITAMIN D IN OLDER PEOPLE IN TERTIARY PREVENTION OF CVD

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Background and objectives: The identification of cardiovascular risk factors is fundamental for clinical practice and development of cardiovascular disease (CVD) prevention strategies. The objective of this study is evaluate classic and emerging cardiovascular risk factors (vitamin D and oxidized LDL) in the elderly with and without overweight in tertiary prevention for CVD.

Methods: A cross-sectional study with 93 elderly people with a mean age of 68.9 ± 6.9 years of both sexes, participants of a multicenter randomized clinical trial that studies the effects of a Brazilian Cardio protective Food Program on reduction of events and risk factors in prevention of CVD. The data were collected in the beginning of the nutritional intervention. Anthropometric evaluation (weight, height, waist-perimeter-PC) and blood collection were performed for analysis of lipid profile, plasma concentration

of 25-hydroxy-vitamin D and levels of oxidized LDL (LDL-ox). The elderly included did not use nutritional supplements. Data expressed in frequency and medians (p25-75), analyzed in SPSS 21.0, considering a significance level of 5%.

Results: 65,5% were male, 93,5% hypertensive, 92,3% dyslipidemic, 63,4% diabetics and 66,7% had a history of a heart attack. The mean BMI was 28,7 ± 4,5 kg/m² and 82,2% were overweight. Eutrophic individuals had no differences in LDL-C levels when compared to "overweight" [93,5 (77,5-113,0) mg/dl)] vs 89,5 (72,7-116,0) mg/dl; p=0,9] respectively, but LDL-ox concentrations were higher in the overweight elderly [6.691,0 (5.058,0 – 9.584,0) mU / mL vs 5.409,0 (3.411,7-7.572,5) mU/mL; p=0,032]. Overweight was associated with lower plasma levels of 25OH vitD, [62,0 (50,7-80,8) mmol/l vs 74,2 (62,3-97,3) mmol/l; p=0,06]. No significant differences were found in the evaluation of food consumption and had no correlations between LDL-ox and 25OH vitD.

Conclusions: Overweight had higher lipid peroxidation even reaching the established lipidic goals, and tends to lower plasma levels of 25OH vitD. These results shows the importance of non-pharmacological therapeutic measures aimed at lifestyle modification should be intensified, in order to contribute to reduction of the risk of a new cardiovascular event.

Keywords: Cardiovascular disease, overweight, elderly, nutritional sciences, low density lipoproteins.

Conflict of Interest Disclosure: Elisa M. dos Santos, Mariana R. Costa Portugal, Daniela O.Peçanha, Paula Borges M. Souza, Carolina Alves, Grazielle V.B. Huguenin, Annie S.B. have nothing to disclose. Bernadete Weber reports grants from Hospital do Coração (HCor), during the conduct of the study.

Further collaborators:

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144/2088

NUTRITIONAL STATUS IN CHILDREN WITH CYSTIC FIBROSIS IN PARAGUAY

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Background and objectives: Introduction: Adequate nutritional status is essential in patients with Cystic Fibrosis (CF) due to its influence on lung function and mortality.

Objective: To characterize the nutritional status of children and adolescents with Cystic Fibrosis (CF) who attend the National Neonatal Detection Program, under the Cystic Fibrosis Program, under the Ministry of Public Health and Social Welfare (MSPyBS), from February to November 2016 .

Methods: Material and method: A cross-sectional, observational, descriptive study with an analytical component with con-

firmed CF diagnosis. Socio-demographic variables, clinical form at diagnosis and presence of pancreatic sufficiency, anthropometric variables and nutritional status, biochemical, dietary and lung function variables (FEV1) were studied.

Results: A total of 84 children, 56% were female. The mean age was 7.5 ± 4.7 years; 64% diagnosed ≤6 months of life). Thirty-one percent had a mixed clinical form at diagnosis and 22% had neonatal screening. The standardized mean values of z weight, z height and z BMI were -0.6, -1 and - 0.2 respectively. In <2 years, 11% presented moderate acute malnutrition. At ≥ 2 years (n = 75), 60% had adequate nutritional status, 11% overweight and 3% obesity (BMI/Age). 17.3% of the total showed low height and 42% fulfilled the nutritional goal in CF; 41% presented chronic colonization by Pseudomonas Aeruginosa. Mean pulmonary function (FEV 1) was 77.8%; 58.1% had some degree of pulmonary involvement; the most affected were those with malnutrition or at risk (p = 0.0266, Student's t test). Children/adolescents with Pseudomona Aeruginosa had significantly lower BMI than those who did not (p = 0.0324, Student's t test) and those with a lower BMI had lower lung function (Pearson correlation positive and significant p = 0.001).

Conclusions: Conclusion. In children older than 2 years, 6 out of 10 have an adequate nutritional status. The height was compromised in more than half of the children.

Keywords: cystic fibrosis, nutritional status

144/2112

GLYCEMIC INDEX AND GLYCEMIC LOAD ARE ASSOCIATED WITH PROSTATE CANCER RISK IN CÓRDOBA, ARGENTINA: A MULTILEVEL ANALYSIS

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Background and objectives: The dietary glycemic index (GI) and glycemic load (GL) would increase the risk of diverse cancers, including prostate cancer (PC). The aim of the present study was to evaluate the association of dietary GI and GL with the risk of PC occurrence in male population, assessing the urban–rural context variability in Córdoba province in 2008-2015 period.

Methods: A case-control study of PC including 163 cases and 324 controls -matched by age and residence- was conducted. All subjects were interviewed with a validated food frequency questionnaire. The average daily dietary GI for a subject was computed by summing the products of the GI value of each food times the

amount of available carbohydrate (CH); then divided by the total amount of available CH consumed daily. The average GL was calculated by summing the products of the GI value of each food times the amount of available CH consumed daily divided by 100. Multilevel logistic regression models were estimated including GI or GL, age, Body Mass Index, energy and fat intake as covariates at the individual level, and level of urbanization of subject's residence as clustering factor (<29,999; 30,000-200,000; >200,000 inhabitants), with the disease status (presence/absence of PC) being the response variable.

Results: Odds of PC increased linearly with increasing GI and GL (OR 1.04; 95%CI 1.02-1.05 and OR 1.01; 95%CI 1.003-1.01). Moreover, men at the third tertile of GI showed a higher risk for PC occurrence (OR: 1.51; 95%CI 1.30-1.75) compared to men in the first tertile. The promoting effect was stronger when comparing the highest vs. the lowest tertile of GL (OR 2.06; 95%CI 2.01-2.11). There was not aggregation linked to the level of urbanization.

Conclusions: Our results suggest that a diet with high GI and GL is associated with an increased risk of PC. Hence, more attention must be given to the quality of dietary carbohydrates when promoting healthy dietary habits in men.

Keywords: glycemic index, glycemic load, prostate cancer, case-control, Argentina.

144/2133

LEVEL OF CARE AND FREQUENCY OF NUTRITION VISITS FOR PATIENTS HOSPITALIZED IN PRIVATE HOSPITAL FROM CURITIBA - PR

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Background and objectives: The patient's impact on hospitalization may not only aggravate his/her general condition but it may also complicate him/her through loss of appetite, difficulty in proper dietary intake or due to imposition of fasting procedures. According to the Brazilian Nutrition Association (ASBRAN), the triage identifies the nutritional risk aiming at performing early intervention and its application is indicated within 24 hours from the admission of the patient at the hospital level and at the first consultation at the ambulatory and home level. The objective of this research was to verify the frequency of the nutritional care levels of patients triaged and the adequacy of the number of nutritionist visits, received by patients during hospitalization.

Methods: Retrospective, descriptive study made through analysis of electronic patient records from a private hospital in the city of Curitiba-PR.

Results: Data were collected from January to December 2015, totaling 5962 medical records, 54% of female patients and 46% of male patients aged 63,5±18,2 years old. The average length of hospital stay was 9,5±6,3 days and 97% of the surveyed patients were classified in secondary and tertiary level. Regarding the time of nutritional triage, 65,2% (n=3893) of the patients were triaged within 24 hours of hospital admission. When comparing the level of care with the number of visits during hospitalization, it was observed that 28.7% (n = 1714) of the patients did not receive the recommended number of visits. It is suggested that the possible causes for this inadequacy may be the limited number of professionals or the fact that patients are not available at routine schedules for nutritionists, due to specific surgical procedures and/or tests. According to CFN Resolution No. 380/2005, a nutritionist is recommended for caring 60 patients at the primary level, or up to 30 patients at secondary level or to care up to 15 patients at tertiary level.

Conclusions: The adequate number of professionals allows applying and maintaining recommendations and protocols regarding professional care.

Keywords: Nutritional care level, triage, nutritional monitoring.

144/2148

NUTRIGENOMIC AND PHARMACOGENETIC PROTOCOL IN THE CONDUCT IN THE TREATMENT OF BREAST CANCER

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Background and objectives: Breast cancer is one of the most common diseases among women, and has a high incidence and mortality, especially in developing countries. The therapeutic success of this type of cancer can be better conducted when considering pharmacogenetic aspects and drug interactions. Another approach is to observe an optimized diet to avoid changes in this pharmacokinetics. The presence of bioactive compounds with inhibitory or cytochrome-inducing action involved in the treatment may interfere with drug metabolism. This approach may prevent possible adverse reactions, with discontinuation of treatment or failure of therapy. Objectives: To develop a protocol of dietary and

pharmacological behavior considering the aspects of drug interactions, interactions between nutrients, pharmacogenetics and cytochrome metabolism in the treatment of breast cancer.

Methods: The protocol was developed using the databases of PharmGKB (The Pharmacogenomics knowledgebase), CIPIC (Clinical Pharmacogenetics Implementation Consortium) and USDA (United States Department of Agriculture) National Agricultural Library.

Results: Single nucleotide polymorphisms (SNPs) in transporters such as ABCB1 (3435C> T) were shown to have low disease control in the use of taxanes. Dihydropyrimidine dehydrogenase has SNPs that affect the effectiveness of the metabolism of Fluoropyrimidines such as 5-fluorouracil, capecitabine, and tegafur increased its toxicity. The metabolism of tamoxifen in CYP2D6 can be affected by several SNPs, changing their concentrations. The use of other drugs concurrently inhibiting CYP2D6 and the presence of bioactive compounds such as garden cress, kale and resveratrol should be avoided as there is a high risk of relapse of the disease. Other compounds such as green tea, black tea and cruciferous vegetables also act inhibiting CYP2D6.

Conclusions: Genotypic analyzes of transporters and metabolizers in the treatment of breast cancer allow a better management of recommended drugs. In addition to avoiding drugs that act concomitantly on the same cytochromes and provide dose adjustments, the practice of developing a warning diet, either in the neoadjuvant phase or in the metastatic phase, that does not inhibit important cytochromes, cooperates for success of treatment and cure of the disease.

Keywords: Breast Cancer; Pharmacogenetics; Nutrigenomics; Bioactive Compounds; Tamoxifen.

BRANCHED CHAIN AMINO ACIDS IMPROVE CELL VIABILITY BUT DO NOT INCREASE NITRIC OXIDE PRODUCTION IN LPS-STIMULATED RAW 264.7 MACROPHAGES

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Background and objectives: BCAAs have a unique place in protein synthesis stimulation, serving as energetic substrates for synthesis of intracellular signaling molecules. However, in inflammation and intense catabolic state, such as sepsis and cancer, the supply of these amino acids must be increased to preserve individual's immunocompetence. In vitro studies have demonstrated that immune cells use isoleucine, valine and especially leucine as substrates for production of cytokines and antibodies, besides having a modulating effect on cellular functions, as in nitric oxide synthesis. Also, studies have found that the absence of any of these amino acids in culture medium results in complete suppression of protein synthesis and cell proliferation. The aim of this study was to investigated the effect of BCAAs supplementation on cell viability and nitric oxide production in LPS-stimulated RAW 264.7 macrophages.

Methods: Cells were cultured in DMEM (with 2 mM glutamine, 10% FBS and 1% penicillin-streptomycin). After reaching 90% confluence, cell cultures were distributed into five groups: CTL - without supplementation with BCAA; LEU - supplemented with leucine (2 mmol/L); ISO - supplemented with isoleucine (2 mmol L); VAL - supplemented with valine (2 mmol/L) and LIV - supplemented with leucine (2 mmol/L), isoleucine (2 mmol/L) and valine (2 mmol/L). The inflammatory state was induced by LPS (1 μg/ml) for 24 hours and then cell cultures were supplemented with the respective amino acids for another 24 hours. The cell viability assay was performed by MTT test and the indirect nitric oxide was measured by Griess reaction.

Results: The LIV group presented higher percentage of cell viability in comparison to CTL group (p <0.05). There was no statistical difference between other groups related to macrophage viability, evidencing that the sinergy among BCAAs is the responsible

for increasing cell viability. Regarding production of nitric oxide, there was no significant difference between groups.

Conclusions: Supplementation with BCAAs association shows to be more effective in increasing cellular viability of LPS-stimulated cells compared to supplementation with isolated BCAAs. In addition, there was no difference in nitric oxide synthesis by macrophages in any of the supplemented groups.

Keywords: branched-chain amino acids, macrophages, inflammation, cell viability, nitric oxide.

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144/2180

THE EPIDEMIOLOGY OF HELICOBACTER PYLORI INFECTION IN EUROPE AND THE IMPACT OF LIFESTYLE ON ITS NATURAL EVOLUTION TOWARDS STOMACH CANCER: A SYSTEMATIC REVIEW

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Background and objectives: Helicobacter pylori is a recognized cause of stomach cancer. This systematic review (1) summarizes the prevalence of infection with this bacterium in Europe, and (2) reviews the possible impact of particular lifestyle factors towards the progression of the associated cancer.

Methods: A systematic literature search was conducted in two databases by two independent investigators. Studies relating infection prevalence among European healthy adult populations and worldwide studies relating the impact of lifestyle factors in association with Helicobacter pylori on stomach cancer risk were included.

Results: Data throughout time showed variable Helicobacter pylori infection outcomes depending on region. Data showed the lowest infection prevalence rates in Northern Europe while the highest infection rates were found in Eastern and Southern Europe, up to 84% in Portugal and Poland. Studies on smoking, salt and meat consumption demonstrated increased risks of developing stomach cancer among Helicobacter pylori infected individuals, while studies relating the intake of fruit, vegetables and vitamins demonstrated decreased risks but the levels of significance differed importantly between studies. No significant interaction could be found for alcohol consumption or physical activity.

Conclusions: Recent data showed still high Helicobacter pylori infection rates in several European regions. Moreover, this systematic review suggests that the following correctable lifestyle factors could impact the disease progression towards Helicobacter pylori associated stomach cancer: the consumption of salt, (processed) meat, fruits, vegetables, vitamins and smoking. However, more qualitative studies are required to draw justified conclusions.

Keywords: helicobacter pylori, stomach cancer, prevention, dietary intervention, nutrition

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144/2182

ASSOCIATION BETWEEN BREAKFAST CONSUMPTION AND CHRONOTYPE IN BRAZILIAN UNDERGRADUATE STUDENTS

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Background and objectives: Current studies have demonstrated that chronotype – which reflects diurnal preferences for the times of rest and activities, and usually classified into "morning","intermediate" or "evening" types –, may influence feeding behavior of individuals. However, the relationship between these variables and the consumption of breakfast – which is currently considered a marker of health – is little explored by studies. The aim of this study was to investigate, in undergraduate students, the association chronotype and overweight and food consumption, with special focus on breakfast.

Methods: The study included 721 undergraduate students (68% female) from a Brazilian public university. Chronotype was determined by Horne and Ostberg (witch score was expressed as a continuous variable and lower score indicate a preference for eveningness). Dietary intake was assessed by applying a 24-hour recall. The usual consumption of breakfast and mealtimes were identified in the 24-hour recall and, subsequently, confirmed by specific questions to the volunteers. Body weight, height and waist circumference were measured by trained researchers. For determination of whether chronotype was associated with food intake and overweight, linear and logistic regression was performed while controlling for confounding factors.

Results: After adjustments for confounding variables it was found a negative association between chronotype and: caloric (kcal/kg/day) (β=-0.23, p=0.007); carbohydrate (g/day) (β=-0.19, p=0.04) and lipids intake (g/day) (β=-0.18, p = 0.04) in the breakfast skippers. Evening (OR=1.8, CI=1.1–2.8, p=0.01) and overweight individuals (OR=2.3, CI=1.3–3.6, p=0.001) presented a significant odds ratio of being a skipper breakfast.

Conclusions: These results suggest that students who tend to eveningness consumed a highest amount of calories, carbohydrates and fats. In addition, skip the breakfast is associated with a higher risk of overweight and eveningness. Future studies are needed to confirm these findings, which could justify the inclusion of chronotype on the nutritional approach to individuals.

Keywords: Breakfast. Food intake. Chronotype. Sleep.

144/2186

OBESITY IN A GROUP OF HIV-INFECTED PEOPLE FROM BUENOS AIRES, ARGENTINA

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Background and objectives: Since the introduction of highly active antiretroviral therapy (HAART), a significantly reduction in AIDS-related deaths was observed. Despite, metabolic diseases are increasing and are one of the major problems that suffer HIV-infected patients. Obesity is affecting people with HIV infection who starts HAART and in some countries, its prevalence is similar to that in the general population. The aim of this study was to learn about the trend in obesity in a group of HIV-infected people under HAART treatment in Buenos Aires.

Methods: It was performed a descriptive, retrospective, cross-sectional study at 3 different years: 2005, 2010 and 2015. Inclusion criteria were asymptomatic adults under HAART, without any nutritional support. Data of age, sex, CD4 count, viral load, time since used of HAART, height and weight were collected from medical records. BMI was calculated and nutritional status was categorized as WHO classification. Obesity was defined as BMI ≥30 kg/m2. Descriptive statistical analysis was applied.

Results: 106 (69.8% men), 100 (70% men) and 110 (66.4% men) HIV-infected patients were included for the years 2005, 2010, 2015 respectively. CD4 cell count media (SD) were 461 (235), 622 (366.5) and 691 (292) cell/mm3 for the different years. Obese people increased along the years. Obesity prevalence was 5.8% (95% CI: 0.9%, 10.8%) for 2005, 11% (95% CI: 4.9%, 17.1%) for 2010 and 21.8% (95% CI: 14.1%, 29.5%) for 2015. The same tendency was observed by sex. For women, 8% (95% CI: 0%, 18.6%), 6.7% (95% CI: 0%, 15.9%) and 24.3% (95% CI: 10.5%, 38.1%) and for men, 4.9% (95% CI: 0%, 10.3%), 12.9% (95% CI: 5.0%, 20.7%) and

20.5% (95% CI: 11.3%, 29.8%) for years 2005, 2010 and 2015, respectively.

Conclusions: Obesity should be considered en HIV-infected people, preferably those under HAART therapy. In this group of Argentinean people with HIV, prevalence of obesity was the same as the prevalence for the general population (20.1%) for the year 2013.

Keywords: HIV infection, obesity, nutritional status, adults, HAART

144/2187

VITAMIN D MODULATE THE HUMAN NEUTROPHILS RESPONSE AGAINST CANDIDA ALBICANS

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Background and objectives: Beyond its classical role in calcium and bone metabolism, vitamin D (Vit-D) is known to exert a protean influence on the immune system. The main source of Vit-D is through the action of UVB rays on the skin and from the diet in a much lesser extent. The prevalence of Vit-D deficiency is higher, even in tropical countries like Colombia, where sun exposure is higher. Several studies have shown that Vit-D plays an immunomodulatory role and its deficiency has been associated with higher risk to developing infectious diseases. Candidemia is the 4th most common bloodstream infection with mortality rates of up to 40%, and one of the main causes is Candida albicans. Neutrophils are the first immune response against Candida infections; however, there are no reports about the direct activity of Vit-D3 on the neutrophil response. The objective for this study was to evaluate the Vit-D effect on the human neutrophil response against C.albicans.

Methods: The effect was evaluated on two group of healthy individuals: 1) Vit-D deficient, and 2) Vit-D normal. The serum levels of 25-OH-D3 were measured by HPLC-UV. Neutrophils of each individual were obtained from peripheral blood. Co-cultures with C.albicans were performed and treated with different concentrations of 25-OH-D3 (25, 100, 200 ng/mL). The efficiency to eliminate C. albicans in each treatment was determined through colony forming units (CFU) counts. Additionally, the immunomodulatory effect of neutrophils was assessed through the burst response of cytochrome C assay.

Results: Significant differences between groups were observed in both, CFU and cytochrome C assay. Individuals from normal

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group showed a higher elimination of CFU with respect to deficient group. Individuals with normal level of Vit-D had a low response in contrast to deficient individuals. The tested concentrations of 25-OH-D3 did not caused differential effect between groups.

Conclusions: Neutrophils from individuals with normal levels of Vit-D showed an immunomodulatory response against C.albicans. The immunomodulatory effect in cytochrome C was negative; however, the neutrophil from normal individuals could eliminate the fungus more efficiently. The fungicidal effect against C.albicans could be due to production of antimicrobial peptide LL-37 as previously reported.

Financial support: Grant Number FP44842-374-2014

Keywords: Vitamin D, Candida albicans, Neutrophil, Normal Vitamin D level and Deficient Vitamin D level.

144/2191

INCIDENCE OF ENTERAL NUTRITION THERAPY COMPLICATIONS IN CRITICALLY ILL PATIENTS

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Background and objectives: Human beings need nutrients in adequate quality and amount in order to satisfy their needs. Sometimes this offer can not be achieved by oral intake and should be done by enteral route. The aims of this study were to evaluate the frequency of tube feeding related complications in critically ill patients and evaluate the relation between complications frequency and enteral feeding nutrition regarding nutrients sources and type of container (open or closed system).

Methods: 364 cases from one single centre in one intensive care unit were reviewed. 166 cases meet the study criteria. Data were analyzed in two separated groups, depending on nutrition solution used. Nutrition solutions were similar in all characteristics except type of container and nutrients sources. The following complications had been analyzed: diarrhea, aspiration, regurgitation, vomits, constipation and abdominal distention.

Results: The incidence of complications was different between groups (22.8% and 38.5%, p< 0.05), being diarrhea the only complication that occurred with different incidence (13.8% and 45.8%, p< 0.05). Tube feeding had an incidence of complications of 27.7% and this may compromises the caloric intake of patients.

Conclusions: Container system does not seem to influence the incidence of complications; however the use of only one or two sources of macronutrients (100% of proteins from casein and 100% carbohydrates from maltodextrin) can be an important factor to predispose diarrhea.

Keywords: Enteral nutrition. Critical ill patients. Complications.

144/2197

PROLIFERATIVE EFFECT OF VITAMIN D ON CANDIDA ALBICANS

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Background and objectives: Candidiasis is one of the most frequent nosocomial infections affecting humans. It is caused by one of the fungus in the genus Candida with C. albicans being the most prevalent species. This yeast is considered as a commensal organism for the human being and one that, under certain altered conditions such as changes in the host immune system, behaves as an opportunistic pathogen. Such altered circumstances can be multifaceted with some being related to the nutritional status of the individual and in particular, with deficiencies in vitamin D, molecule that plays an important role. In this sense, it has been demonstrated that vitamin D contributes to the control of infections and is converted into an essential nutrient for the invading microorganism. Up to this moment, studies related to the role of vitamin D in Candida infections reveal no conclusive findings concerning the direct effect of this vitamin on the invading microorganism.

Objective: To determine vitamin D direct effects on C. albicans growth.

Methods: The effect of the 25-OH-D3 (25-Hidroxy-vitamin D3) on C. albicans growth was measured through: a) determination of the Colony Forming Units (CFU) after 2 hours incubation of the fungus in the presence of three different concentrations of 25-OH-D3 (25, 100 and 200ng/ml), and b) the plaque microdilution test with a yeast suspension placed in front of different vitamin D concentrations (25, 100, 200, 400, 600, 800, y 1000ng/ml) with a 22 hours kinetics run.

Results: The CFU values revealed that the treatment with 200ng/ml of vitamin D, induced a significant proliferative effect by doubling (2,16X) the number of CFU in comparison with the control with no vitamin. According to the growth kinetics obtained through the microplate technique, an important increase in growth was noticed starting at 14h post-incubation in the presence of concentrations of 25-OH-D3 ≥ 200ng/ml

Conclusions: Vitamin D induces a direct and dose-depending proliferative effect on C. albicans possibly due to the fungus capacity to develop metabolic pathways related to the P450 enzymatic complex that allows to process the 25-OH-D3.

144/2208

PERCEPTION OF BODY IMAGE AND DIETARY INTAKE OF MOTHERS OF PATIENTS WITH EATING DISORDERS

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Background and objectives: Eating disorders are psychosomatic diseases resulting from a conflicting relationship of the individual with the food and the primary symptoms are concern about body weight and shape. Generally mothers are very present since the childhood of the children and can be great allies in the treatment of their daughters with feeding disorder. The objective of the study is to investigate the eating behavior and to evaluate the perception and satisfaction of the body image of mothers of patients with eating disorders.

Methods: A quantitative research,performed in a public and specialized service in the interior of São Paulo, currently serving 18 patients. The methods used were a 24-hours Recall, test "How Is Your Feeding ?" EAT- 26 and Scale of Figures of Silhouettes. Data collection was done in individual and reserved rooms, and the mothers' identity was kept confidential. All the tests were answered by the mothers themselves and the collection lasted about 30 minutes for each participant.

Results: Thirteen mothers of the 18 patients participated during the study. EAT-26 showed a negative result, with an average of 17.23 points, the "How is Your Feeding" test showed an average of 38.85 points, showing that the mothers' diet is practically within what is considered healthy. Regarding body image, mothers were dissatisfied.

Conclusions: The study concludes that mothers present body image dissatisfaction, although they do not present eating behaviors similar to the habits of patients with eating disorders, however, this group should be considered, since it may be a group of risk. It is necessary to include mothers in support groups and further studies with them so that more information about the family's eating behavior can be obtained and other forms of treatment for the disorder can be sought.

Keywords: Eating disorders, food behavior, mother, mother-child relationships, eating habits.

Further collaborators: UNIFRAN (University of Franca) and GRATA (Assistance Group on Eating Disorders)

144/2214

LOW MANGANESE MAY INCREASE THE RISK OF DIABETES IN CHINESE ADULTS

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Background and objectives: Diabetes has rapidly increased in past two decades in China. Recent studies reported that manganese may help regulate glucose metabolism, while little is known about the relationship between manganese concentrations and the risk of diabetes.

Methods: We used a subsample (n=5,587 adults aged 18 – 65 years) who provided blood and toenail samples in 2009 from the China Health and Nutrition Survey, a study covering 9 provinces varying in environment and urbanization in China. We measured manganese on toenail samples with inductively coupled plasma mass spectroscopy (ICP-MS), hemoglobin A1c (HbA1c) on fresh whole blood samples with high performance liquid chromatography, insulin on serum samples with radioimmunology method, and glucose on serum samples with Hitachi 7600 Auto-analyzer. We estimated the association between manganese concentrations and diabetes by using logistic regression models in which we controlled for age, gender, body mass index, education, social-economic status, residential region (urban/rural), and urbanization index.

Results: The median manganese concentration was 3.86 mg/kg with a range of 0 – 60.58 mg/kg. The prevalence of diabetes defined as HbA1c ≥ 6.5% was 8.15%, 6.88%, 6.20%, and 4.36% from the 1st to 4th quartile of manganese concentration (p trend <0.001), respectively, and the average prevalence was 6.38%. Compared to the 1st quartile, the odds ratio of diabetes from 2nd to 4th quartile was 0.81 (95% CI: 0.59 – 1.11), 0.83 (95% CI: 0.60 – 1.17), and 0.58 (95% CI: 0.40 – 0.84), respectively. The average serum glucose was 95.87 mg/dL. Serum glucose decreased with increased manganese, but it was significantly lower in the 4th quartile only, compared to the 1st quartile (94.06 vs. 97.68 mg/dL, p trend =0.01).

Conclusions: Manganese is an important element for human health. Our findings suggest that low manganese may increase the risk of diabetes. Manganese may play an important role in preventing the development diabetes.

Keywords: Diabetes, manganese, toenail, hemoglobin A1c, China

144/2224

RISK FACTORS FOR THE DEVELOPMENT OF CVD BY USING OF FRAMINGHAM RISK SCORE IN ELDERLY

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Background and objectives: Various methods are used to measure the risk of CVD in elderly population, being the Framingham Risk Score (FRS) a sensible tool to measure the risk in 10 years. In the elderly, the CVD can affect the nutritional state either by necessity of food restriction, by alteration of energetic needs or by metabolism processes of digestion, absorption and excretion of nutrients. AIM: measure the risk factors for the development of CVD by using of FRS in elderly in the city of Santos-SP

Methods: Cross-sectional study kind, where were measured 54 elderly of both gender, that regularly attend an extension course of an university of the 3rd age, with age over 60 years old. It was used to collect data a questionnaire previously validated, based on Framingham Risk Score and the biochemical values inherent to the questionnaire of Framingham were collected by means of exams done in the last six months.

Results: From the sample of 54 individuals, 35 (64,8%) presented highly increased waist circumference, but 32 participants (64,8%) were diagnosed with BMI of eutrophy. In relation to the lipid profile, it was obtained 20 researched (37,0%) with the total cholesterol >200 mg/dL and 21 with HDL-c 21 (38,9%) <35 mg/Dl. When the group was divided from the classification of FRS, the prevalence of low/moderated risk appeared in 32 (59,25%) participants, while the high risk of developing coronarian events in 10 years was demonstrated in 22 (40,75%) pacients.

Conclusions: Despite the higher prevalence of individuals with low/moderated risk for developing CDV in 10 years, BMI indicative of eutrophy, low index of tabagism and low incidence of DM, the biggest part of the sample presented the CC highly increased, low level of HDL-c and totally elevated cholesterol. Despite the divergences found, the FRS is a very practical parameter to measure the possible deploy of CDV. Thereby it is worth pointing that the better way to quantify cardiovascular risk is to consider all the factors involved.

Keywords: elderly, FRS, CVD, Nutritional Risk.
Further collaborators: MARIANA

144/2236

DIETARY INFLAMMATORY INDEX AND DIABETES MELLITUS IN MEXICAN ADULT POPULATION: THE DIABETES MELLITUS SURVEY OF MEXICO CITY

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Background and objectives: Diet and inflammation have been reported as important risk factors for type 2 diabetes (DM2). In the present study, we aimed to assess the relationship between the dietary inflammatory index (DII) and the presence of DM2 in Mexican adults participating in the Diabetes Mellitus Survey of Mexico City (DMS-MC).

Methods: The study included 1305 subjects (37.6% men and 62.4% women) between 20-69 years. A validated semi-quantitative food frequency questionnaire was employed to evaluate dietary intake and to compute the DII. The DII is based on scientific evidence about the association between dietary compounds and some inflammatory biomarkers. Logistic regression models were used to estimated the odds ratios (ORs) and 95% confidence intervals (95% CIs) adjusted for sex, age, education, physical activity (low vs. moderate/intense); hours of television watching; hours sitting down; tobacco use (current, past, and never); socioeconomic status (low, medium, and high); education (elementary, secondary and high school, and Bachelor's degree or higher); family history of diabetes mellitus (yes vs. no); personal history of hypertension (yes vs. no), medication use (yes vs. no), body mass index (<25.0 vs. ≥ 25.0 kg/m2), and energy intake (kcal/day).

Results: Our data suggest that subjects in the highest quintile of the DII (i.e. with a more pro-inflammatory diet) had higher odds of DM2 (OR = 2.08; 95% CI: 1.27, 3.40; P for trend = 0.007) compared to subjects in the lowest quintile of the DII (i.e. with a more anti-inflammatory diet).

Conclusions: These results propose that a pro-inflammatory diet is associated with significantly higher odds of DM2 in Mexican adult population.

Keywords: Diabetes Mellitus, Dietary inflammatory index, Mexican adult population, Survey.

144/2237

LOW PROTEIN INTAKE OR KILOCALORIE? WHICH, ACTUALLY, CAN INTERFERE IN HAND-GRIP STRENGTH AND IN BODY COMPOSITION IN PATIENTS ON HEMODIALYSIS?

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Background and objectives: The ideal recommendation of proteins for patients on hemodialysis (HD) to promote neutral or positive nitrogen balance must be between 1,1 to 1,2 g/kg/day. This recommendation allied with an average intake of 35 kcal/kg/day, seems to avoid the PEM, which is a frequent condition associated with increase of morbidity and mortality. So, the purpose of this study is to measure the impact of protein and energy intakes on the hand-grip strength (HGS) and on the body composition of the patients with chronic renal diseases subjected to HD.

Methods: the body composition of the patients with chronic renal diseases subjected to HD. Cross-sectional study. 104 patients were measured, from both gender, over 18 years of age and on a regular program of HD. It was gauged after HD session: weight, stature, AC, DCT, HGS and the adductor muscle thickness. The BMI and the AMC were calculated. Protein and energy intakes were calculated from the food register of three days.

Results: were calculated from the food register of three days. The groups were divided by protein and energy intake adequated or not (0,78 vs 1,56 g/kg/day; p<0,01) and (32,4 vs 23,7 kcal/kg/day, p<0,001); respectively. The group that consumed less protein demonstrated lower HGS (21,6 vs 17,1 kg; p=0,02), BMI (24,3 vs 19,9 kg/m²; p<0,01), AC (28,5 vs 24,5 cm; p<0,01), AMC (23,5 vs 20,7 cm; p<0,01) and DCT (16 vs 11 mm; p<0,01). However, the group that consumed less kcal presented just lower BMI (20,4 vs 25,8 kg/m²; p<0,05) and APMT (10,1 vs 13,5 mm; p<0,02).

Conclusions: These results suggest that protein intake is determinative to changes in the body composition and overlaps to energy intake for patient with chronic renal disease in HD.

Keywords: Hd, Body Composition, Protein Intake
Further Collaborators: Mohamed

144/2251

SELF-PERCEPTION OF CORPULENCE IN AN ADULT POPULATION SAMPLE ACCORDING TO GENDER, AGE AND EDUCATIONAL LEVEL

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Background and objectives: BACKGROUND: Evidence shows that distortion of body weight perception is more prevalent in people with a lower educational level, particularly in men and racial minorities. As a result, people may be less likely to demand medical care and this could limit the effectiveness of public health campaigns.

OBJECTIVES: To analyze the ability to self-perceive corpulence in an adult population according to their referred BMI, gender, age and educational level.

Methods: MATERIAL AND METHODS: Cross-sectional, descriptive and analytical observational study. An anonymous questionnaire was provided to individuals belonging to private institutions not related to health. Data obtained included: gender, age, weight and height; perception of body weight (low, normal, overweight, obese); level of education (primary or elementary school, secondary or high school, tertiary-university or college/university). Data were analyzed using the STATA statistical software program.

Results: RESULTS: Respondents surveyed were 1617 individuals aged 18 to 70; female 66.6% and male 33.4%. According to weight and height: underweight 2.2%; normal 49.1%; overweight 30.2% and obese 18.6%.

According to age groups: from ages 18 to 29: 28.4%, 30 to 49 48.3% and 50 to 70 23.3%. According level ef education: primary 22.5%, secondary 40.4% and tertiary / university 37.1%.

There was no evidence of a significant relationship between age and corpulence perception discordance.

While 27.3% of women underestimate their weight, 47.7% of men do. (P <0.001).

9.7% of normal weight individuals, 47.8% of overweight and 80.7% of obese perceive themselves to as thinner than they actually are and in all paired-comparisons the differences were significant

(P <0.001). Obese respondents had the lowest levels of correct weight perception (2 out of 10).

The highest percentage of underestimation of body weight occurs among respondents with primary education (47.8%) and diminishes as the educational level increases: 36.5% for the secondary level and 23.0% for the tertiary / university level (P <0.001).

Conclusions: CONCLUSIONS: In the population surveyed, conditions of lower educational level, higher BMI and male gender, were related to underestimation of body weight.

Keywords: Key words: weight perception, BMI, level of education, gender, obesity.

Further collaborators:
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144/2289

EVALUATION OF AN INTUITIVE EATING WEIGHT MANAGEMENT PROGRAMME TO SUPPORT WEIGHT MANAGEMENT PATIENTS

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Background and objectives: Overweight and obesity rates are increasing exponentially worldwide, resulting in high rates of chronic diseases. Maintaining weight-loss can reduce associated risks, however, many dietary restriction weight-loss interventions have poor sustainability. The impact of psychological factors on managing weight and supporting related changes is critical. This study explored whether an intuitive eating weight management programme is an effective intervention for people classified as obese within the hospital system.

Methods: Participants (n=49) were enrolled in a 28-week evaluation study: 4-week usual diet run-in; 4-week intervention; 24-week follow-up. Of these participants, 14 failed to start, four withdrew during the study, and 18 failed to complete all components. Data were collected at baseline and end of periods for anthropometry (height, weight, circumferences), behavioural and cognitive approaches to food (Intuitive Eating Scale (IES-2), Dutch Eating Behaviour Questionnaire (DEBQ), Quality of Life Questionnaire (QoL), dietary intake (24h-Recall)).

Results: Changes in reasons for eating (mean±SD) occurred after attending group sessions, improving significantly from baseline to 6-month follow-up: 'eating for physical rather than emotional reasons' (2.87±.80 to 3.44±.72, P=0.002), 'reliance on hunger/satiety cues' (2.80±.95 to 3.38±.83, P=0.004), and total IES-2score (2.93±.54 to 3.31±.41, P=0.000). Positive changes was observed in the DEBQ emotional and external trigger eating style scores, decreasing from 2.67±1.04 and 3.06±.67 respectively from baseline to 1.98±.86 (P<0.002) and 2.56±.63 (P<0.001) at 6-month follow-up. Participants' reported mean (±SD) intuitive eating level (percentage of total eating times) increased from

baseline to end of intervention, and further increased at 6-month follow-up (35.9±22.0 to 60.0±23.5 (P<0.000) to 67.50±26.356, P<0.001, respectively). Participant's median [95%CI] confidence levels increased significantly after completing the group sessions, from 6.0 [5, 7.5] to 8.0 [7, 9] (P<0.001, r=0.8) and remained higher (7.5 [5,8]), at 6-month follow-up. Weight (mean±SD) did not change significantly from baseline (112.33±26.67 kg) to follow-up (112.04±28.52 kg). However, 32% of participants lost >3% of their initial body weight and 74% either lost or maintained weight.

Conclusions: Group-based intuitive eating weight management programmes can improve psychological factors associated with weight management, and support weight maintenance long term. It further initiates the process of making changes to improve food-related behaviour and lifestyle.

Keywords: Weight management, Intuitive eating, Obesity, Eating behavior, Cognitive approaches.

144/2295

ASSOCIATION BETWEEN PHYSICAL ACTIVITY LEVELS, SEDENTARY BEHAVIOR AND INCIDENCE OF RISK FACTORS IN PATIENTS WITH CARDIOMETABOLIC RISK

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Background and objectives: The interrelationship between physical activity (PA) levels and sedentary behavior could promote health or increase the incidence of risk factors to develop cardiometabolic diseases. The aim of this study was to assess the association between auto-reported physical activity levels, sedentary behavior and the incidence of cardiometabolic risk factors.

Methods: To analyze the aforementioned associations, an observational and correlational design was used. Participants (n = 117, mean ± SD for age = 61±1.43 years) were recruited from the non-invasive cardiology division at HNC of Cordoba city during the period between 2014-2016. Physical activity was recorded by

means of the Spanish version of the International Physical Activity Questionnaire (IPAQ) and analyzed using a spreadsheet that allow to estimate three weekly levels of PA (low, moderate and high), the energy expenditure of PA (EEPA) and the sedentary behavior. Incidence of cardiometabolic risk factors was assessed by exploring the patient's medical history. The selected risk factors were: body mass index (BMI), waist circumference (WC), systolic (SBP) and diastolic (DBP) blood pressure and serum lipid profile. Comparisons between men and women were made using independent samples T tests. All analyses were carried out using the Stata v.11.

Results: Average PA levels for the total sample was 240.00 ± 116.44 METs·min/week; representing an EEPA of 1388.31 ± 600.26 Kcal/week. Further analysis showed that 25.63% of women and 18.80% of men reported to be engaged in PA of moderate intensity while only 5% of women and 11% of men were engaged in vigorous PA. Sedentary behavior was reported to be 360 ± 37.82 min/day. Significant associations were observed between BMI and sex (p<0.05), were women tended to have less weight than men. A very high risk regarding WC was found in 82% of the total sample, being the risk higher in women than in man (p<0.05). Moreover, an inverse relationship was found between both SBP (r = 0.51, p<0.01) and DBP (r = 0.35, p = 0.04) and moderate intensity PA levels.

Conclusions: Physical activity was related to an increased risk for metabolic diseases, being this risk higher in women compared to men.

Keywords: Cardiometabolic Risk, Blood Pressure, International Physical Activity Questionnaire, Waist Circumference.

144/2297

CITIES CHANGING DIABETES MELLITUS: A REPRESENTATIVE SURVEY OF MEXICO CITY

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Background and objectives: Currently in Mexico, diabetes mellitus type 2 represents a serious public health problem and a challenge for the health system. Diabetes is the second cause of death in the adult population and the main cause of hospitalization related to complications.

A representative survey of adults between 20 to 69 years was performed in Mexico City to know the risk factors and other health indicators of non-communicable diseases to describe aspects in the attention process, quality of services and vulnerability of people who lives with diabetes, hence to obtain information about their socio-economic conditions.

Methods: We applied a questionnaire of seven sections that identified the socio-demographic characteristics of people that integrated the household, the health situation, the usage of health services, general aspects of the household, goods and expenses of the household, and other section that explores aspects about health and usage of medical services. Blood samples and serum were obtained from a sub-sample of participants to obtain the prevalence of diabetes Mellitus in Mexico City, and to compare the results with data shown in the ENSANUT 2012. Different risk biomarkers were used to define metabolic syndrome such as: cholesterol, triglycerides, HDL, LDL, and glycosylated hemoglobin.

Results: The prevalence of diabetes mellitus was 13.9% (9.9% for known diagnosis (KD) and 4.0% known by the survey (Sv). From the total of people with KD, 29% had an adequate control of their disease. In people with KD, the determination of HbA1c was more frequent in people who were not controlled in their disease (67%), than in those people that were controlled (52.7%) (p<0.05). From the total of people that received treatment, only 25.6% had an adequate control of their disease.

Conclusions: A high proportion of the sample presented high levels of glucose, and they are not aware of it. The absence of prevention measures for non-communicable diseases in the adult population are reflected in the results.

Keywords: Diabetes, Non-Communicable-Diseases, Survey, Mexico-City, Changing

144/2306

ASSOCIATION OF VITAMIN B12 AND HOMOCYSTEINE WITH COGNITIVE DECLINE IN ELDERLY PATIENTS WITH CARDIOVASCULAR DISEASES

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Background and objectives: Dementia and Cognitive Dysfunction are common in elderly and lower intake of B-vitamins may contribute to the development of neurological diseases, since they participate in the metabolism of homocysteine that, in altered levels, is associated with cognitive disorders. The objective of this study was associate serum homocysteine, dietary intake of B-vitamins and their markers with cognitive impairment in elderly patients with cardiovascular disease.

Methods: A cross sectional study with 194 elderly patients with a mean age of 70,7±7,0 years of both sexes, participants of a multicenter randomized clinical trial that studies the effects of a Brazilian Cardio protective Food Program on reduction of events and risk factors in prevention of CVD. Anthropometric evaluation and blood collection were performed. Dietary assessment (by food frequency questionnaire) was made using Food Processor program. The evaluation of cognitive function were performed

through the Mini Mental Health Examination (MMME). Data was expressed in frequency and medians (P25-75), analyzed in SPSS 21.0, considering a significance level of 5%.

Results: The majority of the population had a clinical suspicion of mild cognitive decline (CDL), 40,2%, male 65,4%. The median score obtained in MMME was 24 (22 - 25) for the group with mild cognitive decline and for the group with dementia was 17 (16 - 19) points and 27 (26 - 27) for those who did not Cognitive decline (CD) p <0.05. The serum homocysteine level of the dementia and DCL groups was adequate 10.87 ± 4.28 μmol / L and 10.69 ± 3.46 μmol / L, and was not significantly different from the group without DC 10.19 ± 3 , 11 μmol / L p> 0.05. The group with dementia consumed 3.8mg (2.77 - 7.74) of vitamin B12, 78.4% had consumption according to the recommendation by the EAR and 83.3% with DCL had adequate intake of this nutrient.

Conclusions: We conclude that the consumption of vitamin B12 and its blood marker and serum homocysteine are adequate in the groups that presented clinical suspicion of cognitive disorders such as dementia and mild cognitive decline, not being associated with this pathology in these elderly people.

Keywords: Cognitive decline , cardiovascular disease, dementia, vitamin B12, homocysteine

Further collaborators:

To the scientific initiation students, post-graduation and master's students, who contributed to the elaboration of this study.

144/2308

ASSOCIATIONS OF STRESS MANAGEMENT WITH METABOLIC SYNDROME IN JAPANESE -SAKU COHORT STUDY-

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Background and objectives: Background: The Japanese government launched the Stress Check Program as a new occupational health policy. Stress management is considered useful strategies to prevent the metabolic syndrome (MetS). The effective methods to reduce stress on preventing MetS remained unclear.

Objectives: To evaluate the role of stress management in preventing or exacerbating MetS, we examined the associations between their ways to release stress and the risk factors of MetS in the cohort subjects undergone health checkup.

Methods: 4450 Japanese men and women were enrolled at the Saku Central Hospital. They received an anthropometric and clinical examination and were assessed for present illness, lifestyle factors such as physical activity, smoking, drinking, dietary habits and present stress level and stress busters at the enrollment. Eating behavior was analyzed by the Sakatas Eating Behavior Question-

naire. Dietary assessment was made using a brief self administered diet history questionnaire. 2602 men and 1844 women aged more than 20 were analyzed.

Results: The mean age in men and women were 59.2 and 58.4 years old, respectively. The percentages of MetS were 20.6 in men and 6.1 in women. There was no significant difference in prevalence of MetS between with or without perceived stress in men and women. However, there were significantly more men with Mets in people who reduce stress by eating. The scores of all the categories in eating behavior were worse in subjects with perceived stress than those without perceived stress. Furthermore, the scores in eating behavior were bad in subjects with emotional eating regardless of perceived stress.

Conclusions: The influence of the way to stress management, especially for emotional eating, on MetS was suggested in men and women.

Keywords: Metabolic Syndrome. MetS. Stress Management. Eating Behavior.

144/2313

APPETITE AND SYMPTOMS OF WOMEN WITH GYNECOLOGICAL CANCER ATTENDED AT BARRETOS CANCER HOSPITAL: A PILOT STUDY

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Background and objectives: The decrease or lack of appetite, affected by both the treatment and the disease itself, are inherent characteristics of the patient with cancer, and can promote weight loss, early satiety, gastrointestinal symptoms and others. The objective was to evaluate the Appetite/Symptoms of women with gynecological cancer treated at the outpatient clinic of the Barretos Cancer Hospital (HCB), Brazil.

Methods: This is a pilot study with the participation of 37 women, cross-sectional, prospective, with sample collection for convenience. All women with an initial diagnosis in HCB were included in the study. Sociodemographic and clinical information were collected. The appetite and symptoms were assessed using the global score of Cancer Appetite and Symptom Questionnaire (CASQ) translated and adapted to the Portuguese language, composed of 10 items with answers arranged in a five-point Likert scale, where the score ≤1 represents low impairment of the Appetite/Symptoms, 1 to 3 moderate impairment and a score > 3 severe impairment.

Results: The average age of participants was 50.6±16.0 years, body mass index equal to 28.4±7.4 kg/m2, belonging to economy class C (62.2%) and married (51.4%). For this sample, 70.3% (n=26) presented moderate impairment, 27.0% (n=10) severe impairment and 2.7% (n=1) low impairment of the Appetite/Symptoms.

Conclusions: Most participants find themselves with moderate impairment of Appetite/Symptoms.

Keywords: cancer, appetite, symptoms

144/2318

CORRELATION BETWEEN ANTHROPOMETRIC AND BODY COMPOSITION INDICATORS OF PEOPLE LIVING WITH HIV/AIDS WITH HIV ASSOCIATED LIPODYSTROPHY CLINIC DIAGNOSES

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Background and objectives: Nowadays, one of the major problems among people living with HIV/Aids (PLHA) is body composition alteration accompanied to the accumulation and/or loss of body fat in specific locations, being this impairment known as lipodystrophy. The fat accumulation in body central area is associated to an increased risk of developing cardiovascular diseases, glucose intolerance, type 2 diabetes mellitus and, still, decreases in bone density. For the early evaluation of these individuals and a nutritional diagnosis establishment, the protocol must be easily accessed in the clinical practice. The present study had the objective to correlate the anthropometric and body composition indicators of PLHA with HIV associated lipodystrophy diagnosis by means of Pearson correlation test.

Methods: The study was observational and transversal, with its sample selected by convenience and performing clinical immunological characterization, anthropometric assessment, nutritional diagnosis, body composition of PLHA during the follow-up of specialized outpatient service in infectiology with a clinical HALS diagnosis from July 2015 to July 2016, in regular antiretroviral therapy use for at least a year, ranging from 18 to 60 years old. Pregnant women, people with chronic kidney failure, nephrotic syndrome, B and C virus chronic infection, uncontrolled hypothyroidism were excluded from the study.

Results: It was possible to identify strong correlation between Body Mass Index (BMI) with abdominal circumference (AC) and fat visceral area (FVA) (R = 0,86 and R = 0,83, respectively), and between AC and FVA (R = 0,78).

Conclusions: These results deserve to be highlighted because the utilization of simple measures as BMI and AC, despite their limitations, is important in facilities where is not possible to perform more specific evaluations on these individuals, once those measures present low cost and easy applicability in clinic routine, making the nutritional follow up of this population simpler. Considering the follow up of PLHA as complex as it is, the usage of parameters which may indicate increased cardiovascular risk or fat accumulation is determinant for the adoption of specific strategies, beyond the inclusion of low cost and easy access evaluations to correctly monitor the nutritional state of these patients.

Keywords: People living with HIV/aids, lipodystrophy, body composition

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144/2326

NUTRITIONAL STATUS OF HOSPITALIZED PATIENTS BY SUBJECTIVE EVALUATION IN PUBLIC HOSPITALS OF ASUNCIÓN AND METROPOLITAN AREA DURING 2017. PRELIMINARIE STUDY

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Background and objectives: Hospital malnutrition is highly prevalent in Latin America. Studies done in Paraguay in 2003 showed a prevalence of malnutrition of 50,9%. The aim of this study was to determine the nutrition status by subjective parameters in adult hospitalized patients in Public Hospitals of Asunción and the Metropolitan Area during 2017.

Methods: Cross sectional study enrolled hospitalized patients older than 18 y hospitalized in 8 highly complex Public Hospitals of Asunción and Metropolitan Area during 2017. We used the Subjective Global Assessment tool to assesses malnutrition.

Results: There were 145 patients enrolled whose mean age was 50,3 ± 16,7 years. The 51,7% (n=75) was men, 53% (n=77) had clinic pathologies and 13,9% (n=20) was infected.

The study showed that 51% (n=74) of patients had a BMI between 25 and 29.9 kg/m2. The mean of BMI was 25,6±5,4 kg/m2. We found that 35,2% (n=51) patients had lost more than 10% of their usual weight in the previous 6 months, 73,8% (n=107) had dietary intake change, 21,4% (n=31) had gastrointestinal symptoms and 80,7% (n=117) had functional capacity dysfunction.

Malnutrition was present in 50.3% (n=73) of the patients. Severe malnutrition was present in 19,3% (n=28) of them.

Conclusions: Hospital malnutrition is still highly prevalent. Data related to severe malnutrition increased in relation to previous data.

Keywords: hospital malnutrition, nutritional assessment

Further collaborators:

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144/2378

EFFICACY OF NUTRITION SUPPORT AMONGST TUBERCULOSIS PATIENTS AT SELECTED REFERRAL HOSPITALS IN MALAWI

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Background and objectives: Tuberculosis (TB) remains one of the world's deadliest communicable diseases. In 2013, an estimated 9.0 million people developed TB and 1.5 million died from the disease.

Objective: To investigate whether high energy and/or multivitamin supplementation will improve the results of TB treatment based on sputum conversion rate, nutritional status, and clinical outcomes.

Methods: Randomized factorial design was used and patients were recruited at Bwaila and Queens referral hospitals. Patients were provided with multivitamin and/or high calorie and compared to the control group.

Results: A total of 81 patients were recruited, with 3.7% drop-out rate. The mean age of was 35.8 ± 8 years and 80% were males. Mean BMI was 18.7 ± 2.3 and 41.6% classified malnourished. They were gradual increase in BMI to 20.9 kg/m2, presenting 11.8% with p= 0.041. The mean weight gain was 5.9kgs ± 4.3. Performance improvement was recorded with (t=-14.717, p <0.001) using Karnofsky index. Our findings show that the treatment success rate was 86%. The sputum conversion for supplemented was also significant for the supplemented over the controls at RR, 0.39 [95% CI, 0.17 to 0.86, p=0.03] at 2 months.

Conclusions: On the basis of the result we found beneficial factors existing of supplements on enhancing sputum conversion rates, treatment success rates, weight gain, improve quality of life, improve dietary adequacy, and reduce mortality.

Nutritional supplements in tuberculosis patients are a feasible and low-cost intervention and have public health importance.

Keywords: Nutritional Supplements, Tuberculosis, Smear positive, Sputum conversion,

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144/2391

PREVENTISSIMO – HEALTH ASSESSMENT AND COUNSELLING WITH E-HEALTH

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Background and objectives: The Preventissimo project aimed to develop an evidence-based, preventive and interventive tool for health assessment and counselling, using e-Health methods.

Methods: We have developed an internet-based application that focuses on the prevention of the most common non-infectious chronic diseases. The application uses questionnaires to get a picture of the client's disease risks. This is followed by a personalized counselling, based upon the individual's answers. Currently the project deals with the main non-communicable diseases: cardiovascular diseases; type 2 diabetes; the most common cancers: breast, prostate, colorectal and lung; chronic pulmonary disease (COPD); depression, dementia; glaucoma; cataracts; macular degeneration). The various questionnaires assess diseases running in the family, already existing abnormalities and various lifestyle factors including nutrition, physical activity, mental health and smoking. The counselling algorithm takes into account not only the risk factors, but also personal preferences and existing disorders, allergies. Last year we extended the original algorithm by including a set of cognitive games to get an indication of the person's performances on the relevant cognitive skills. The use of the cognitive games significantly improves the diagnostic and therapeutic power of the doctor for some patients having risk of dementia or depression.

Results: Preventissimo has been developed through the co-operation of medical doctors, dieticians, physiotherapists, psychologists and IT specialists.

The questionnaires contain 286 questions, 308 risk and protective factor descriptions. 14 cognitive games are also included plus a performance reporting framework.

There is an evidence based knowledge base on the site with more than 300 videos and articles with topics in lifestyle, diseases, diet, stress-management, physical activity. There are illustrated questionnaires for the visitors to check the level of understanding of the various illnesses

The system already collected data from, provided advice to more than 60 thousand people of different regions of the country.

Conclusions: When using Preventissimo (filling out the questionnaires, playing games) the user can download the results and health plan and can e-mail them to their doctor or any other healthcare provider for further input if needed. This helps assessing risk in a community, and can help planning preventative strategy.

Keywords: e-health, questionnaires, lifestyle, cognitive games

ASSESSMENT OF WEIGHT LOSS AFTER BARIATRIC SURGERY OF A SAMPLE OF ADOLESCENTS

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Background and objectives: To evaluate weight loss during one year of adolescent patients submitted to gastric bypass by the percentage of the excess of body mass index (BMI) lost and to catalog the results according to recommendations.

Methods: Sample: 18 adolescents were operated through gastric bypass from a single laparoscopic anastomosis in the center of excellence for the study and treatment of obesity (CTO) in the period 2008-2010, 9 women (50%) and 9 men (50%) of average age = 16.6 years with a mean BMI of 42.9 ± 6.8 (range 34.6-56.8).

50% were morbidly obese patients: BMI >40. 27.7 % supermorbid: IMC > 50 and 22.2% obese patients: BMI>35<40.

The weight loss efficacy was determined by percentage of the excess of lost BMI (PEIMCP) (Cigaine criteria).

Results: The results after 3 years correspond to 66.6% of the patients since the rest of them have not yet concluded the study.

100% had no surgical complications nor at the time of follow-up postoperative.

The weight loss results expressed as PEIMCP are:
PEIMCP to 3 months = 95,78% ±8,27;
     6   months = 96,04± 4,39
    12   months = 99,92±2,81
    24   months = 99,77 ±1,85
    36   months = 99,79 ± 2,13
Mean PEIMCP was 99,61% ±15,32 at the end of the review period (3 years).

100% of those who have completed the follow-up show excellent results with a PEIMCP>65%.

Conclusions: Bariatric surgery using laparoscopic One-Anastomosis Gastric Bypass Technique is effective for the treatment of morbid obesity in terms of immediate weight loss and maintained in the time.

Keywords: Bariatric Surgery, Obesity, Weight Loss, Adolescent.

Further collaborators:
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IMPACT OF PRE-SURGICAL DIETETIC PREPARATION ON THE WEIGHT LOSS

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Background and objectives: Dietary–nutritional preparation to achieve a weight loss prior to bariatric surgery implies benefits in the surgical act and in the postoperative period, since it allows patients adaptation to a healthy and balanced diet, which must be its habitual pattern for life.

To study the weight loss of patients with morbid and extreme obesity prior to surgery.

Methods: Observational, descriptive, longitudinal study with 192 patients, average body mass index (BMI)=42.24 in the first consultation, of which 22 patients present BMI > 50.

The mean time of preoperative preparation in the group with BMI<50 is 85 days and in the group with BMI >50 is 136 days. To the BMI<50 group, a mixed hyperproteic hypocaloric diet was prescribed for 66 days and the remaining 20 days was prescribed center protocol. Group with BMI > 50, pattern in 3 phases, 1st: 60 days hypocaloric-hyperproteic mixed diet; 2nd: 56 days hypocaloric-hyperproteic exclusived diet with substitutes; 3rd: the same pattern as the previous group. Statistical analysis: mean determination, standard deviation, confidence interval and Pearson coefficient.

Results: Regarding to the mean weight loss in the group with BMI < 50, the decrease of the weight loss mean was 14.97 kg, it assumes that the BMI decreases 5.38 and the mean of the group with BMI>50 is 28.15 kg, which it supposes a decrease in BMI = 10.23 in the pre-surgical period.

The mean daily weight loss in the pre-surgery phases in the group with BMI<50 was 175 g/day and in the group with BMI>50 the weight decrease = 200 g/day.

Conclusions: It is effective to perform dietetic-nutritional interventions differentiated according to the BMI both with respect to the time and the pattern, to minimize the surgical risks.

Patients with extreme obesity require more days of dietetic-nutritional preparation before of the surgery to achieve equivalent results to patients with morbid obesity.

Keywords: Bariatric Surgery, Obesity Morbid, Weight Loss, Diet Therapy

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144/2404

WHAT IS THE PERCEPTION OF BODY IMAGE IN A GROUP OF ADULT WOMEN?

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Background and objectives: Body image has been defined as a multidimensional structure that differ in two underlying dimensions, the first refers to the perceptual aspects of body size estimation and the second includes the emotions or feelings that the individual has associated with his physical appearance and cognitive assessments that makes of its own body (Cash 1994). Having a negative body image can affect health. When this happens there is a greater predisposition to more disturbances such as anxiety, depression, low self-esteem, anorexia, bulimia, and many others that can have serious consequences. (Salaberria et al 2007)

Women have a greater vulnerability in light of these disorders due to the strong social pressure on their own appearance and socialization processes that emphasize aspects of appearance.

Set the perception of body image in a representative healthy adult women of Valladolid (Spain) collective.

Methods: Cross sectional study; sample of 500 women aged 40 to 60 years, mean age 51.16, and urban area of the city of Valladolid, intermediate between the Spanish cities, which guarantees that the probability of error will not exceed 5%.

We used a self-designed questionnaire formed by questions that assess anthropometric and attitudinal variables. This questionnaire takes as a reference: Body Image Questionnaire Questionnaire by Cooper and Attitude towards food by Gardner.

Results: From estimates of height and weight data we obtain a mean BMI of 24.43, within normal parameters. 87.5% of women are concerned about their body weight, between of them the 78% of the cases are concerned due to a combination of aesthetic and health reasons. The 57.14%, have tried to hide their silhouette with clothes and if we calculate the IAC (Alvarez Rayon) it gives a score of 108.11 listed as moderate over estimation of weight. In the perception of body image, estimated by using models, we find that the 37.49% believe that the model that represent them has overweight or obesity.

Conclusions: The women in our study have a normal mean BMI. They are concerned about their weight, which overestimate moderately. They try to hide their silhouette and consider that their image corresponds to overweight in a high percentage of cases.

Keywords: Body image, Women, Health Care Surveys.

Further collaborators:

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144/2409

EVALUATION OF DIETARY HABITS INFLUENCE ON THE ACNE VULGARIS MANIFESTATION

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Background and objectives: Acne vulgaris is a chronic dermatologic disease that manifests in adolescence. It is characterized by the presence of comedones, papules, pustules and scars on the skin. The disease is caused by hyper-secretion of sebaceous glands. The manifestation of acne is influenced by many factors. The aim of the study was to assess the relationship between diet and the manifestation of acne vulgaris.

Methods: The instrument used for the purposes of the research was a questionnaire prepared by the authors. The study subjects were individuals affected by acne currently or in the past as well as people not affected by acne. The participants of the study were selected by snowball sampling. Respondents were asked about the age of onset of the first symptoms of acne, the occurrence of acne among their relatives, the location of acne on the skin and its severity, methods of treatment and other ways of coping with acne as well as about the frequency of consumption of specific products/dishes and the change in the severity of acne

due to their consumption. In order to compare the results, cross tabulation, Chi-square test of independence, and Mann-Whitney U test (independent samples) were used. The significance level was α=0.05.

Results: 118 people participated in the survey, including 32 (27.12%) men and 86 (72.88%) women. More than half of the men (56.25%) and women (52.33%) in question had acne vulgaris. The average age of onset of the first symptoms of acne was 14 years. Most frequently acne occurred on the face (92.06%). The majority of the participants assessed the severity of acne as medium (51.61%). More women (57.78%) than men (29.41%) responded that a dermatologist treated them. Participants manifesting acne believed that salty food increases the severity of acne (45.76%, p<0.05). Consumption frequencies of certain products/dishes differed significantly between the surveyed groups (p<0.05).

Conclusions: Most of the products/dishes do not influence the severity of acne in respondents. The difference in responses concerning the change in the severity of acne following the intake of candies and cakes was significant between men and women (p<0.05).

Keywords: Acne vulgaris, Diet, Nutrition, Severity of acne.

144/2415

PREVALENCE OF CORONARY HEART DISEASE RISK FACTORS IN PATIENTS WITH HIGH LDL CHOLESTEROL LEVELS, WITH OR WITHOUT FAMILIAL HYPERCHOLESTEROLEMIA DIAGNOSES: A CROSS-SECTIONAL STUDY IN RIO DE JANEIRO

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Background and objectives: Familial hypercholesterolemia (FH) is an autosomal dominant disorder, which can be caused by a mutation in low-density lipoprotein receptor (LDLR). This study evaluated the prevalence of coronary heart disease (CHD) risk factors in patients with high low-density lipoprotein cholesterol (LDL-c) levels, with or without confirmed mutation in LDLR (referred to as familial hypercholesterolemia [FH]).

Methods: A cross-sectional study of 63 patients with high index of FH suspicion (patients with elevated LDL-C levels > 190 mg/dL, significant personal or family history of premature cardiovascular disease). A genetic test was done and HF diagnosis was confirmed by mutation in LDLR. A standardized questionnaire was applied by the researchers to assess patient's personal and clinical information. Medical charts were reviewed to collect additional data on CHD risk factors such as diabetes or hypertension and to obtain LDL-c baseline values. The anthropometric measures were done and checked weight (Kg), height (m), waist circumference (cm), BMI (Kg/m2) and waist/height ratio. Statistical analyses were performed using Software IBM® SPSS® Statistics version 21 and P values were associated with a significance level of .05 for all tests.

Results: Of the 63 patients with high LDL-c, 24 (38,1%) had confirmed HF diagnosis while 39 (61,9%) had unexplained hypercholesterolemia. Patients who carries LDLR mutation were mostly women (75%) and significantly younger than the ones without mutation (mean + SD, 49 + 16 vs 58 + 11 years; P = .008). No differences existed in prevalence of traditional CHD risk factors such as diabetes type II (25% vs 23%, P = .682), hypertension (58% vs 77%, P = .118), exposure to tobacco (43% vs 50%, P =.615), sedentarism (75% vs 95%, P= .06) and raised waist circumference (95 +13 vs 97 +11, P = .599), waist/height ratio (68% vs 87%, P = .051) and BMI (58% vs 69%, P =.378).

Conclusions: Our findings suggest that HF patients were younger, however none of the other evaluated risk factors showed significantly different between both groups. Besides, the food consumption of these patients must be assessed, since this is a modifiable risk factor.

Keywords: Familial hypercholesterolemia (FH), Low-density lipoprotein receptor (LDLR), Coronary heart disease (CHD)

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144/2440

LIPID ACCUMULATION PRODUCT: A SIMPLE AND ACCURATE INDEX FOR PREDICTING CHANGES IN SERUM LEVELS OF C REACTIVE PROTEIN

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Background and objectives: High sensitivity C reactive protein is increasingly associated with cardiovascular risk. There are several studies regarding the use of the lipid accumulation product as a risk marker for the development of cardiovascular disease. The aim of this study was to evaluate the predictive ability of the lipid accumulation product in detecting changes in serum levels of high sensitivity C reactive protein.

Methods: A cross-sectional study was conducted with 130 apparently healthy Brazilian adults men (20-59 years). Waist circumference was determined. Triglycerides were determined by enzymatic colorimetric method. The lipid accumulation product was calculated as (waist circumference [cm] − 65) × (triglycerides concentration [mM]). C reactive protein was measured by the high sensitivity nephelometry method. It was considered as cutoff point for high sensitivity C reactive protein ≥ 0.12 mg/dL. The statistical analysis consisted in construction of ROC curves (Receiver Operating Characteristic Curve). Statistical analysis was carried out using Medcalc version 12.7.

Results: The frequency of high sensitivity C reactive protein levels ≥ 0.12 mg/dL was 30.8%. The lipid accumulation product showed prediction accuracy to detect changes in high sensitivity C reactive protein with an area under the ROC curve (AUC) of 0.642 ± 0.054 ($p < 0.01$). The cutoff point value of 36.6 cm.mmol/L for the lipid accumulation product provided a sensitivity of 47.5% (95% CI: 31.5-63.9%) and specificity of 82.2% (95% CI: 72.7-89.5).

Conclusions: The lipid accumulation product has a reliable predictive ability to detect changes in serum levels of high sensitivity C reactive protein in apparently healthy Brazilian adults men. In other words, the lipid accumulation product was a good marker to detect individuals with higher cardiovascular risk.

Keywords: Adiposity. Cardiovascular diseases. Lipid accumulation product. Prediction.

144/2442

RISK OF MALNUTRITION AT ADMISSION OF CANCER PATIENTS. STUDY OF CASES TREATED IN ONE YEAR

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Background and objectives: Because of the characteristics of the disease and the treatments to which they are subjected, patients diagnosed with cancer (CA) have a high risk of malnutrition. The risk could vary according to the type of tumor, location and tumor stage. Therefore, we studied all patients admitted to the National Cancer Institute (INCAN) during 2016 and determined the risk of malnutrition at the time of admission based on the location of the cancer.

Methods: We conducted a cross-sectional study with data obtained from January to December 2016 at INCAN. We attended 912 patients with different types of CA. We analyzed demographic and clinical data and the nutritional status was determined by the screening method proposed by Gómez et al (2010). Patients with location of CA abdominal/peritoneal, head/neck, gastric, colon/rectum/anus, digestive organs annex, and lung were considered in risk of malnutrition. Chi Square and Odds Ratios test was used to determine the risk of malnutrition based on the CA location.

Results: The final sample was 877 patients with CA. The average age was 55±14years (95%CI 54-56years), 65.5% were woman. The location most frequent of CA were gynecological (26.9%), head/neck (15.5%) y colon/rectum/anus (15.2%). In woman prevailed CA Gynecological type, breast and head/neck 38.7%, 21.4% y 12.5%, respectively and in man colon/rectum/anus (24.8%), head/neck (21.1%) y male reproductive system (13.2%). According to the nutritional evaluation, 38.9% presented malnutrition and 42.2% of patients have risk of malnutrition according by location of CA. Patients with Gastric, Abdominal/Peritoneal and Pulmonary CA present a higher frequency of malnutrition, while urinal, breast and skin CA patients present malnutrition in less frequent. 52.2% (n = 178) of the malnourished were patients with risk by CA localization, while 64.2% of the non-malnourished did not present risk by CA localization. The patients with head/neck, digestive (liver, pancreas, gastric, colon, rectum, anus), Abdominal/Peritoneal and Pulmonary CA have 1.957 more likely to present malnutrition ($p < 0.05$).

Conclusions: In the patients treated at the INCAN the location of the cancer would predict the risk of malnutrition. However, it is important to continue the investigations considering that malnutrition in these patients is multifactorial

Keywords: Malnutrition, Cancer, Location, Risk.

Further collaborators: Anyelius Arami Limprich Soilán

144/2452

NUTRIGENETICS AND EPIGENETICS AS COADJUVANTS IN THE THYROID CANCER DIET

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Background and objectives: Thyroid cancer is a disease that affects an important endocrine gland. To achieve better treatment and cure efficacy, it is important to consider the polymorphic aspects of patient genetics, such as single nucleotide polymorphisms (SNPs) that may cooperate with therapeutic success in CYP3A4 cytochrome metabolism. Another characteristic of observed SNPs is mainly due to the enzymes Methionine Synthase and Methylenetetrahydrofolate Reductase involved in the maintenance of methyl group supply by S-Adenosylmethionine, in addition to corroborating cofactors for the epigenetic mechanisms. Objectives: To elaborate a therapeutic diet plan that does not compromise the treatment in thyroid cancer in its main cytochromic metabolizers and that can modulate the epigenetic mechanisms pertinent to the genetic characteristics of the tumor.

Methods: The dietary plan was developed using the databases of the International Human Epigenome Consortium (IHEC),

PharmGKB (Pharmacogenomics Knowledgebase), CIPIC (Clinical Pharmacogenetics Implementation Consortium) and USDA (United States Department of Agriculture).

Results: Bioactive compounds such as bergamottin and furanocoumarin inhibit cytochrome CYP3A4, which is the main drug metabolizer Vandetanib, Cabozantinib and Sorafenib. Inhibition of this cytochrome may alter drug plasma concentrations. Grapefruit juice, tomato fruit, St. John's wort and others with the same inhibitory potentials should be avoided. The correct functioning of the epigenetic mechanisms comes from a diet containing folic acid, vitamins B2, B6, B12 and betaine that aid in the altered kinetics in the presence of SNPs. The use of bioactive compounds active in the inhibition of DNA methyltransferases, such as genistein present in soybean or epigallocatechin gallate of green tea, may provide a decrease in growth and induction of apoptosis of cancer cells. Curcumin acts on gene regulation causing hypomethylation of DNA.

Conclusions: Knowledge of the SNPs of people with thyroid cancer, as well as histology, degree of differentiation and tumor genetics, may cooperate with therapeutic success. Allied to this conduct, a diet can provide elements that do not harm the treatment and act in the modulation of important mechanisms in the pathogenesis of the tumor.

Keywords: Thyroid Cancer, Nutrigenetics, Epigenetics.

144/2461

SPLENIC INTERSTITIAL FLUID PROTEOMIC PROFILE DURING PROTEIN MALNUTRITION AND LEISHMANIA INFANTUM INFECTION

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Background and objectives: Protein malnutrition (PM), the most deleterious cause of malnutrition in developing countries, has been considered a primary risk factor for the development of clinical visceral leishmaniasis (VL). Protein malnutrition and infection with Leishmania infantum leads to lymphoid tissue disorganization, changes in cellularity and lymphocyte subpopulations in the spleen. A proteomic analysis of the interstitial fluid (IF) of the spleen in protein restricted BALB/c mice infected with L. infantum was undertaken in this study to define the mechanisms that drive splenic response during PM and infection.

Methods: We compared four groups of mixed IF samples: animals fed 14% protein (CP: iTRAQ 114), animals fed 4% protein (LP: iTRAQ 115), animals fed 14% protein and infected (CPi: iTRAQ 116), and animals fed 4% protein and infected (LPi: iTRAQ 117). Samples were analyzed in a LTQ-Orbitrap-XL.

Results: A total of 344 proteins were identified and the fold changes in protein quantification were calculated from the intensities of iTRAQ reporter ions between the CP and CPi, LP, LPi using the PatternLab plataform. A total of 74 proteins presenting a change in abundance were screened in the splenic IF of LPi mice, of which 27 proteins were upregulated and 47 proteins were downregulated. In total, 291 (85%) proteins were identified as secreted proteins. From the remaining proteins 53 were not predicted as secreted, 45 were previously reported as exosomal proteins, and 8 were neither predicted as secreted nor exosomal proteins.

Conclusions: We identify alterations in different points of the metabolism and splenic immune response, such as proteins of the pentoses phosphate pathway and purine biosynthesis, as well as response to oxidative stress, which may affect the proliferation of splenocytes and generate an imbalance of the oxidative state of splenocytes from LPi mice. We detected reduced levels of various proteins involved in the pro-inflammatory response and chemotaxis in the splenic interstitial fluid of LPi mice, such as: MIF, PPBP, ISG15 and ALDH1A1. Our results reinforces the idea that the increased parasitic load in the spleen of malnourished animals is associated with an altered pro-inflammatory response during protein malnutrition involving different molecules and biological processes during the immune response.

Keywords: Protein malnutrition, Leishmania infantum, Visceral leishmaniasis, Apoptosis, T cell migration.

Further collaborators:

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EFFECT OF DIET ON GASTROINTESTINAL SYMPTOMS IN PATIENTS WITH IRRITABLE BOWEL SYNDROME (IBS) STRATIFIED BY ANTIGLIADIN (AGA) ANTIBODIES

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Background and objectives: Diet plays an important role in IBS and there is evidence that foods with high Fermentable-Oligosaccharides-Disaccharides-Monosaccharides-and-Polyols (FODMAPs) content and gluten may worsen symptoms. IBS patients with positive antigliadin-antibodies (AGA) may preferentially respond to a gluten-free diet (GFD). Differences in dietary patterns were observed in IBS vs healthy volunteers (HV), however, the effect of food consumption on the symptomatic response to gluten withdrawal in IBS patients stratified by the presence of AGA has not been previously studied. We conducted a clinical trial to evaluate the dietary patterns and nutrient intake in IBS patients stratified by their AGA status, before and after one-month of GFD.

Methods: IBS patients (Rome III criteria) were stratified by the presence of AGA (INOVA Inc). A group of HV served as controls. All participants underwent a GFD for one month. Gastrointestinal symptoms were assessed by the IBS-Birmingham score. A food-frequency questionnaire (FDQ-VES2, Australia) was used to assess: 1)dietary patterns, 2)nutrient intake, and 3)FODMAP consumption before and after GFD.

Results: 44 IBS-patients (24 AGA+; 20 AGA-) and 23 HV were recruited. GFD improved symptoms (indigestion, diarrhea and abdominal pain) in IBS AGA+ patients while only pain improved in IBS AGA– patients. At baseline, IBS AGA+ had significantly lower consumption of protein (p<0.05 vs IBS AGA- and HV). Both IBS AGA+ and AGA- had significantly lower fiber intake compared to HV.IBS AGA+ increased the intake of foods with high content

of vitamin-A and C (carrots, lettuce, spinach and capsicum) and decreased the intake of some cereals (porridge). There was no change in amount of food high-in FODMAPs, except for multi-grain bread which was decreased in the three groups.

Conclusions: The type and quality of food differ between subsets of IBS patients, suggesting that patients may have their dietary preferences based on symptoms. GFD improves IBS symptoms in AGA+ patients, and this seems to be independent of overall FODMAPs consumption. The increase in food with high content of vitamin-A & C may play a role in the beneficial effect of the GFD in IBS AGA+ patients, due to their anti-inflammatory properties or by inducing changes in GI motility.

Keywords: Gluten. Diet. Nutrients. Gastrointestinal symptoms. IBS

Further collaborators:

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ESTABLISHMENT OF HEMOGULOBIN MEASURING METHOD FOR THE PREVENTION OF SPORTS ANEMIA IN FEMALE ATHLETES

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Background and objectives: For a female athlete, iron deficiency and anemia is one of the symptoms which remarkably lowers performance, and could cause health impairment. Athletes frequently undergo anemia due to rigorous training, reducing food intake for weight control and destruction of erythrocyte by repeated sole impulse. In addition, menses make it difficult for females to improve anemia. In this study, we focused on the collegiate female athletes of land jump, volleyball and fencing who often complain anemia, and tried to establish the simple method of measuring the hemoglobin concentration in blood using non-invasive fingertip sensor, in order to monitor the status of iron nutrition easily.

Methods: Subjects were composed of each 27 collegiate female athlete of land jump, volleyball and fencing. The hemoglobin concentration was measured at before training using measuring instrument of non-invasive fingertip sensor (Pront-7). Furthermore hearing investigation was performed to record the physical condition and food intake frequency of one week.

Results: In hearing investigation, the athletes who complained symptom of anemia were70%, 40% and 35% in land jump, volleyball and fencing, respectively. The score of anemia condition negatively correlated with hemoglobin concentration. Hemoglobin concentrations were 12.4±0.2 g/dL, 12.1±0.4 g/dL and 12.9±0.2 g/dL athletes of land jump, volleyball and fencing, respectively. As a result of surveying the meal intake frequency in the athletes of jumping events of athletic competition, there was a positive corre-

lation between the amount of iron, protein or zinc intake per day and hemoglobin level. (iron: r = 0.575, protein: r = 0.630 and zinc: r = 0.661, respectively)

Conclusions: The measurement of hemoglobin using fingertip sensor might be useful option for monitoring the status of iron nutrition to prevent sports anemia.

Keywords: Sports anemia, Fingertip sensor, Hemoglobin, Protein, Iron.

144/2499

ROLE OF FATTY ACID BINDING PROTEIN 4 AS AN ADIPOKINE TO REGULATION BONE RESORPTION DURING POSTMENOPAUSE OSTEOPOROSIS MICE FED BY HIGH FAT DIET

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Background and objectives: Adipokines is involved in both onset and progression of postmenopause osteoporosis(PMOP). However, the link between adipokines and PMOP has not been explored. Present study was designed to investigate the role of fatty acid binding protein 4 (FABP 4 /ap 2) as an adipokines with the effects on bone metabolism in the pathogenesis of PMOP mice.

Methods: 12 weeks old FABP -/- and FABP +/+ mice were fed with standart chow diets (SCD) or high fat diet for (HFD) 8 weeks after ovariectomy or sham surgery , then re-function of FABP by implanted a osmos pump fill with FABP protein (1g/kg.BW.day) into FABP -/- mice or fill with FABP 4 inhibitor BMS309403 (200 ng /day) to FABP +/+ mice fed by HFD for 28 days after ovariectomy. followed by micro CT and histological to evaluations the BMD and bone resorption in all mice of the ten groups ,Real-time PCR analysis the expression of TLR4, JNK, c-JUN-AP1 ,FABP 4 ,RANKL, OCs (TRAP**,** MIP-1α) and TNF-α,IL-6 in femur bone tissues and blood were detected.

Results: The BMD and mRNA exoression of TLR4, JNK, c-JUN-AP1 ,FABP 4 ,RANKL, OCs (TRAP**,** MIP-1α) and TNF-α,IL-6 in femur bone tissues and LPS , FABP 4 ,TNF-α,IL-6 in blood were decreased significantly(P<0.01 or P<0.001) in FABP -/- mice compared with FABP +/+ mice afterovariectomy fed by HFD, Although the biomarkers of four groups of FABP -/- and FABP +/+ mice after ovariectomy were different significantly to other mice after sham surgery, but there were no different significantly between FABP -/- and FABP +/+ mice after ovariectomy fed by SCD compared with these biomarkers (P>0.05). When re-function and inhibitor of FABP 4, all biomarkers mentioned above reversed siginificantly in this two groups. Which indicated that there is a positive feedback loop between FABP4 and LPS-JNK- c-Jun-AP1 in the TLR4 pathway, which is involved in the process of bone metabolis in POMP.

Conclusions: The pathogenesis of FABP 4 acceleration bone resorption in PMOP mice fed by HFD was regulation both LPS-TLR4-FABP4 pathway and stimulate the osteoclast cell activity induced by inflamation adipocytokines.

Keywords: Postmenopause osteoporosis, Fatty acid binding protein, LPS-TLR4-FABP4 pathway, Inflamation adipocytokines.

144/2507

INTRAVENOUS ARGININE ADMINISTRATION PROMOTES ENDOTHELIAL PROGENITOR CELLS MOBILIZATION AND ATTENUATES LUNG INJURY IN MICE WITH POLYMICROBIAL SEPSIS

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Background and objectives: This study investigated the influences of intravenous arginine (Arg) administration on alteration of circulating endothelial progenitor cells (EPCs) and lung injury in polymicrobial sepsis.

Methods: There were 1 normal control group (NC) and 2 sepsis groups. Sepsis was induced by cecal ligation and puncture (CLP). One sepsis group wasinjected with saline (SS), whereas the other group (SA) was administered 300 mg Arg/kg of body weight once via the tail vein 1 h after CLP. Septic mice were sacrificed either 24 or 48 h after CLP.

Results: Results showed that compared to the NC group, septic mice had higher EPC releasing factors and circulating EPC percentage. Also, inflammatory cytokine concentrations and Ang/Tie2 gene expression were upregulated in lung tissues. Arg administration promoted EPCs mobilization, downregulated inflammatory cytokine production and Ang-2 gene expression in the lungs. Histopathological findings showed that the severity of lung alveoli inflammatory lesions was attenuated after CLP when Arg was administered.

Conclusions: Our results suggest that intravenous administration of Arg after the onset of sepsis enhances the mobilization of circulating EPCs and reverses the imbalance of the Ang-Tie2 axis that may improve the vascular function, reduce inflammatory reaction and offer organ protection in polymicrobial sepsis.

Keywords: Arginine, Sepsis, Endothelial progenitor cell, Ang/Tie2, Lung injury.

144/2510

BECOMING MALNOURISHED CHILDREN, ONE YEAR AFTER NUTRITION EDUCATION IN KAYA (BURKINA FASO)

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Background and objectives: The objective of this study is to determine the fate of malnourished children one year after nutrition education ain the nutrition éducation center in Kaya.

Methods: This is a cohort study of children who stayed at the Nutrition Education Center in Kaya in the year 2014.

Results: A total of 135 children were included in our study. The results showed a year after the nutrition éducation center release a relapse in 32% of the cases of which 7.69% in severe form. We recorded five deaths and 30 children were not found. Of 105 children recovered one year after discharge from nutrition éducation center, we noted a relapse in malnutrition in 32% of cases, 7.69% in severe cases. Also, 46.39% of the children received food before the age of 6 months and 86.73% of the mothers know that the food introduced is the porridge prepared from fortified flour and water. In addition, 17.35% of mothers evacuate the child's stool in an unhygienic manner and only 77.55% wash their hands with soap after handling the child's stool. Knowledge assessment revealed that 78.8% of mothers know that complementary food should be introduced at 6 months of age, 53.61% know that porridge and Hygiene and thus have the right knowledge in the care, nutrition and hygiene of the child.

Conclusions: The nutritional situation one year after children received at nutrition éducation center is critical and deserves special attention from the various institutions involved in improving the living conditions of households and the survival of children. Also, post-education monitoring is needed to strengthen mothers' knowledge.

Keywords: Becoming children, Malnutrition, Nutrition education, Kaya.

144/2526

CALORIE RESTRICTION IN THE MANAGEMENT OF OBESITY ASSOCIATED OBSTRUCTIVE SLEEP APNEA - A NON-PHARMACOLOGICAL INTERVENTION STUDY

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Background and objectives: Obstructive sleep apnea (OSA) is the result of a partial or complete blockage of upper airway structures and will reduce the oxygen flow to vital organs, resulting in irregular heart rhythms. Obesity is the strongest risk factor for the development of OSA. Our main objective is to see the fat infiltration in to the tongue of calorie restricted rats and its consequences on upper airway obstruction in comparison with lean and ad lib fed obese rats.

Methods: Eighteen Lean (223.33 g ±20.42), obese (584.22 g ± 5.65) and calorie restricted (CR) (303.00 g ± 16.97) obese rats were taken for the study. Body fat and lean body mass (LBM) was determined by total body electrical conductivity (TOBEC), radiographs of upper airway structure were analyzed by digital X-ray. Ex-vivo biochemistry was carried for leptin, lipids in blood/tissues, and fat infiltration by oil red O staining (ORO). The tongue, masseter muscle fat, fibre and taste buds morphology assessed by scanning electron microscope (SEM).

Results: TOBEC analysis showed higher body fat and low LBM, X-ray displayed excess fat in the neck region. Triglyceride levels were high and leptin levels were reduced in CR rats compared to lean and ad lib fed obese rats. ORO staining of tongue showed fat accumulation of varying degree in different groups. SEM analysis of the tongue and masseter muscle demonstrated an increase in fat infiltration with an increase in fat droplets. Tongue muscle fibres showed rugged abnormal folding, with an increase in width in obese rats. The distance and width between the taste buds of CR reduced to levels of lean rats.

Conclusions: There is a different degree of fat infiltration in the tongue of calorie restricted and adlib fed obese compared to lean rats. The calorie restriction in obese rats also increased the lunge volume and haemoglobin levels compared to adlib obese rats. The hypertrophy seen in the calorie restricted obese rat tongue may play a role in altered tongue neuromuscular function. These findings suggest that, future studies on the role of obesity in OSA should focus on tongue fat infiltration and its distribution with calorie restriction.

Keywords: Calorie restriction, Lipids, Masseter muscle, Obesity, Upper airway structures.

144/2544

ANALYSIS OF THE EVOLUTION OF NUTRITIONAL PARAMETERS IN PATIENTS TREATED IN BARIATRIC SURGERY THE CLINIC-SCHOOL

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Background and objectives: Currently, bariatric surgery is accepted as the most effective tool in the treatment and control of morbid obesity. Several indicators are used to analyze the success of bariatric surgery. The objective of this study was to analyze the evolution of nutritional and clinical parameters in the postoperative period of patients submitted to bariatric surgery by the Roux-en-Y gastric bypass technique attended at a school-clinic.

Methods: Patients were selected from one month to one year after bariatric surgery without distinction of age and gender, and postoperative complications such as the presence of craving, vomiting and weight gain were evaluated, and clinical signs were more evidenced due to the deficiency Were micronutrients, hair loss and dry skin (protein, zinc and biotin). To obtain the results of the anthropometric evolution, we analyzed records of BMI,% PP and% PEP, CC, CA and CB.

Results: In the anthropometric analysis, the BMI and CB indicators in the 6th month already indicated a drastic reduction for classification for overweight, for the% PP and% PEP, the highest losses occurred until the 3rd month and the CC and CA measures were no longer presenting cardiovascular risk In the 9th month. As for food intake, there was an adjustment in relation to the consumption of dairy and cereal groups and reduction in meat consumption. In general, the individuals presented a reduction in the symptoms analyzed in the first trimester.

Conclusions: In the course of the present study, it is verified that the results obtained were already expected, although the patients' adherence was considered as unsatisfactory as of the 6th month. Nutritional monitoring is necessary so that it can achieve expected success in the indicators.

Keywords: Nutritional parameters, Patients, Bariatric surgery, Clinic-school.

144/2545

RELATIONSHIP BETWEEN NUTRITIONAL STATUS AND CARDIOVASCULAR RISK IN PATIENTS WITH METABOLIC SYNDROME

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Background and objectives: The objective of this study was to evaluate the relationship between nutritional status and cardiovascular risk in patients with metabolic syndrome (MetS).

Methods: This study is transversal and included 171 patients with MetS. The nutritional status was assessed using body mass index (BMI) score MNA (Mini Nutritional Assessment) and nutritional assessment score instantly - (instant nutritional assessment - INA). We also calculated a combined score of malnutrition: MNA results have merged, INA and BMI in a single combined score. We considered patients with malnutrition rezutatul based on the combined score, so it is considered malnourished individual score indicates if any is present. The diagnosis of MetS was established using a modified IDF definition. Cardiovascular risk was assessed for each patient using software UKPDS-CHD.

Results: MetS was present in 64.9% of patient. The age of patients with malnutrition and MetS was higher than that with MetS without malnutrition (57.75±6.16 years vs. 51.85±9.65 years, p=0.125). Using the combined score of the total number of patients, malnutrition was present in 18 patients (10.5%). Of these, 12 patients (66.7%) belong to the group with MetS. The combination of malnutrition - moderate cardiovascular risk level, was observed in a small number of patients, most of the malnutrition associating with a low cardiovascular risk (n=2). Cardiovascular risk among those with only 6 patients had moderate malnutrition, and among those at high risk, only 4 associated malnutrition. The presence of MetS is associated with a higher frequency of malnutrition in patients with hepatitis C. Obesity was present in 122 patients (71.3%) - 58 women and 64 men. Of these, 8 patients (4.7%) had malnutrition based on the combined score.

Conclusions: Assessment of nutritional status in patients with MetS brings significant benefits by identifying malnutrition risk and to which they are exposed.The prevalence of malnutrition was high in patients with MetS (10.5%). Assessing the relationship of cardiovascular risk - malnutrition, has placed patients with malnutrition among those with low cardiovascular risk (n=2) or moderate (n=6), only a small number of people with malnutrition (n=4) with a high cardiovascular risk .

Keywords: Metabolic sydrome, Nutritional status, Cardiovascular risk.

144/2564

GENOTYPE AND PHENOTYPE DETERMINATION IN CHILEAN SUBJECTS WITH PHENYLKETONURIA

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Background and objectives: Phenylketonuria (PKU, OMIM 261600) is an autosomal recessive disease, caused by mutations in Phenylalanine Hydroxylase (PAH) gene situated in chromosome 12q22-q24.2. This gene has 13 exons. The genotype is one of the main factors that determine the phenotype of this disease. Objective: Characterize Chilean PKU genotype and phenotype.

Methods: 71 PKU subjects to study the PAH gene by restriction fragment length polymorphism (RFLP) and sequencing techniques to identify the genotype, previous exon and intron amplification through PCR technique. We classified the phenotype according to Guldberg predicted value.

Results: 26 mutations in 134 of the 142 alleles studied were identified (94.4%), completing the analysis in 88.7% of the subjects, 11.3% had one allele identified. 84.5% of the sample was heterozygous. Exon 7 included the majority of mutations (23%). 50% of mutations were missense. Most frequent mutations were IVS10-11G>A, p.Ex5del and p.Val388Met. According with results 52.3% of the subjects had a predicted classic phenotype.

Conclusions: The most frequent mutations can be identified by RLFP and MLPA, which lowers the costs of genetic analysis. It is possible to predict phenotype by detecting the genotype, with which we can establish the disease prognosis and ease patient's medical and nutritional management.

Keywords: Phenylketonuria, Genotype, Phenotype, Phenylalanine Hydroxylase gene, Mutations.

144/2582

INTERLEUKIN-6 PROMOTER -174 G>C POLYMORPHISM IS ASSOCIATED WITH PRIMARY IRON OVERLOAD IN MALE ADULTS

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Background and objectives: Hereditary hemochromatosis (HH) is commonly associated with mutations in the HFE gene. Nonetheless, the variable penetrance of these mutations suggests that other genetic host factors may influence the development of overt iron overload (IO). There is a single nucleotide polymorphism (SNP) on position -174 G>C of the gene promoter of interleukin 6 (IL-6) which might be associated with primary IO. Carriers of the C allele were described to produce less IL-6. The aim of this study was to evaluate the SNP -174 G>C of the IL-6 gene and its interaction with iron metabolism and with inflammatory markers in male patients with primary IO.

Methods: Patients with primary IO, evidenced by liver histology, were consecutively recruited during a 12-month period (n=37). Patients were divided into two groups, treated (n=24; ferritin = 85 (28-225) ng/ml) and untreated (n=13; ferritin = 722 (558-986) ng/ml). Controls were age-matched male volunteers (n=37). High sensitive C reactive protein (HsCRP) concentration was determined by an immunoturbidimetric assay and IL-6 by enzyme immunoassay. SNP-174 G>C was evaluated by PCR-RFLP. Differences were analyzed by ANOVA. Genotype distribution was compared by the Chi square test.

Results: HsCRP was higher and IL-6 lower in untreated IO patients than in the other groups (p<0.05). The analysis of the SNP-174 G>C showed different genotype frequencies between patients

(43% CC, 43% CG and 14% GG) and controls (10% CC, 41% CG and 49% GG) (OR= 4.094, 95%CI = 2.062 to 8.128, p<0.0001), being in Hardy-Weinberg equilibrium. IO was significantly associated with CC homozygosis in the SNP-174 [OR= 6.3, 95%CI = 1.9-21.4, p<0.005]. Such association remained significant even when the analysis was performed including age and body mass index in the model (p<0.005).

Conclusions: This study describes for the first time that the C allele in the -174 G>C SNP of the IL-6 gene was associated with primary IO. The probable mechanism by which this polymorphism influences the development of IO is through lowering hepcidin synthesis via IL-6 receptor signaling in hepatocytes. Indeed, untreated IO patients showed significantly lower IL-6 levels, which were not related with the inflammatory process or metabolic abnormalities associated with overt IO.

Keywords: Iron overload, Inflammation, IL-6, Polymorphism, Hereditary hemochromatosis.

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LEVEL OF HYPERTENSION TREATMENT ADHERENCE FROM TWO POPULATIONS THAT ARE TREATED IN PUBLIC AND PRIVATE AMBIT DURING THE MONTHS OF OCTOBER AND NOVEMBER 2016

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Background and objectives: The prevalence of hypertension in Argentina is 34% with similar values in the world. It has been seen in different investigations that the knowledge, treatment and control in our country are very low and it is due to, among multiple factors, to poor treatment efficiency and low adherence on the part of the patients.

The objective is to describe the adherence level to the integral treatment for arterial hypertension and to compare obtained data from patients diagnosed and treated over 18 years of age, who were treated in outpatient clinics of one private and one public hospital in the city and province of Buenos Aires respectively, during the months of October and November of the year 2016.

Methods: Quantitative, descriptive, correlational research.

Population: hypertensive patients in treatment older than 18 years.

n = 146, not probabilistic.

Variables analyzed: sex, age, educational level, care system, age in treatment, compliance with medical prescription, lifestyle habits, and professional referral.

Technique and tool: survey, structured questionnaire CAT-HTA.

Results: 42% adhered to integral treatment for hypertension. 79% adhered to the pharmacological treatment. 18% adhered to non-pharmacological treatment. The field of care was a modifying variable in adherence. 64% never consulted other professionals. 66% were never referred by their GP to other professionals. 32% consulted the nutritionist as part of non-pharmacological treatment.

Conclusions: It was observed a greater ease to carry out the medical prescription in relation to the pharmacological aspects of the treatment for hypertension, and not with the modifications in the changes of lifestyle.

Keywords: Arterial pressure. Life style. Patient Compliance. Nutritionists. Professional referral.

Further collaborators:
Marcela Leal.

144/2619

THE RELATIONSHIP BETWEEN SUCCESS BARIATRIC SURGERY AND WEIGHT REGAIN AFTER AT LEAST FIVE YEARS POST POSTOPERATIVE

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Background and objectives: A successful Bariatric Surgery (BS) is defined as Excess Weight Lost (EWL) of at least 50%. If the patient gains less than 15% of his nadir, it is considered weight loss maintenance. To our knowledge there are no reports about relationship between Weight Regain (WR) over 15% and failure of BS, defined by EWL < 50%. Objectives: To analyze the number of patients with WR above 15% after at least 5 years from surgery and to evaluate relationship between WR and BS success.

Methods: Analytical observational study. Between June 2007 and March 2012, 79 patients underwent on BS at Buenos Aires British Hospital. Anthropometric data, sex, age, date and types of surgery were collected from clinical histories. Current anthropometric data were recorded from 43 patients: 25 interviewed by telephone, 5 by e-mail and 13 personal encounters. Successful BS was considered as EWL at least 50% and weight loss maintenance if the patient gained less than 15% of his nadir.

Results: BS was performed in 79 patients: 57 sleeve gastrectomy (LSG) and 22 Roux-en-Y Gastric Bypass (RYGB). Data of 43 patients were recorded: LSG 27 (63%) and RYGB 16 (37%). Mean age was 51,3± 9,7 years; 29 (67%) female, mean baseline body mass index (BMI) 48,32 Kg/m2 (7,2DE). Mean percent of EWL: 71,32%. At least five years after surgery 8 (30%) of LSG were successful and 15 (94%) of RYGB (p 0.013). Successful patients with LSG 7 (87,5%) reported WR <10% and 1 (12.5%) WR 10-15%. In RYGB successful patients group 6 (43%) reported WR < 10%, 5 (36%) WR 10-15%, 1 (7%) WR 15-20% and 3 (21%) above 20%.

Conclusions: In RYGB group patients were more successful than those in the LSG, 5 years after surgery. None of the successful patients with LSG regained weight. Excessive weight gain was experienced by almost one third of patients in RYGB group, these results are consistent with literature. Even with this setback RYGB continued being successful, this would suggest that WR over 15% would not indicate BS failure in this group. Further extensive studies are needed in order to confirm these results.

Keywords: Bariatric Surgery, Regain weight.

144/2649

TRIGLYCERIDES/HIGH DENSITY LIPOPROTEIN CHOLESTEROL RATIO AS A PREDICTOR IN DETECTION OF INSULIN RESISTANCE IN TYPE 1 DIABETES MELLITUS

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Background and objectives: The Triglycerides/High Density Lipoprotein cholesterol (TG/HDL-C ratio) is considered a clinical indicator of insulin resistance. The aims is to assess the relationship of a high TG/HDL-C ratio in T1DM with parameters of insulin resistance, habits and diabetes complications

Methods: T1DM patients over 18 years old assisted by 26 Argentinian doctors specialized in Diabetes, year 2011. Evaluation: anthropometric measures, laboratory, habits, treatment and chronic complications. Obesity (WHO criteria), physical activity at least 150 min/week, glycemic control A1c<7%, TG/HDL-C ratio>3 , intensive insulin treatment (IIT) three or more daily injections. Statistical analysis: Chi2, Student t, Spearman correlation, Multiple Logistic Regression (CSS/Statistical)

Results: 514 patients were included (age: 40.6± 14.6 years), T1DM duration: 17.4 ±12.0 years, females: 55.1%, BMI 25.1±4.3 kg/m2; A1c 8.0 ± 1.5%, Fasting blood glucose 147.1±69.1 (mg/dl). Waist circumference in men 90.5±11.4 cm, women 80.6±12.2 cm. Physical activity 45% .

Overweight 34.4%, obesity 11.9%. Intensive insulin treatment: 75.1%. Metabolic syndrome (IDF criteria) 34.7%. LDLc 110.3±31.7 mg/dl(>100 mg/dl: 60,8%), TG 107.6+61mg/dl (>150 mg/dl: 18.2%) and HDLc 50.4+13mg/dl in men (>40 mg/dl in 81.7%) and 57.8+15.2mg/dl in women(>50 mg/dl: 68.3%). The TG/HDL ratio was >3 in 20.1% and Coronary Hearth Disease (CHD)4.6%.

It was found association with high TG/HDL-C ratio with glucose fasting elevated (p<0.0009), men (p<0.03), obesity (p<0.00001), high waist circumference (p<0.0001). IIT (p=0.005)

and physical activity (p<0.009) were found as protective factors. No association with A1c and age were found. Despite the low frequency of CHD, TG/HDL ratio correlationed significantly with CHD(p<0.0001)

In multivariate analysis the high TG/HDL ratio was associated with: glucose fasting elevated(OR 1.004, IC 1.001-1.008; p< 0.008) , male(OR 1.82,IC1.12-2.96; p<0.016) , obesity(OR 2.83,IC1.51-5.28; p<0.001) and high waist circumference(OR 2.98, IC 1.74-5.1; p<0.0001) It was found as protective factor the Intensive Insulin treatment(OR 0.55, IC0.02-0.33; p<0.02)

Conclusions: The elevated TG/HDLc ratio had significance correlation with metabolic syndrome as high waist circumference, obesity and fasting blood glucose elevated. This ratio may be a surrogate marker for insulin resistance in T1DM and to identify persons with high risk of cardiovascular disease. Further studies must be made.

Keywords: TG/HDL ratio, Type 1 Diabetes, Insulin-resistance.

Further collaborators:

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MEASUREMENT OF REST ENERGY EXPENDITURE IN PEDIATRIC ONCOLOGICAL PATIENTS: CONCORDANCE BETWEEN INDIRECT CALORIMETRY AND PREDICTIVE EQUATIONS

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Background and objectives: Cancer in pediatric patients impacts resting energy expenditure (REE) in a way that is not estimable by predictive equations.

The aim of this study is to determine the concordance between the measurement of resting energy expenditure (REE) by indirect calorimetry (IC) in pediatric oncological patients versus World Health Organization (WHO) and Schofield predictive equations.

Methods: Cross - sectional study in children, aged 5-15 years old, receiving chemotherapy, in outpatient from Clinica Las Condes and Hospital Dr. Sótero del Rio, between July 2013 to July 2015.

REE measurement was performed by indirect calorimetry and WHO and Schofield equations.

Concordance analysis was performed, with a clinically relevant cut-off point of 90% concordance coefficient of Lin (CCI).

Results: 27 indirect calorimetry in 27 children were performed. 66% (18) were diagnosed with leukemia, 15% (4) brain tumor. 81% (22) in the maintenance stage of their treatment and 33% (9) eutrophic.

There was no significant difference between indirect calorimetry measurement versus WHO (p 0.18) or Schofield (p 0.07), nor when stratifying by nutritional status, age range or type of cancer diagnosis.

Concordance was calculated between IC and Schofield, with a CCI = 79.4% (CI 65.2 -93.6%) and IC and WHO, CCl = 78% (CI 62.9 -93.2%).

Conclusions: Conclusion: This level of agreement, less than 80% in both cases, is insufficient.

With both equations for estimating REE, there is more than 20% of cases who was an overestimation or underestimation of the energy requirements.

There was no agreement between the measurement of REE, measured with indirect calorimetry versus its estimation with Schofield's equations and WHO, so the use of indirect calorimetry for the determination of energy requirements in pediatric patients with oncological pathology should be considered.

Keywords: Childhood cancer, Indirect calorimetry, Resting energy expenditure, Pediatric oncological patients .

144/2677

ALCOHOL IN ADULTS WITH TYPE 1 DIABETES MELLITUS: IMPACT ON METABOLIC SYNDROME

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Background and objectives: The international guidelines give limits in terms of alcohol quantity consume. The amount of alcohol consumed impacts health differently. Risks associated with excessive alcohol consumption in Diabetes include weight gain, hypoglycemia and hiperglycemia.

To assess the frequency of moderate alcohol consumption in Type 1 Diabetes Mellitus (T1DM), its relationship to habits, glycemic control and the presence of metabolic syndrome.

Methods: Patients with T1DM older than 18 years old, assisted by 26 Argentinian doctors specialized in Diabetes, year 2011. Evaluation: anthropometric measures, laboratory, habits, treatment and chronic complications. Obesity (WHO criteria) and metabolic syndrome(IDF criteria), physical activity at least 150 min/week, alcohol consumption: drinking more than 15 standards drinks a week for men or 10 a week for women (Canada: Guidelines for Low-Risk Drinking), Smoking (current smokers), glycemic control A1C<7%, hyper trygliceridemia TG>150 mg/dl, Hypertension: systolic blood pressure (SBP) >140 and/or diastolic blood pressure(DBP) >90 mmHg. Statistical analysis: Chi2, Student t, Spearman correlation, Multiple Logistic Regression (CSS/Statistica).

Results: 514 T1DM patients were included, 40.6±14.6 years old, T1DM duration 17.4±12.0 years, Females 55%, A1C 8.0±1.5%, and Fasting blood glucose 147.1±69.1mg/dl. BMI 25.1±4.3 kg/m2 and waist circumference 90.5±11.4cm in men and 80.6±12.2 cm in women. Obesity 11.9% and overwheight 34.4%. Physical activity 45%, Smoking 20.2%. LDL-C 110.3±31.7mg/dl, HDL-C 50.4+13mg/dl in men, 57.8+15.2mg/dl in women and TG 107.6+61mg/dl. Metabolic syndrome 34.7%. Hypoglycemia was 67% in the last week and 13% had severe hypoglycemia in the last year. SBP118,8±11,9 mmHg and DBP 73,7±8,4 mmHg, hypertension 22,7%.

The 29.9% of patients consumed alcohol in excess.

The excessive alcohol consumption was in association with: male gender(p<0.0001), smoking(p<0.0001), hypertension(p<0.05), being overweight and obesity(p< 0.0001), hyper trygliceridemia(p<0.041) and metabolic syndrome(p<0.046). There was no association with: age(p=0.2), good glycemic control(p=0.09) and hypoglycemia(p<0.9).

The most frequently consumed beverages were beer, wine, and liquor.

Conclusions: In this study, 30% of adults with Type 1 Diabetes consumed alcohol in excess. Has been more frequent in male gender and smoking. They had an increased risk of the metabolic syndrome as overweight, obesity, hyper trygliceridemia and hypertension. Alcohol use still needs to be tackled. The low consume of alcohol supports healthy lifestyles.

Keywords: Alcohol, Type 1 Diabetes, Metabolic syndrome.

Further collaborators:

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144/2683

ZINC SUPPLEMENTATION IS AN EFFECTIVE AND FEASIBLE STRATEGY TO PREVENT GROWTH RETARDATION IN 6 TO 24 MONTH CHILDREN: A PRAGMATIC RANDOMIZED DOUBLE BLIND TRIAL

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Background and objectives: Zinc is an essential nutrient that is naturally available in most foods. Deficiency of this micronutrient in particular can cause a number of health complications. Zinc deficiency during infancy is more troublesome as rapid growth and nutrient relied development takes place in this period. Most severe outcomes of zinc deficiency during infancy are considered to be cerebral damage, impaired immunity and growth retardation. This feasibility study assesses the effectiveness of zinc supplementation during infancy in Iran.

Methods: Randomized double blind controlled trial that compared oral zinc supplementation with placebo in children aged 6 to 24 months. From children contacted by researchers in the beginning of the study (n=839), 580 completed the trial. Subjects were randomly divided in two groups to take 5ml of zinc sulfate suspension containing 5mg elemental zinc or placebo daily for 6 month.

Results: Following the intervention, compared with the placebo, zinc supplementation was associated with significant difference in the average height increment (placebo 5.23 cm ±2.19 vs. intervention 5.79 cm±2.18 p=0.02). No significant difference was observed in serum zinc, ferritin and high-sensitivity C-reactive protein (hs-CRP) following the 6 month intervention. The prevalence of zinc deficiency was significantly lower in the intervention group compared to the placebo. No complications were reported and the compliance was very good.

Conclusions: Zinc supplementation for 6 month among children (6-24 months) had beneficial effects on growth parameters including average height.

Keywords: Zinc supplementation, Serum zinc, Ferritin.
Further collaborators:
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144/2706

FOOD INTAKE AND BODY MASS INDEX OF PATIENTS WITH TYPE 2 DIABETES MELLITUS FROM AN OUTPATIENT CLINIC IN SÃO PAULO

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Background and objectives: The prevalence of type 2 diabetes mellitus is increasing in all populations worldwide. This increase is accompanied by the rising rates of obesity and overweight observed over the past decade. For this reason, the analysis of the body mass index (BMI) may serve as a powerful tool in the assessment of the risk factor for Diabetes. As overweight is directly related to the to lifestyle and eating habits, a better understanding of food intake in patients with type 2 diabetes mellitus is essential in order to correct problems, stimulate healthy habits and foster weight loss of these population. This study objective is to classify the population using the BMI scale and correlate it to food intake.

Methods: This is a cross-sectional, descriptive study with primary data collection, sampling done by convenience, approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A structured questionnaire to characterize food intake was developed for this research and applied to 82 patients with type 2 diabetes mellitus, both male and female, attending an outpatient clinic in São Paulo. BMI was classified according to the World Health Organization. Weight and height were self-reported. Data analyses were performed using descriptive statistic, the Quisquare test with a level of significance of p<0.05.

Results: Regarding the interviews, the mean age was 63±10.6 years. Mean BMI was 29.6 ± 5 kg/m2 ranging from 28.5 to 30.8 kg/m2 (for a 95% of confidence interval). When BMI was classified as underweight, normal weight and overweight it was possible to find a significant difference (p=0.04) between the groups regarding their eating habits. As for individuals with overweight the most consumed foods were: fruits, vegetables and greens (86%), pasta, breads and biscuits (82%), foods of animal origin (73%) and sweets in general (27%).

Conclusions: Most patients with type 2 diabetes mellitus are overweight and there are significant differences in food choices according to their BMI score. This insight may bring possibilities

for dietary changes and may facilitate the translation of findings to public health recommendations.

144/2707

IMPORTANCE OF DIETARY COUNSELING TO PATIENTS WITH DIABETES MELLITUS TYPE 2 FROM AN OUTPATIENT CLINIC IN SÃO PAULO

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Background and objectives: A healthful eating pattern and regular physical activity are extremely important components of type 2 diabetes mellitus management. For many individuals with type 2 diabetes mellitus, the most difficult part of the dietetic plan is to decide what to eat. Dietary therapy has been recognized as an essencial strategy for helping patients with type 2 diabetes mellitus, improving self-management, developing nutritional education and providing an eating plan. In this context the purpose of this work is to correlate the eating habits of patients who received professional guidance with those who did not receive any guidance.

Methods: This is a cross-sectional, descriptive study with primary data collection, sampling done by convenience, approved by the Ethics and Research Committee of Centro Universitário São Camilo, Brazil. A structured questionnaire to characterize food intake was developed for this research and applied to 82 patients with type 2 diabetes mellitus, both male and female, attending an outpatient clinic in São Paulo. Data analyses were performed using descriptive statistic, the Qui-square test with a level of significance of $p<0.05$.

Results: Regarding the interviews, the mean age was 63 ± 10.6 years characterizing an elderly population (64.6%). The majority of respondents (80%) received specific dietary guidance for type 2 diabetes mellitus but only 30% admitted to follow the guidance given by the health professional. It is noteworthy that the main health professionals who carried out dietary counseling were nutritionists (50%) and physicians (46%). People who received guidance showed a slightly more varied diet than those who did not receive guidance. Nevertheless, this result was not statistically significant (p=0.26). The most consumed types of food were: fruits, vegetables and greens (74%), pasta, breads and biscuits (66%) and food of animal origin (59%).

Conclusions: Patients who received professional guidance on diet present a more varied food profile in relation to those who did not receive it. Therefore, the professional counseling in this population is extremely important for an adequate management of the disease and quality of life.

144/2708

INTEGRATION OF PREVENTATIVE AND CURATIVE ASPECTS OF NUTRITION INTO INTEGRATED COMMUNITY CASE MANAGEMENT (ICCM) IN DEMOCRATIC REPUBLIC OF CONGO

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Background and objectives: Integration of nutrition into iCCM provides an opportunity to improve and strengthen IYCF and care practices, nutritional status, and reduce rates of child morbidity. Global iCCM guidelines focus on the identification, treatment, and referral of children who are sick with diarrhea, pneumonia, and/or malaria, as well as acute malnutrition. Yet, the implementation of iCCM is often not delivered with the intensity, quality, and coverage needed to achieve improvements in child nutritional status. Globally, a gap in evidence exists for integrating nutrition into the iCCM platform. The objectives of this study are to 1) examine how various aspects of nutrition integration into iCCM are currently delivered within the DRC health system 2) identify possible approaches for behavior change communication for infant and young child feeding, and advising families with sick children and 3) identify gaps and areas for strengthening nutrition within iCCM programming through health services, including linkages for identification and referral of acute malnutrition.

Methods: In-depth interviews were carried out with mothers (n= 48); grandmothers (n= 20) and fathers (n=21) of children under five years of age, 18 health facility providers and 20 traditional healers in 4 sites in Tshopo, DRC. Eight focus group discussions (FGDs) were carried out with community health workers (CHWs). Following transcriptions of recordings for FGDs and IDIs, key emergent themes were identified and sub-themes were coded.

Results: Our findings reveal inadequate infant and young child feeding practices, with minimal counseling by health providers. Cultural beliefs and traditional practices surrounding breast-

milk sufficiency and breastfeeding problems should be addressed by health providers. Complementary feeding practices are suboptimal, in terms of quantity, frequency and diversity. Involvement of traditional healers is key. Addressing care seeking behaviors for child illness, as well as targeting preventative rather than solely curative care for malnutrition within the iCCM platform is needed.

Conclusions: These findings will be translated into practical approaches for strengthening integration of nutrition into iCCM programming in DRC.

Keywords: Integration, Nutrition, Child health, iCCM

Conflict of Interest Disclosure: Richard Bachunguye, Tosha Maphie, Octave Safari and Janvier Mirindi were hired as local consultants to carry out the data collection, and aid with analyses and documentation of findings for this study.

144/2710

SOCIODEMOGRAPHIC ROLE IN DEPRESSION PREVALENCE AMONG MIDDLE-AGED AND ELDERLY IN CHINA: FINDINGS FROM THE CHINA HEALTH AND RETIREMENT LONGITUDINAL STUDY

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Background and objectives: Background and objective: Although several studies explored the prevalence of depression in China, few studies have investigated the sociodemographic impact on depression prevalence. Therefore, this study aimed to examine the association between depression prevalence and sociodemographic factors among Chinese middle-aged and elderly.

Methods: Using baseline data of the China Health and Retirement Longitudinal Study (CHARLS), conducted between March 2010 and June 2011, the study performed a cross-sectional analysis about depression prevalence and socioeconomic role among 15,271 middle-aged and elderly participants aged 45 and older. Depression was diagnosed by Center for Epidemiological Studies Depression Scale-10 (CES-D) score. Multivariable logistic regression model was used to analyze the association between sociodemographic factors and depression prevalence by providing odd ratios (ORs) and 95% confidence intervals (CIs).

Results: The prevalence of depression in the middle-aged and elderly was 37.1% (30.2% for men and 43.2% for women, respectively) in 2011. Multivariable logistic regression model showed that odds of depression in the women was 1.82 times that in the men (95% CI: 1.68-1.97), while the odds of depression in the rural area was 1.42 times that in the urban area (95% CI: 1.31-1.55). Moreover, the depression prevalence was positively associated with age, and negatively associated body mass index (BMI), education and household income level (P for trend < 0.001). Compared with participants living in North region, the ORs and 95% CIs of depression among participants who lived in East, South-Central, North-West, South-West, and North-East regions were 0.81 (0.71-0.93), 0.95 (0.83-1.08), 1.36 (1.15-1.62), 1.26 (1.09-1.45), and 0.84 (0.70-1.00), respectively.

Conclusions: there was about one third of Chinese middle-aged and elderly having depression in 2011. Prior measures should be taken among high-risk middle-aged and elderly with lower education and income levels, older women, living in rural area or west China. Further cohort studies are needed to identify the prospective association between sociodemographic factors, diet and lifestyle factors with depression risk among Chinese populations.

Keywords: Depression, Sociodemographic disparity, Middle-aged and elderly, China.

144/2719

OBESITY, DIABETES AND BLOOD PRESSURE INDEPENDENTLY CONTRIBUTE TO WHITE MATTER MICROSTRUCTURAL VARIABILITY IN THE BRAIN

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Background and objectives: Obesity has been associated with increased risk of dementia. Grey and white matter (WM) of the brain are commonly used as biomarkers for early detection of dementia. However, considering WM, available neuroimaging studies had mainly small sample size and yielded less conclusive results (Kullmann et al., 2015). Recently, a positive correlation between obesity and fractional anisotropy (FA) in a middle age group was reported (Birdsill et al. 2017). Furthermore, obesity is related to many medical problems such as diabetes and hypertension. Diabetes and hypertension were found to be correlated with brain structures independently (de Leeuw et al., 2002; Weinstein et al., 2015). Yet, studies rarely investigated non-lesion WM microstructure and its association with diabetes and blood pressure. Therefore we aim to investigate the relation between abdominal obesity, diabetes, blood pressure and WM microstructural variability in a large cohort of community-dwelling healthy adults.

Methods: The sample included dementia-free participants (mean age 55 ± 16 years; 50.7% women) of the LIFE cohort with brain MRI scans (n = 1255). WM microstructure was measured with diffusion tensor imaging (DTI). Mean FA was derived from the individual WM skeleton processed by tract-based-spatial-statistic method. Linear regression models were used to assess the relationships between diabetes, blood pressure, waist to hip ratio (WHR) and DTI parameters. Adjustments were made for age, sex, education and Apoe4.

Results: The preliminary result indicated diabetes, systolic blood pressure and WHR were independently associated with lower FA, and diabetes explained the most variance besides age. Subgroup analysis revealed both systolic blood pressure and WHR were negatively associated with mean FA in the non-diabetes group (n=1101).

Conclusions: The preliminary result of our study indicates that diabetes accelerated brain aging on directional diffusion of WM. Abdominal fat and blood pressure were associated with WM variabilities independently from age, sex and diabetes. With subsequent analysis of additional DTI measures, blood parameters, WM hyperintensity maps and voxel-based microstructural WM "integrity", we aim to further characterize the associations between obesity, diabetes, blood pressure and WM microstructure. This will contribute to the existing literature and help to disentangle the underlying mechanism.

Keywords: Abdominal fat, Waist to hip ratio, DTI, Fractional anisotropy.

144/2730

DIET AND CHILDREN WITH ATTENTION DEFICIT HYPERACTIVITY DISORDER (ADHD) - A PILOT INTERVENTION STUDY FOCUSING ON COMPLIANCE AND SYMPTOMS

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Background and objectives: The potential effect of food on Attention deficit hyperactivity disorder (ADHD) symptoms has long been debated. The aim of this pilot study was primarily to investigate compliance to two diets of interest, the healthy diet and the temporary few foods diet (few allergens) and secondary evaluate their effects on ADHD symptoms.

Methods: Participants were children who had been diagnosed with ADHD at the two main psychiatric centers for children in Reykjavik, with 29 children randomized into three groups: healthy diet (n=10), few foods diet (n=10) and a control group (n=9). A three-day food diary and questionnaires for both parents and teachers gave background information and symptoms. The same questionnaires were answered five weeks later as well as questions regarding the participation. A blinded physician interviewed the children and parents before and after the intervention. Compliance checklists were designed for the intervention period. Full participation rate was 68%.

Results: Baseline diet was not in line with dietary recommendations. Compliance to the diets was generally good (70-80%), although most children found it hard to follow the few foods diet and four dropped out. Using ADHD rating scale (ARS) the parents' total score decreased similarly on both diets (median from 35 to 27) or by 25% (p<0.05). Teachers found no change on ARS nor on Achenbach's Teacher Rating Form after the healthy diet, but significant improvement of symptoms were observed after the few foods diet (p=.027). No change was seen in the control group. The psychiatrist also found differences between groups (p<0.05).

Conclusions: With good support, compliance was generally good. Parents reported a decrease in symptoms on both diets, while teachers only reported improvements for children on the few foods diet. Diet of children with ADHD can be substantially improved and nutritional status and food sensitivity should be examined at diagnosis. However, further studies are needed.

Keywords: ADHD, Healthy Diet, Few foods diet, Compliance, Symptoms.

144/2734

POSTPARTUM ABNORMALITIES OF CARBOHYDRATE METABOLISM IN PATIENTS WITH GESTATIONAL DIABETES AND RISK FACTORS INVOLVED

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Background and objectives: Gestational Diabetes Mellitus (GDM) is a highly prevalent clinical entity that identifies a population of young women with a high risk of developing type 2 Diabetes Mellitus (T2D) in the future. The rate of persistent metabolic abnormalities after delivery is highly variable and there are no consistent statistics about risk factors. Objectives: 1) To describe the prevalence of carbohydrate metabolism abnormalities in postpartum reclassification 2) To classify risk factors that predict persistence of such abnormalities

Methods: Seventy-eight patients with a diagnosis of GDM within the past 3 years were evaluated and reclassified. Patients with pregestational diabetes, those diagnosed before gestational week 20 and/or with blood glucose levels ≥ 126mg% were excluded. Diagnostic criteria were: fasting plasma glucose (FPG) and blood glucose in OGTT at 120 minutes after a 75-g of glucose, based on the American Diabetes Association and the Sociedad Argentina de Diabetes criteria.

Results: Sixty-four patients had normal OGTT (82.1%), while 14 (17.9%) showed blood glucose abnormalities: IGT in 9 patients, IFG in 2, two cases with both abnormalities and 1 patient developed T2D. In patients with abnormal reclassification, 57% were diagnosed based on FPG and only 25% in the group with normal reclassification (p= 0.03). In patients with pathologic reevaluation, 69.23% had a family history of T2D compare to 36.5% in the other group (p=0.03). There was a tendency towards an age ≥ 30 yr, higher BMI, personal history of GDM and macrosomia in the group that persisted with abnormalities of the carbohydrate metabolism.

Conclusions: In our analysis, we found a high prevalence of carbohydrate metabolism abnormalities following GDM. We found a higher risk for persistent abnormalities in patients who had been diagnosed with GDM based on FGP and in those with a family history of T2D. We consider it is highly important to classify risk factors in order to institute preventive therapeutic actions, particularly in the population with greater vulnerability.

Keywords: Gestational diabetes postpartum reclassification factors.

144/2782

KETOGENIC DIET COMPLICATIONS IN CHILDREN WITH REFRACTORY EPILEPSY

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Background and objectives: The ketogenic diet (KD) is a non-pharmacological treatment used as an alternative in the management of difficult-to-treat epilepsy since 1921. It is a high-fat, low-carbohydrate diet effective in around 50% of the patients. The KD is an unbalanced diet lacking micronutrients leading to possible deficits in energy, proteins, minerals, and vitamins and excess of lipids with a risk of unwanted early as well as late adverse effects (AE). Our aim is to describe the early and late AE of KD treatment in a prospective cohort of 51 children with difficult-to-treat epilepsy seen at a single center.

Methods: We performed a prospective study of children with intractable epilepsy admitted for ketogenic diet initiation at our institution from 2014 to 2016. We studied adverse effects at one and six months after diet initiation.

Results: Before starting the diet, constipation and Vitamin D deficiency were the most common nutritional conditions seen in this cohort, and at one month after the most common acute AE were metabolic acidosis (n=20), constipation (n=13), food intolerance (vomits, food refusal) (n=13), hipoglycemia (n=8), hipercholesterolemia (n=7) and hipertrigliceridemia (n=5). Long-term adverse effects were metabolic acidosis (n=7) hypercholesterolemia (n=6), neutropenia (n=1), selenium deficiency (n=10), and growth impairment (n=4). In only two patients the AE were severe enough to discontinue the diet.

Conclusions: Some AE are difficult to interpret as they may be manifestations of underlying disorders instead of the diet. It is important to follow the protocol regarding frequency of lab tests to detect and prevent these AE. If managed by an experienced multidisciplinary team, all AE are treatable or preventable.

Keywords: Ketogenic diet, Adverse effects, Intractable epilepsy.

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ASSOCIATION BETWEEN BLOOD VITAMIN D LEVELS AND METABOLIC SYNDROME BIOMARKERS IN POST MENOPAUSE WOMEN

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Background and objectives: Vitamin D may act in several vital cellular processes, as well as biochemical and physiological disorders in obesity, cardiovascular disease and diabetes mellitus. This study aims evaluate the association between blood levels of vitamin D and indicators and your relation to metabolic syndrome in postmenopausal women.

Methods: A retrospective cross-sectional study was carried with postmenopausal women living the city of Rio de Janeiro - RJ. The women were interviewed between August 2013 and August 2014 (n=177 volunteers) and Clinical and demographic data were obtained by individual oral interview using a structured questionnaire. The metabolites were measured 25(OH)D3: insulin, C-reactive protein, follicle stimulating hormone (FSH), estradiol, progesterone, and parathyroid hormone (PTH) glucose, triglycerides, total cholesterol, HDL-cholesterol and LDL-cholesterol. cut off for vitamin D was 25(OH)D3 ≥ 30 ng/mL (75 nmol/L) = normal, 25(OH)D3 <30 ng/mL (75 nmol/L) = hypovitaminosis (WHO). In the anthropometry was analyzed: weight, height, body mass index (BMI) and waist circumference (WC). Statistical analyzes were performed using Student's t test, Wilcoxon test and Chi-square test for. The significance level was 5%.

Results: Of the 177 women evaluated, 87 (49,15%) had vitamin D deficiency, and 90 (50,85%) had normal levels of this vitamin; 88 (49,7%) had metabolic syndrome and 89 (50,3%) had no such syndrome. The average weight, body mass index (BMI), waist circumference, blood pressure, insulin, follicle stimulating hormone (FSH), parathyroid hormone (PTH), C-reactive protein (CRP), fasting glucose and triglycerides were higher (p< 0,05) in patients with the metabolic syndrome, while the HDL-cholesterol average was greater (p<0,05) in the group without metabolic syndrome. In the group with metabolic syndrome, the mean diastolic blood calcium and blood pressure were higher (p<0.05) in the group of women with normal levels of vitamin D. In the group without metabolic syndrome, only blood calcium showed a possible relationship with the level of vitamin D in the blood, but the blood calcium was higher (p<0.05) in the group with hypovitaminosis D. There was no statistical difference (p>0.05) between the groups in relation to ethnicity.

Conclusions: The vitamin D showed a possible interference in diastolic blood pressure and blood calcium in metabolic syndrome women.

Keywords: Vitamin D, Metabolic syndrome, Post menopause, Aging

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ANALYSIS AND DESCRIPTION OF AUDITS PERFORMED ON PATIENTS WHO ATTENDED FOR REFERRAL TO BARIATRIC SURGERY IN GALENO GROUP OFFICES

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Background and objectives: Obesity is a chronic, complex, heterogeneous health problem of a growth and epidemic behavior that shortens life expectancy, generates great morbidity and increases socio-health costs. Obesity surgery is safe, presenting low morbidity and mortality, and effective for weight loss and improvement of comorbidities. However, it necessarily implies a change in people's eating habits, it is not curative, nor is it the solution for everyone.

To analyze, describe and interpret a database audits carried out on patients who attended a referral for Bariatric Surgery as a treatment for obesity in the Galeno group Palermo and Barrio Norte clinics from September 2014 to September 2016.

Methods: Quantitative, descriptive, observational, transversal, retrospective research. The sample was non-probabilistic, conformed by 1544 patients who attended the consultation for referral to Bariatric Surgery, analyzing the variables Age, Sex, Family History, Weight, Height, BMI, Derivation and Performing Bariatric Surgery. It was used Excel 2016® to analyze database of audits and medical histories.

Results: The mean age of the sample was 42 years (DS ± 11), 64% were female, 71.5% had an obese family history of at least one relative, 70% had a BMI ≥40, 26% did not meet the requirements for Bariatric Surgery and did not accept another treatment, 1% was placed intragastric balloon, 37.24% was referred to the Comprehensive Center for the Treatment of Severe Obesity (CITOS) and 35.47% that were authorized to perform the surgery, 72% were performed.

Conclusions: Many patients who consult for Bariatric Surgery as a treatment for obesity do not meet the inclusion requirements for it and do not accept another treatment for their disease. Prior audits of referral to appropriate treatment for obesity, personalized according to the history and needs of each patient, can reduce the percentage of failures in the treatment chosen and the economic cost that it represents for health systems.

Keywords: Obesity, Bariatric surgery, Treatments, Medical referral.

Further collaborators: Micaela Scuri, BSc. Nutritionist. Maimonides University. Argentina.

144/2788

EFFECTS OF VITAMIN D SUPPLEMENTATION IN DIABETICS RATS METABOLISM

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Background and objectives: Diabetes mellitus affects about 422 million people worldwide and it is considered one of the major global epidemics of the 21st century. However, vitamin D can act in several vital cellular processes, including the pathology of diabetes mellitus. This study evaluated the effects of vitamin D supplementation in diabetic rats metabolism.

Methods: Thirty-two recently weaned rats (21 days of life) were distributed randomly in four groups (n=8 per group): 1- control non-diabetic (C); 2- diabetics control (DC); 3- diabetics treated with 400 IU of vitamin D / day (VD400); 4- diabetics treated with 520 IU of vitamin D / day (VD520), for twenty days. The induction of diabetes was performed by applying streptozotocin intraperitoneally diluted in citrate buffer. The analysis performed were glucose, total cholesterol, HDL-cholesterol, triglycerides, insulin, vitamin D, total protein, albumin and calcium serum.

Results: The control non-diabetic group had a lower consumption (p<0.05) compared to the diabetic groups, while the body weight did not present variation (p>0.05). Fasting blood glucose decreased (p<0.05) in the treated animals compared to diabetic control animals. Total cholesterol, HDLc, vitamin D and calcium did not show significant differences (p>0.05) with the supplementation, while triglycerides showed statistical difference (p<0.05) between the groups applying ANOVA, but with the Newman-Keuls test was not possible to observe difference between them. The total protein and albumin presented an increase (p<0.05) in the groups supplemented with vitamin D.

Conclusions: Vitamin D supplementation may improve glucose control in diabetic rats and total proteins (albumin and globulin) but did not show a significant beneficial change in lipid and insulin profile, suggesting that it may be acting in an alternative way of independent insulin blood glucose control. Thus, the relationship between vitamin D status, fasting blood glucose and insulin action requires a more depth investigation.

Keywords: Diabetes mellitus. Vitamin D. Rats. Metabolism.

PERCEPTION OF BODY IMAGE, KEY FACTOR IN THE CARE OF NUTRITIONAL STATUS

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Background and objectives: Obesity, particularly abdominal obesity, is considered a very important risk factor for the metabolic syndrome, a situation with a high risk of diabetes and cardiovascular disease. Knowing how overweight and obese people perceive their body image (BI) will help define new strategies that strengthen the need to have a healthy weight.

Objective: To study the perception of the nutritional status of patients attending the Secondary Cardiovascular Prevention Program of the National Resources Fund (NRF) of the city of Montevideo, during the period of May-December 2015.

Methods: The study is descriptive of an exploratory, cross-sectional type. 203 patients were studied, who were given a semi-structured form that contained the Stunkard and Stellard BI test. The nutritional status was assessed through the body mass index.

Results: Two-thirds of the population were men; Six out of ten patients were older adults, and almost nine out of ten had overnutrition, of which almost half were obese. However, more than half were observed with normal weight, of which 65% were male. However, more than half were observed with normal weight, of which 65% were male. Almost half of the obese were perceived as overweight, 8 out of 10 overweight patients were found normal, of those with normal weight, almost half were observed as thinned and those who were underweight were reflected as they are.

Conclusions: Most patients had a severe underestimation of their BI. It was men who underestimated more. Identify the perception of the BI is a key factor in weight control and modification of individual behaviors to improve nutritional status.

Keywords: Obesity, Patients, Body image, Perception, Underestimation.

Conflict of Interest Disclosure: Authors Paula Riccetto, Soledad Calvo, Rosana Gambogi and Sonia Nigro declare to be part of one of the technical teams of the evaluated program, as well as the institution that sends this summary (NRF).

Further collaborators: MSc. Biol. Gustavo Fernando Saona. Statical Advisor. National Resorces Fund. Uruguay.

EATING BEHAVIOR AND STRESS PERCEPTION IN ADULT WOMEN FROM BUENOS AIRES PROVINCE, BUENOS AIRES CITY AND CHACO, ARGENTINA

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Background and objectives: Stress is considered a disease of the XXI century, and can influence eating behavior and consequently body weight. The aim of this study was to evaluate the relationship between stress perception and eating behavior in Argentinean adult women.

Methods: An observational, transversal and analytical study was carried out on adult women (30-65 years) attending to nutritional appointment in clinics from Buenos Aires Province, Buenos Aires, Buenos Aires City and Resistencia, Chaco. A sociodemographic and lifestyle survey was carried out (physical activity, smoking). The stress perception was assessed by the Preceived Stress Scale (PSS10) with maximum of 40 points and the eating behaviors were evaluated using the Three-Factor Eating Questionnaire (TFEQ-R18), classified as: emotional eating (EE), uncontrolled eating (UE) and cognitive restraint eating (CRE). Nutritional status was assessed by body mass index (BMI) and abdomial fat by waist circumference (WC). Physical activity was defined considering at least 150 minutes of exercise per week. Statistical analysis was performed with SPSS 19.0 using X2, Mann-Whitney Test and Spearman correlation (statistical significance at $p < 0.05$).

Results: A total of 251 women aged 43.3 ± 9.8 years were included. The median values of EE, UE and CRE were: 5.0 (3.0-8.0), 16.0 (12.0-21.0) and 15.0 (10.0-18.0), respectively. The mean values of perceived stress were 15.5 ± 6.0. The stress perception positively correlated with the EE ($r = 0.23$, $p = 0.0003$) and the UE ($r = 0.24$, $p = 0.0001$); however, it did not correlate with CRE ($r=0,08$, $p=0,19$). Meanwhile EE, UE and CRE scores were significantly higher in overweight or obese women, the perception of stress was not associated with BMI.

Conclusions: The stress perception correlated with higher EE and UE scores, however, it was not associated to nutritional status. On the other hand, the three eating behaviors evaluated were associated to nutritional status.

Keywords: Adult woman, Stress, Eating behaviors.

144/2807

ASSOCIATION BETWEEN DEPRESSIVE SYMPTOMS, NUTRITIONAL AND CLINICAL ASPECTS OF ELDERLY RESIDENTS OF A CITY OF SÃO PAULO: A POPULATION-BASED STUDY

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Background and objectives: Depression, or depressive morbidity, is a complex mental disease that includes different phenotypes and symptoms. It has association with different negative results. There are many questions about the association between diet and eating habits with different brain disorders, including depressive symptoms. Eat now is not examined. To investigate the association between depressive symptoms, nutritional and clinical aspects of elderly residents of a city of São Paulo.

Methods: The present study is part of a larger thematic project: "Study on the Prevention and Treatment of Depression in the Elderly: A Population-Based Study." A cross-sectional, community-based epidemiological study of 2,643 elderly individuals aged 60 years and over. Considering the following variables: Depressive Symptoms: Center for Epidemiologic Studies Depression Scale (CES-D); Nutritional status: BMI and waist circumference; Habit to consume certain food groups and habit to make meals (Brazil, 2006). Presence of chronic diseases: hypertension, diabetes and hypercholesterolemia; Socio-demographic and economic characteristics: Brazil's Economic Classification Criterion (CCEB) (ABEP, 2011). The variables were analyzed by binary logistic regression. All variables investigated as significant values of $p < 0.05$ (SPSS 22.0 software).

Results: We found a high rate of depressive symptoms (38%); Depressive symptoms are associated with the habit of consuming milks and derivatives less than 1 serving per day, olive oil less than 2 times a week, do not consume wine every day, do not often carry out lunch and dinner, possess HAS, be female and be divorced or separated.

Conclusions: This study showed that negative association between depressive symptoms and the consumption of some foods. The results remained positive, even after adjustment for socioeconomic, demographic and clinical variables.

Keywords: Depression, Depressive symptoms, Elderly, Foods, Nutrtion.

144/2812

EFFICACY OF A MODIFIED CARBOHYDRATE DIET IN OBESE WOMEN

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Background and objectives: The dietary management of obesity may consider both: energy intake and macronutrient distribution. The most effective dietary treatment for reducing adiposity seems to be a low carbohydrates (CH) and low glycemic index (GI). Fructose and high fructose corn syrup (HFCS) seems to be related to obesity too. The objective was to compare the efficacy of a modified CH diet vs. a diet with a standard proportion of macronutrients within a program of reduced adiposity in obese women.

Methods: A randomized clinical trial was performed. Women in reproductive age diagnosed with obesity (BMI ≥ 30) were included. Dietary intervention was performed for six months. The dietary modification of the intervention group consisted of a hypocaloric diet, with a macronutrient distribution of 45-55% CH, 15-20% proteins and 30% lipids, foods with low or medium GI were recommended and to reduce the intake of industrialized foods with HFCS. In the control group, a hypocaloric diet was also recommended, with a distribution of macronutrients of 60-65% CH, 10-15% proteins and 25% lipids, without restriction of any kind of food. Physical activity recommendations were made equally in both study groups and monthly workshops were implemented to improve adherence to treatment. Measurements of anthropometric (body weight, BMI, fat percentage, arm anthropometry), dietetic (24-hour recalls, food frequency questionnaires), physical activity and adherence to treatment variables were taken at baseline and monthly.

Results: Changes in body composition were observed in both study groups. The greatest differences were mainly intra-group variables shown in adiposity. BMI, fat percentage measured by bioelectrical impedance as well as skinfolds, arm fat area (AGB) triceps skinfold thickness (PCT) and subscapularis (PCSE) showed major differences in the intervention group. The arm muscle area (UMA) increased in the intervention group and only significant statistically differences were detected ($p=0.032$ intervention group vs. $p=0.305$ control group).

Conclusions: The effectiveness of the modified diet in amount and type of CH to reduce adiposity was higher in the intervention group compared with the control group, although both groups were decreased adiposity.

Keywords: Low-carbohydrate diet, Low-glycemic index diet, High fructose corn syrup, Adiposity, Obesity.

Conflict of Interest Disclosure: The authors whose names are listed certify that they have NO affiliations with or in-

volvement in any organization or entity with any financial interest, or non-financial interest in the subject matter or materials discussed in this manuscript.

144/2823

LONG-TERM MAGNESIUM RESTRICTION MODIFIED THE BODY IRON STORES IN RATS FED A HIGH-FAT DIET

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Background and objectives: Poor iron status described in obese individuals has been attributed either to dietary inadequacies, to increments in body iron requirements or more often to inflammation-induced iron decompartmentalization. Here, we tested the hypothesis that a long-term dietary Mg restriction modifies body iron stores (liver and spleen) in rats fed a high-fat (HF) diet.

Methods: Male Wistar rats (n = 24; initial body weight 97-123 g) were fed ad libitum semipurified AIN-93-based control (CT) or high-fat (HF) diets (adequate or Mg-restricted; 500 [Mg500] and 50 [Mg50] mg Mg/kg diet, respectively) for 24 weeks. Diet consumption and body weights were recorded twice a week. At the end of experiment, liver and spleen iron concentrations were analyzed by atomic absorption spectrophotometry (AAS). Moreover, liver total protein homogenates were employed in analysis of ferroportin (Fpn1) abundance by immunoblotting.

Results: Compared to CT, HF feeding promoted reduced diet consumption (p <0.05) and enhanced body weight gain (p <0.05), irrespective of Mg restriction. Liver iron concentrations did not differ among groups. However, HF fed animals with Mg restriction (HF[Mg50]), but not those with Mg adequate diet (HF[Mg500]), had lower spleen iron concentrations in comparison to controls (CT[Mg500] and CT[Mg50]) (p <0.05). In this context, ferroportin abundance in the liver was significantly lowered in both HF groups (p <0.05), suggesting that Mg restriction did not modified the efficiency of liver iron exportation in response to the dietary lipid overload.

Conclusions: Long-term Mg restriction did not affect weight gain, but modified body iron distribution in rats fed HF diets. Further analysis of serum cytokines and hepcidin concentrations and ferroportin (Fpn1) abundance in duodenum and spleen samples will help to clarify whether these findings are accompanied by changes in the inflammation response, in the intestinal iron absorption or in the mobilization of splenic iron stores for erythropoiesis.

Keywords: Obesity, Iron deficiency, Ferroportin, Hepcidin.

144/2852

ENTERAL NUTRITIONAL THERAPY IN HOSPITALIZED PATIENTS: EFFECTIVENESS IN DIET ADMINISTRATION?

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Background and objectives: Hospital malnutrition is very prevalent, especially in patients receiving Enteral Nutritional Therapy (ENT), due to several factors such as inadequate and ineffective diet administration, lack of monitoring by the team, among others, which may complicate the Clinical picture of the patient, increasing the hospitalization time. The objectives of this study were to evaluate the nutritional status and the effectiveness in the administration of enteral diets in hospitalized patients.

Methods: A cross-sectional study with adults and elderly individuals over 20 years old in a hospital in Taubate, Sao Paulo, between August 2015 and April 2016. All patients under ENT were selected. It was considered as effective dietary administration when the prescribed diet was completely infused, reaching 100% of the nutritional needs of the patient. To evaluate the effectiveness of diet administration, the dietary prescription, the volume of diet programmed in the infusion pump as a function of time, as well as information obtained by the patient's chart, nursing professionals, physicians and the multidisciplinary team for nutritional therapy. The mean time attributed to interrupting the diet was also verified. For nutritional status assessment, arm circumference was measured, and compared to the reference values demonstrated by Frisancho (1990), and adequate according to Blackburn and Thomton (1979). Descriptive statistics were performed for data analysis.

Results: Among the 135 patients evaluated, 56.3% (n = 76) were males, while the median age for this sex was 76.5 ± 12.3 years and for females 68.5 ± 10.2 years old. Regarding the nutritional status, 72% of the evaluated patients presented some degree of malnutrition. Regarding the diet administration, it was effective in 78% of the sample. Regarding the 22% of the patients who did not receive the prescribed diet, it was observed that there was interruption of diet for at least 2 hours. Among the patients who did not receive the diet effectively, 80% were malnourished.

Conclusions: It is concluded that the majority of the sample was found to be malnourished, and the enteral diet infusion was not effective for all patients. Therefore intervention measures should be adopted and implemented, helping to prevent hospital malnutrition.

Keywords: Enteral Nutritional Therapy. Enteral Nutrition. Hospital Malnutrition. Diet Management. Diet Infusion.

Further collaborators:
Rafella Teixeira da Silva Chagas Monteiro, Ariane Nunes Novais Calisto and Livia Resende de Aguiar helped to implement the

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study and data collection. Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

144/2861

FOLLOW UP OF CHILDREN WITH CLASSIC PKU DIAGNOSED BY NEWBORN SCREENING PROGRAM IN CHILE: 24 YEARS OF EXPERIENCE

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Background and objectives: Phenylketonuria (PKU) is a metabolic disease characterized by increased plasma levels of phenylalanine (Phe) which causes mental retardation. Through the National Neonatal Screening Programme for PKU; 248 cases are diagnosed with classical PKU, 46% of the patients are older than 10 years old, which poses important challenges regarding adherence to treatment and PKU Maternal Syndrome prevention.

Methods: The treatment consists in restricting Phe intake, providing Phe-free formula, medical and nutritional assessments, psychometric (Weschsler Bayley Scale) and biochemical evaluations (MS/MS).

Results: Average age of diagnosis: 17.6 ± 9.5 days, with initial values of Phe: 18.5 ± 8.9 mg / dl and Tyrosine: 1.2 ± 0.7 mg/dl. Current age range (1 month to 24 years). The average diet provides 15.5 ± 10 mg Phe/kg/day, 2.1 ± 0.7 g protein/kg/day (80% of the formula), 1330 ± 441 kcals/ ay. 71% of the PKU patients maintains blood FA values under 6 mg/dl (good metabolic control), there was a significant correlation (p <0.01) with IQ. The 89% of PKU have normal IQ, 9% borderline and 2% boundary slight delay. The 61% have normal nutritional status, 19% are overweight, 15% are obese and 5% is underweight.

Conclusions: The PKU population may show normal growth and development because of neonatal diagnosis and strict long-term follow-up.

Keywords: Phenylketonuria, Metabolic control, Treatment.

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TREATMENT WITH PASSION FRUIT (PASSIFLORA EDULIS F. FLAVICARPA DEGENER) AND ITS EFFECTS UNDER INDUCED HYPERCHOLESTEROLEMIA IN RABBITS

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Background and objectives: The passion fruit (Passiflora edulis f. flavicarpa Degener) has been studied and several researches works the pharmacological and therapeutic properties both for its calming action and its action in hyperlipidemias. Thus, this work verified the possible relation of passion fruit to a caloric diet and the cholesterol level in rabbits with induced hypercholesterolemia.

Methods: The experiment was carried out in rabbits divided into three groups: G1 (without treatment), G2 (commercial passion fruit treatment) and G3 (remedy treatment - simvastatin). The experimental protocol was divided in three phases: 1) was offered normal ration to evaluate the basal level of cholesterol; 2) was offered supplemented ration with egg yolk to obtain hypercholesterolemia; and 3) continued with supplemented feed and daily G2 and G3 rabbits were treated with pulp and passion fruit seed (30g) and medicine (10g), respectively.

Results: The data indicate a decrease in the average feed intake in the animals of the 3 groups, analyzed during the experiment: G1 was 35.77%, G2 was 38.25% and G3 was 31.01%, but without altering the growth and weight of animals. The results of analyzes of total cholesterol level of the animals showed that in phase 1 it was approximately 80.00mg.dL-1; a significant increase in phase 2 (for 151.2mg.dL-1 in G1, 105,9mg.dL-1 in G2 and 116,1mg.dL-1 in G3); and in stage 3 a reduction to 84.5mg.dL-1 in G2 and to 82.2mg.dL-1 in G3 with treatment, while G1 continued with elevation to 182.7mg.dL-1. The increase in cholesterol level in phase 2 proves that the egg yolk diet was efficient in developing hypercholesterolemia and in phase 3 (in G2 and G3 animals), it is clear that the treatment with passion fruit and with the allopathic medicine reduced plasma cholesterol (21% and 29%, respectively).

Conclusions: Passion fruit intake did not change the weight of the animals as it increased progressively and in the same proportion throughout the experimental phases and may be an alternative in the treatment of high cholesterol compared to conventional treatment.

Keywords: Passion fruit. Hypercholesterolemia. Simvastatin. Rabbits.

144/2884

SALT AS MICRONUTRIENT CARRIER FOR SAVING LIVES AT BIRTH

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Background and objectives: Deficiency of micronutrients in the diet is a major contributor to maternal and infant mortality, birth defects and development problems . These widespread deficiencies can be readily addressed through food fortification. Unfortunately a very large proportion of rural poor do not participate in the purchase of processed foods, and are not reached by basic fortification programs for flour, bread etc. Salt is an ideal carrier for micronutrients as it is universally consumed in predictable, uniform quantities. Unfortunately salt cannot be directly fortified with combinations of micronutrients. We developed appropriate technologies for multiple fortification of salt,

Methods: Salt has been fortified with different combinations of iodine, iron, zinc, folic acid, and B vitamins. To prevent interactions among the micronutrients, especially iron and iodine, we developed technologies for microencapsulating iron alone and in combination with zinc and vitamin B12 to form a solid premix that can be admixed to salt. We have developed stable spray solutions that contain iodine, folic acid and other B vitamins that can be sprayed onto salt using currently installed iodization equipment.

Premixes and spray solutions as well as salt prepared with them were stored at elevated temperatures for up to a year.

Results: Stable solid premixes were prepared by extruding ferrous fumarate, colour masking it with titanium dioxide, alone or in combination with zinc oxide, and overcoated with a moisture resistant edible coating . The premix was blended with salt at a ratio of 1:200, and sprayed with the combined spray solutions that were pH adjusted and stabilized

The salts retained <80% of the added iodine and vitamins for at least six months at 45°C, <60% RH.

Conclusions: Salt multiple fortified with stable agglomerated and coated premixes and stable spray solutions can provide 30-100% of critical micronutrients at a cost of ≤25US¢ per person per annum, and can reach populations that do not purchase manufactured food products. Salt is a versatile, simple and inexpensive carrier for micronutrients, when combined with appropriate technologies for maintaining organoleptic qualities of food and stability of micronutrients.

Keywords: Salt, Micronutrients, Deficiencies, Fortification, Premixes.

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ASSOCIATION BETWEEN FAT INTAKE AND THE RISK OF BREAST CANCER: A CASE-CONTROL STUDY

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Background and objectives: This case-control study aims to evaluate the association between dietary fat intake and the risk of breast cancer (BC).

Methods: The dietary intake assessed using "Food Processor" in 31 women newly diagnosed with BC and 39 healthy women. A descriptive approach collected relevant data such as nutritional status, sociodemographic and anthropometric characteristics, and lifestyle of subjects. Comparisons between cases and controls carried out by simple t-tests and statistical correlations conducted between lipid intake and dietary parameters.

Results: The calorie intake is significantly lower (1699±527 vs. 2221± 799 kcal; $p<0.05$) in the subject group vs the control group. The same results are observed with the averages in the protein intake (75± 30 vs 99±36 g; $p<0.05$), carbohydrates (230±73 vs 294±123 g; $p<0.05$), and dietary fibre (21±11 vs 31±14 g; $p<0.05$). No significant association between dietary fat intake and the risk of breast cancer is observed: total fatty acids (68 ± 31 vs 77±36 g), saturated fatty acids (19±12 vs 21±11 g), monounsaturated fatty acids (23±13 vs 27±17 g), polyunsaturated fatty acids (12±8 vs 14± 9 g), or cholesterol (213±177 vs 225±130 mg).

Conclusions: Our results do not support a positive relationship between fat intake and BC.

Keywords: Lipid intake, Dietary assessment, Breast cancer.

Further collaborators: A Khalil. PhD. Université de Sherbrooke.

IS THE TIME SPENT FETCHING WATER ASSOCIATED WITH CHILDREN'S ANTHROPOMETRIC INDICATORS STATUS? A COMPARATIVE STUDY OF ETHIOPIAN, MALAWIAN AND ZAMBIAN MOTHERS WITH CHILDREN UNDER 5

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Background and objectives: Women's access to water and the time they spent carrying water have implications for maternal and child health status; however, little is known about the association between mothers' time fetching water and children anthropometric indicator status. This study aims to fill the existing knowledge gap.

Methods: The main objective of this paper is to study the association between the amount of time mothers spent carrying water and children anthropometric indicators such as, wasting, stunting, underweight and BMI for age.

Data from three surveys carried out in Ethiopia on 2016, Malawi and Zambia on 2017 were used in this article.

Different statistical analyses such as, descriptive, bivariate and linear regression analyses were used to examine the association between the time mothers spent fetching water and each of anthropomeric indicator status by adjusting children's sex, age, community water supply and mothers' decision making.

Results: Findings of unadjusted linear regression analyses showed negative associations between the time spent fetching water and wasting, stunting, and underweight. But, results of adjusted model revealed that time spent of carrying water is not the final determinant of anthropometric indicators, and children's sex, age, and mothers' decision making were significantly associated with stunting, wasting, and underweight.

Conclusions: Overall, our study found that children's characteristics and maternal decision making influence the anthropometric indicators.

Keywords: Water access, Time fetching water, Children's anthropometric indicators, Ethiopia, Malawi, and Zambia.

ASSOCIATION OF SALT AND POTASSIUM INTAKE ASSESSED BY URINARY EXCRETION OVER 24-HOUR AND BLOOD PRESSURE: A CROSS-SECTIONAL ANALYSIS FROM A POPULATION COHORT

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Background and objectives: Globally, a positive association between sodium consumption and blood pressure has been pointed out. Therefore salt reduction has been recommended as a strategy to reduce population BP levels. Twenty four hour urinary sodium analysis is considered the "gold standard" to estimate sodium consumption, although collection is difficult and cumbersome. In Uruguay, consumption of salt is estimated from national dietary surveys, without considering potassium. The aim of this study is to assess sodium and potassium urinary excretion as surrogate of salt and potassium intake and its main dietary sources in a local population sample, and its relationship with blood pressure.

Methods: Participants form GEFA (Genotype Phenotype and Environment of Hypertension in Uruguay) Study recruited until September 2016 were included. Electrolytes excretion was measured from 24-hour urinary collection, and creatinine excretion (mg/Kg/day) used to validate completeness of urine collection (>13 in women, >15 in men). Blood pressure was considered average of 5 consecutive conventional measurements. Dietary sources of electrolytes were assessed using a food frequency questionnaire.

Results: Form 394 recruited participants, 350(89%) complete urinary collection. From these, only 176(50%) completed valid urine collection. Table shows principal characteristics.

Sodium intake >2g/day was present in 92% of participants (men: 97%; women: 87%). Main dietary sources of sodium were processed meats (21%), sausages (12%) and bread (24%). Most of participants (93%) had potassium intake below 3.5 g/day, being major sources: mate (ilex paraguariensis) drink (29%), milk (13%) and meats (10%). Multivariable analysis in participants without hypertension treatment (n=137), showed a positive association between sodium intake (adjusted by age, sex) and systolic (r=0.18, P=0.033) or diastolic (r=0.21,P=0.011). Linear regression showed per each gram of sodium intake, an increase in systolic and diastolic blood pressure by 1.6 (R2= 0.22, P=0.032) and 1.2 mmHg (R2= 0.15,P=0.011) respectively. Potassium intake and systolic blood pressure were not associated (r=0.11,P=0.17): a trend was observed for diastolic blood pressure (r=0.17, P=0.05).

Conclusions: Less than 50% of participants completed valid urinary collection. Mean salt intake (9.2 g/day) was lower than world estimates (~9.9g/day). Nevertheless, mean sodium intake was over and potassium intake below WHO recommendations. A positive association was found between sodium intake and blood pressure.

Keywords: Urinary sodium, Urinary potassium, Intake, Blood pressure.

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DEFINITION AND INDICATORS OF ADHERENCE TO NUTRITIONAL TREATMENT IN PATIENTS WITH METABOLIC SYNDROME

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Background and objectives: Backgrounds and objectives: In recent years, diseases related to lifestyle, especially obesity and associated non-communicable diseases (NCDs), have reached global epidemic levels. Adherence to nutritional treatment, as well as other preventive actions, may help modifications of lifestyle-dependent risk factors that could control these diseases. The aim of the study is to define the adherence to nutritional treatment in patients with metabolic syndrome identifying the indicators that measure adherence to treatment.

Methods: Delphi´s Method was the investigation technique use for the study. 24 experts in non-chronicle diseases nutritionists begin the process, 16 finish it. Four consultation instances were held. The first one required a definition of the experts of what is nutritional treatment adherence in patients with metabolic syndrome. Based on the answers, the researchers elaborated three definitions and a list of contributions to the topic that were, in a second query, put into experts consideration. In the third query, a consensual definition was created. In addition, a list of indicators was requested. In the fourth query, agreement or suggestions of the indicators list were requested.

Results: An adherence to nutritional treatment definition was obtained, including the patient's perspective, the personalized treatment performed by the professional and the indicators that allow adherence to be measured.

Conclusions: The obtained definition and the indicators allowing adherence assessment will enable an instrument that facilitate patience adherence to nutritional treatment.

Keywords: Nutritional treatment adherence, Metabolic syndrome patients, Delphi´s Method.

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HOSPITAL MENU: ASSESSMENT OF NUTRIENT COMPOSITION AND PATIENT SATISFACTION

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Background and objectives: At best, menus fail to be noticed by administrators and ministries when determining overall satisfaction of a patient's hospital experience. Patient satisfaction with hospital food enhances consumption to facilitate adequate intake of nutrients required for recovery. The nutrient content of the menu must balance patient preferences. This study of Ontario hospital foodservice departments determined the prevalence/frequency and methods of menu analysis, nutrients assessed and criteria to determine and provide amounts required for health or foster recovery from illness/injury, methods and frequency of assessing patient satisfaction.

Methods: A review of manuscripts, government documents on hospital services, hospital resources and popular media identified current practices and focused on legislation/standards for menu planning. Survey questions were then developed based on perceived gaps and the researchers' work experiences. Foodservice managers and directors from 57 Ontario hospitals were included in a cross-sectional in-depth telephone survey. Respondents were asked close- and open-ended questions to explore barriers, issues and priorities. Responses to open-ended questions were captured in an Excel spreadsheet and deductive analysis was done to supplement quantitative data.

Results: Of the 140 hospital corporations, 45 foodservice managers from academic hospitals, hospitals with <100 beds and hospitals with ≥100 beds participated in the survey together with 12 managers working in hospitals governing long-term care facilities. Findings indicate that more than or almost half of the hospitals assessed regular, therapeutic and texture modified menus for nutritional adequacy. This differed from hospitals governing long term care facilities where 75 % of regular menus were assessed. Most departments obtained patient satisfaction feedback at departmental and corporate levels.

Conclusions: Inconsistency in practice disables foodservice leaders to identify trends or compare their results to similar facilities. They are challenged to provide high quality regular, therapeutic and texture modified menus for patient satisfaction and quality nutritional care within available resources and nutritional standards. The study suggests the importance of establishing evidence-based standards for assessing nutritional adequacy and patient preferences in Ontario hospitals to assist foodservice leaders in creating or modifying hospital menus.

Keywords: Hospital foodservice, Patient satisfaction, Hospital menu analysis, Long-term care menus, Nutritional adequacy.

Track 5: Nutrients and Nutritional Assessment

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PREDICTIVE EQUATIONS FOR INDIAN WOMEN TO CALCULATE BODY FAT PERCENT (BF%)

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Background and objectives: Obesity is defined as a condition with an excess accumulation of fat in the body. There are various tools and techniques to assess body fat i.e. laboratory methods and anthropometric indices. The latter has benefit over laboratory techniques as they are simple to use in field setting. However, the accuracy of the same in estimating BF% is debatable. Therefore, the objective of present study was to develop predictive equations using anthropometric measurements to calculate BF%.

Methods: A cross-sectional study was conducted in South Delhi area on 320 subjects (through purposive sampling). The women who were pregnant, habitual smoker, morbidly obese, suffering from thyroid disorder or any other persistent health problem and having irregular menstrual cycle were excluded from the study. The data was collected on basic descriptives, height, weight, waist circumference (WC), hip circumference (HC) and BF% (assessed using Bioelectrical Impedance Analysis method – BIA) of the subjects. The multiple linear regression analysis was done on 261 subjects using SPSS 23.0 version.

Results: The results from Kolmogorov-Smirnov Test showed that the data was normally distributed under the study. The predictive equations were formulated from multiple regression analysis using anthropometric measurements which are highly correlated with BF% (p-value < 0.05). These are:

BF% = (0.444*WC) + (0.065*Age) – 5.204
BF% = (0.506*HC) + (0.149*Age) – 20.970
BF% = (0.584*Height) + (-0.478*Weight) + 74.299

From the regression analysis it was evident that 90.8% variation in BF% was attributed by height and weight of an individual.

Conclusions: The study developed predictive equations for Indian women using anthropometric measurements that can provide an estimate of BF% more effectively than anthropometric indices like BMI, FMI etc. The combination of anthropometric measurements and age provides good combinations that are not only easy to measure but also these can be used in clinical and anthropometric studies.

Keywords: Body Fat Percent (BF%), Predictive equations

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IMPLEMENTATION OF NUTRITION-SENSITIVE AGRICULTURE IN THE CENTRAL PROVINCE OF ZAMBIA

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Background and objectives: The Central Province of Zambia contains the majority of the nation's malnourished children, despite being the most productive province in terms of Agriculture. Most studies in the province have not paid attention to the linkages between agriculture performance and nutrition outcomes of the population. In light of this knowledge gap, this study focused on the linkage between nutrition and agriculture. In 2010 the Ministry of Agriculture in the Central Province while working with Non-Governmental Organizations (NGOs), the Ministry of Health and the Ministry of Education started a pilot project in Kapiri-Mponshi on Orange fleshed Sweet Potatoes and Orange Maize and educating farmers on the importance of crop diversity.

Methods: The study assessed the extent to which the small scale farmers are implementing the best practices of nutrition-sensitive agriculture in the Central Province. This study sought to determine the association of crop diversity and nutritional status of children aged 6-59 months in Kapiri-Mposhi district in the Central Province of Zambia. A cross-sectional descriptive study was conducted using a structured questionnaire. A total of 365 households were randomly sampled and the nutritional status of one child from each household assessed using anthropometric measurements. A total of 100 children were included in the study.

Results: Up to 21% of the children were stunted; 2% were wasted; and 9% underweight. There was a significant relationship between crops grown in households (ground nuts, mangoes and orange-fleshed sweet potatoes) and Z-scores for stunting (HAZ) and underweight (WAZ) (p<0.05).

Conclusions: This study has established that farmers may not diversify if they have high market demands on the staple.

Keywords: Agriculture, Crop diversity, Children, Nutrition.

CAUSAL ANALYSIS OF UNDER-NUTRITION IN JEJU AND MELKA BELO DISTRICTS OF OROMIA REGION OF ETHIOPIA

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Background and objectives: Under-nutrition has been one of the main health problems in Ethiopia. The poor nutritional status in children and women is a consequence of multiple factors. Mainly, inadequate nutrient intake and illness and some underlying conditions being compounded by factors related to socioeconomic conditions. World Vision Ethiopia has been supporting both districts with various emergency relief and development projects. However, the districts faced concurrent malnutrition problems and often classified as hot spot 1 and 2. The current study was, therefore, to assess the magnitude of under nutrition in children 6–59 months and to identify key factors and generate evidence-based responses to address the determinants.

Methods: Both quantitative and qualitative data collection methods were applied. For quantitative data, household questionnaire was used in selected 640 households and for qualitative, 20 key informant interviews and 13 Focused Group discussions (FGD) along with secondary data review were carried out. ENA and SPSS softwares were used for cluster selection, data entry and analysis.

Results: The result of SMART study showed that the assessed areas had a high prevalence of malnutrition. The prevalence of Global Acute Malnutrition (GAM) was estimated at 16.4%, with Severe Acute Malnutrition (SAM) 4.1 % and stunting, 33.2 %.

It was found that, 55% of mothers expressed and disposed colostrum thinking that it is not good and over 77% of children were introduced complementary foods late. The mean dietary diversity score was 4.9 and 94% of children never consumed meat and and only 30% consumed vegetables and 24% fruits. More than 35% drink water from unprotected sources and 62.5% of them do not treat. About 56% reported that they had less than 1 hectare farmland.

Conclusions: Under nutrition is one of the most important public health problem in the study area. Despite the long years intervention, GAM and SAM rate was still at serious stage. The factors significantly related with wasting and stunting include high maternal illiteracy rate, shortage of farmland, poor child care practices, insufficient agricultural production, poor diet diversity, poor hygiene and sanitation practices, which all need to be given due attention to define priorities for action.

Keywords: Wasting, Stunting, Complementary feeding, Diet diversity, Severe Acute Malnutrition, Breastfeeding.

ASSOCIATION BETWEEN MANGANESE INTAKE AND BODY MASS INDEX IN A POPULATION BASED SURVEY IN SÃO PAULO, BRAZIL

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Background and objectives: Manganese plays an essential role in metabolism, activating mitochondrial enzymes, especially those involved in β-oxidation. The functional impairments of this pathway may lead to incomplete catabolism of amino acids, and promote triglycerides synthesis, consequently, increasing adipose tissue. The aim of this work was to investigate the association between manganese intake and obesity in a population-based study.

Methods: The dietary intake data, a 24hR of 832 adolescents and adults, were obtained from the "Health Survey of São Paulo" (ISA-Capital 2008), a population based cross-sectional survey in Brazil. Linear regression was used to verify the relationship between manganese intake and Body Mass Index (BMI), adjusting by energy intake, age, sex, race, and physical activity. In this model, the energy adjusted manganese intake (independent variable) was log-transformed. It was considered the p-value ≤ 0.05 for statistical significance. The multicollinearity between the predictors variables were verified by the variation inflation factor (VIF).

Results: Manganese intake was negatively associated with BMI (β= -1.30; p=0.031, VIF=1.46), suggesting a BMI decrease of 0.013 units for every one percent increase in manganese intake.

Conclusions: In conclusion, considering the relationship with manganese and mitochondrial metabolism, the low manganese intake could make changes in the metabolism of carbohydrate, cholesterol, and amino acids, by impairing the manganese metalloenzyme activity. These metabolism changes could reflect the metabolism alteration related to the obesity.

Keywords: Manganese intake. Body Mass Index. Obesity. Metabolism.

SUBJECTIVE GLOBAL ASSESSMENT FOR THE DIAGNOSIS OF PROTEIN–ENERGY WASTING IN PERITONEAL DIALYSIS PATIENTS

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Background and objectives: Subjective global assessment (SGA) has been demonstrated to be a reliable method for protein–energy wasting (PEW) in CKD patients. Few data are available on PEW evaluation in chronic peritoneal dialysis (CPD) patients. This study has two purposes, (1) the prevalence of PEW by 7 point SGA; (2) the correlation between SGA and PEW.

Methods: This study enrolled 146 patients (71 males and 75 females) from the PD unit of National Cheng Kung University Hospital, Tainan, Taiwan. Patients were divided into a PEW and non-PEW groups. We measured anthropometric, 7-points SGA, biochemical parameters, body composition.

Results: PEW was present in 57 (39%) patients, Among the SGA components, the most frequent abnormality in patients with PEW were appetite, GI function, activity, stress, muscle score, and total SGA score (P< 0.0001). Hb, HCT%, serum albumin, potassium, uric acid were lower in PEW (P< 0.05). In body composition, lower fat% and higher water % of total body and lean mass in PEW patients (P< 0.05). 32 patients with severe and mild malnutrition (SGA 2~4 score) had 24 (75%) patients with PEW, 46 patients with SGA 5 score had 21(46%) patients with PEW, 68 patients with SGA 6~7 score had12 (18%) with PEW.

Conclusions: The prevalence of PEW was 39% in our CPD patients, malnutrition from SGA score can reflect the status of PEW in CPD patients.

Keywords: Subjective global assessment, Protein–energy wasting, Chronic peritoneal dialysis.

Conflict of Interest Disclosure: Subjective global assessment is a very practical method in assessing overall nutrition and protein-energy wasting. it can be fast and easy diagnosis for protein-energy wasting in diialysis patients. Subjective global assessment is promoted and practical method in peritoneal dialysis patients.

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HOW DIFFERENT IS THE DIET OF OBESE PATIENTS COMPARED TO THE NORMAL WEIGHT PEOPLE?

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Background and objectives: According to World Obesity Federation, in 2025 there will be 2.7 billion adults suffering from overweight and obesity, up from 2 billion in 2014. We need to see how different is the diet of obese patients compared to normal weight subjects in order to make adequate nutritional advises to obtain or to maintain a healthy weight and diet.

Methods: A sample of 199 subjects, 54 normal weight patients and 145 obese people were investigated. Anthropometric and paraclinic data, biological samples and nutritional assessment were made. Using a 7-day food self-recorded questionnaire, we evaluated the nutritional content of food intake: carbohydrates, proteins, lipids, vitamins A, B1, B2, B3, B5, B6, B12, C, D, E, folic acid, and minerals like calcium, iron, magnesium, phosphorus, zinc, copper, manganese, selenium, and sodium. We measured resting metabolic rate using the indirect calorimetry.

Results: As we expected, the differences between the two samples were regarding the weight, body mass index, body fat, percent of body fat, the resting metabolic rate, abdominal circumference and blood pressure.

We found plasma HDL cholesterol in normal ranges more frequently in patients with normal body weight compared to obese subjects (78.79% vs 58.47%, p = 0.03). In 3.81 % of obese patients we found a small, significant, negative correlation between the HDL cholesterol plasma levels and the intake of iron from diet.

All the patients had a high fat, high protein, low carb diet, without significant differences between the two groups.

Regarding the vitamins, the only significant differences were about the mean intake of B1 (thiamine) and B3 (niacin) vitamins.

Obese subjects consumed higher amounts of phosphorus, iron, copper and selenium.

Conclusions: None of the patients, neither normal-weight nor obese, had a balanced diet regarding the intake of macro-nutrients, vitamins and minerals. There are some significant differences between the groups regarding micro-nutrients but not regarding macro-nutrients.

We need to pay more attention to nutritional recommendation in both normal weight and obese people in order to not exceed the recommended daily doses.

Keywords: Obese, Diet, Vitamins, Minerals, Normalweight.

ASSOCIATION BETWEEN DIETARY SERINE IN- TAKES AND TYPE 2 DIABETES AMONG CHINESE ADULTS IN HARBIN, CHINA

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Background and objectives: Serine (Ser) is a non-essential amino acid associated with metabolic disorders. For example, significantly lower levels of serum Ser has been reported among Type 2 diabetes (T2D) subjects. However, the relationship between dietary Ser intakes (DSI) and risk of T2D is scarcely known. In this study, we evaluated DSI and risk of T2D among normal weight Chinese adults.

Methods: 3006 adults (BMI<24.00kg/m2 and WC<85cm (men)/< 80cm (women)) from the Harbin Cohort Study on Diet, Nutrition and Chronic Non-Communicable Diseases Study (HDN-NCDS) initiated 2010 in Harbin, China participated after duly informed consent. Socio-demographic and lifestyle characteristics (SLCs), anthropometry, habitual dietary intake in the last 12 months preceding the study and fasting blood samples were assessed using standard methods. Ser and nutrient intakes of food item consumed were evaluated by multiplying the mean daily consumption of each food by Ser content of a specified amount according to the Chinese food composition table and adjusted for total energy intake using the residual method. T2D was defined as respondents self-reporting diagnosis of T2D (or on glucose lowering medications) and/or FBG ≥ 7.0mmol/L or 2h-PG ≥ 11.1mmol/L (ADA criteria). SLCs were compared across quartiles of DSI, odds ratio (OR) and 95% confidence interval (CI) of T2D status by quartiles of DSI was assessed using logistic regression at P<0.05.

Results: Prevalence of T2D among men (13.0%) was significantly higher ($\chi 2$=14.8, P=0.000) compared to women (8.0%). Mean age was insignificantly different (F=1.68, p=0.168) across quartiles of DSI. Mean±SD of DSI among men (3.43±1.54g/day) was significantly higher (t=6.04, P=0.000) compared to women (3.01±1.43g/day). With adjustment for potential dietary (energy and protein intakes) and non-dietary (age, education, smoking, alcohol intake, physical activity, and family history of T2D) confounders, OR (95% CI) of T2D status among subjects in the 4th quartile of DSI (1st quartile as reference) were 1.060(0.358–3.135);

P=0.916 and 2.220 (1.117–4.413); P=0.023 among men and women respectively.

Conclusions: Our data suggests higher DSI appears associated with higher prevalence of T2D, especially among women. Further studies are necessary to explore the role DSI in T2D.

Keywords: Dietary Serine Intakes, Type 2 Diabetes, Logistic regression, China.

TEST-RETEST REPRODUCIBILITY OF DIETARY PATTERNS ASSESSED WITH A FOOD FREQUEN- CY QUESTIONNAIRE (KOMPAN): STUDY IN POL- ISH ADOLESCENTS AND ADULTS

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Background and objectives: Deriving and interpreting dietary patterns (DPs) is a common approach to assess the diet-disease relationship[1,2]. Estimation of the reproducibility of each newly developed questionnaire is necessary. The aim of the study was an assessment of the test-retest reproducibility of dietary patterns assessed with a food frequency questionnaire (KomPAN).

Methods: The study involved 517 subjects aged 15-64 years. The self-administered KomPAN was used. The interview was repeated after two weeks. The consumption frequency of 33 food groups was analysed. Dietary patterns (DPs) were derived by PCA.

Results: Two major DPs were identified and were similar in both FFQs (test-retest). The Prudent DP was characterized by high frequency of consumption: fermented milk drinks, cottage cheese, vegetables, fruit, cereals, fish, legumes, wholemeal bread, milk, refined grains, water; while the Westernised-Polish DP was characterized by high frequency of consumption: sweetened beverages, instant soups, fried foods, potatoes, energy drinks, cheese, red meat, white bread. Agreement of tertile categorization in test-retest responses was 73.1% for Prudent, 72.0% for Westernised-Polish. Misclassification to the extreme tertile categories for both DPs was 2.1% and 3.5%.

Conclusions: We found good test-retest reproducibility of both DPs derived from the FFQ data. The KomPAN questionnaire is an adequate tool to use in nutritional epidemiologic studies among Poles.

References: [1]Hu FB et al. Reproducibility and validity of dietary patterns assessed with a food-frequency questionnaire. Am J Clin Nutr,1999,69:243-249.

[2]Parr CL et al. Test-retest reproducibility of a food frequency questionnaire(FFQ) and estimated effects on disease risk in the Norwegian Women and Cancer Study(NOWAC). Nutr J,2006,5:4.

Keywords: KomPAN questionnaire, FFQ, Test-retest reliability, Dietary pattern, Adults.

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ANTHROPOMETRIC INDICES AND THE EFFECT OF EXERCISE ON SOME URINARY ANALYSIS AMONG ADOLESCENTS IN SECONDARY SCHOOLS IN NSUKKA LOCAL GOVERNMENT AREA, ENUGU STATE, NIGERIA

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Background and objectives: Anthropometrics can be a sensitive indicator of health, growth and development in infants and children. Exercise physiology is concerned with the description and explanation of the changes that occur in human body during single or repeated bouts of muscular exercise.This study was aimed at assessing the anthropometric indices and the effect of exercise on some urinary analysis among adolescents in secondary schools in Nsukka Local Government Area.

Methods: A cross-sectional survey design was employed. A multistage sampling technique was used to select 200 adolescents aged 10-19 years from 8 (3 boys and 5 girls) secondary schools. They were randomly selected without replacement. Questionnaire was used to obtain information on the socio-economic status, food consumption pattern and physical activity level (PAL) of the subjects. Anthropometric measurements (weight, height, waist and hip circumferences) of the adolescents were obtained using standard procedures. Body Mass Index and waist-hip ratio were used as an indicator of obesity in terms of over fatness. The measurements were calculated and compared with WHO (2007) reference standard. Data obtained were coded and entered into the computer and analyzed using the Statistical Product for Service Solution (SPSS), version 21. Descriptive statistics (frequencies, percentages, means and standard deviation) were used to examine the anthropometric indices.

Results: About 13% of the respondents were overweight, 5% was severely underweight and 1% was obese. More than a quarter (28.5%) of respondents was at risk of abdominal obesity. All of the boys and 96% of girls were hypervolemic before exercise and after exercise. All the respondents had hypernatremia. Only 8% and 4% of girls showed the presence of impairment of renal function and were hypoalbuminemic before and after exercise. Eight percent of boys and 28% of girls were microalbuminemic before exercise while 78% boys and 20% girls were microalbuminemic after exercise.

Conclusions: Malnutrition prevalence exists amongst the adolescents. Urinalysis results of the adolescents showed some abnormality in the urine before and after the excercise.

Keywords: Urinalysis, Adolescents, Anthropometry, Exercise, Effect.

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MEASURING ADIPOSITY AMONG WOMEN IN NAROK COUNTY, KENYA: COMPARISON BETWEEN BODY MASS INDEX, WAIST-HIP RATIO, WAIST CIRCUMFERENCE, FAT MASS INDEX AND PERCENTAGE FAT MASS

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Background and objectives: There is an increase in the prevalence of overweight and obesity among women in sub-Saharan Africa and there is need for a reliable and validated measure to provide the policy makers with data for timely intervention. Body mass index (BMI), waist circumference (WC), waist-hip ratio (WHR), percentage fat mass (%FM) and fat mass index (FMI) are some of the measures of adiposity. Objective: The aim of this study was to assess overweight using the different measures and to evaluate the association between these measures of adiposity to guide measurements among women in Kenya.

Methods: Our study sample was selected randomly among women aged 15-45 years. Anthropometric measurements were taken to assess BMI, WC, WHR and deterium oxide dilution solution was used to measure total body water and to assess body composition (% FM and FMI).

Results: Using WC as a measure of adiposity, the numbers of overweight women was high (46.4%) compared to BMI (21.4%) and WHR and FMI which had the same results (28.6%). Overweight was high among married and older women in all measures. Post primary education indicated significantly higher overweight than those with less education using BMI (p<0.05), FM (p<0.01) and FMI (p<0.005). FMI and FM correlated significantly with all the other measures (p<0.001) except WHR. Regression coefficients indicated a stronger association between BMI and all other measures (p< 0.001) except WHR (r2 = .15, p<0.05).

Conclusions: More than one measure is needed to assess overweight among women where proper cut-off points are not available.

Keywords: Body mass index, Fat mass, Adiposity, Sub-Saharan Africa, Women.

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VALIDATION OF PREDICTION EQUATIONS OF BASAL METABOLIC RATE BY INDIRECT CALORIMETRY IN PATIENTS WITH TYPE 2 DIABETES

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Background and objectives: Assessment of basal metabolic rate (BMR) is a fundamental activity in clinical dietetic practice. The aim of this study was to investigate the predictive equations which BMR are the best alternatives to the indirect calorimetry (IC) in patients with Diabetes Mellitus (DM) type 2.

Methods: Diagnostic test study in 21 patients with type 2 diabetes [age 62 (48-70) years; diabetes duration 8 (2-36) years; 52.4% of females]. Patients underwent clinical and laboratory evaluations. The body composition was measured by absorptiometry dual X-ray emission and BMR by IC. BMR was also tested by seven equations based on the age, weight, height, fat mass and glycemic control. Statistical analysis included paired t tests, correlation coefficients and Bland–Altman plots.

Results: Our results demonstrated a wide variation in the accuracy of BMR predictive equations and the CI. The equations reported by Harris-Benedict, Oxford and FAO / WHO / UNO were the ones with the lowest significant differences in relation to IC and presented a bias <8%. However, the equation that most closely approached the real BMR measured by CI was that proposed by FAO / WHO / UNO, underestimating -5.4% Kcal / day.

Conclusions: In patients with type 2 diabetes, the present study indicates that the equation of the FAO / WHO / UNO which includes gender, age and weight in the equation was the one closest to the BMR values measured by CI.

Keywords: Indirect Calorimetry; Basal Metabolic Rate; Type 2 Diabetes Mellitus.

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NUTRITIONAL STATUS AND FUNCTIONAL CAPACITY IN HOSPITALIZED ONCOLOGICAL PATIENTS

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Background and objectives: Malnutrition is an important and prevalent dysfunction in cancer patients. Methods of nutritional assessment and functional capacity can identify the nutritional status by collaborating for a more adequate and early nutritional therapy in these patients. The aim of study was to evaluate the nutritional status and functional capacity of adults hospitalized oncological patients.

Methods: Cross-sectional study in 54 hospitalized patients. Patients were evaluated according to the presence of Solid Tumors (ST) and Hematologic Tumors (HT). The nutritional status was identified by Subjective Global (SGA) and Patient-Generated Subjective Global Assessment (PG-SGA) and functional capacity by the Handgrip Strength (HGS) and the Performance Status of the Eastern Cooperative Oncology Group (PS-ECOG). Kappa concordance and Sperman correlation tests were performed to evaluate the results.

Results: Patients had 52.3 ± 17 years old and 35.2% female. SGA showed that patients with HT had a higher prevalence of malnutrition when compared to ST patients (71.4 vs. 16.7%, respectively; p = 0.001). On the other hand, PG-SGA identified a high prevalence of malnutrition in both ST patients (51.4%) and HT patients (44.0%). Functional capacity instruments demonstrated that 35.2% of the patients had reduced HGS and that 33.3% had significant functional limitation (PS-ECOG ≥2). The agreement analysis identified a strong and significant agreement between the SGA and PG-SGA nutritional assessment methods (Kappa = 0.634, p <0.001). However, it did not observe agreement of the methods of nutritional evaluation with the HGS. Among the instruments for assessing functional capacity, HGS and PS-ECOG, a statistically significant correlation was found (r = 0,136; p = 0.028).

Conclusions: In hospitalized oncological patients, regardless of tumor type, nutritional assessment methods, SGA and PG-SGA, showed strong and significant agreement, demonstrating that the use of any of these instruments can identify nutritional status. The HGS is an efficient tool for evaluating functional capacity and can be complementary in the identification of nutritional status in this group of patients.

Keywords: Nutritional status, Functional capacity, Cancer, Hospitalized patients.

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CONTRIBUTION OF SELECTED TRADITIONAL GREEN LEAFY VEGETABLES TO MICRONUTRIENT INTAKE OF WOMEN AND CHILDREN 2-5 YEARS IN ELERUWA FARMING COMMUNITY, OYO STATE NIGERIA

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Background and objectives: Traditional green leafy vegetables (TGLVs) are often not considered as sustainable food-based strategy for addressing existing micronutrient malnutrition especially among vulnerable groups in resource poor settings. Their contribution to micronutrient intake is rarely accounted for during dietary surveys and nutrient intake analysis in rural communities. This study investigated the contribution of TGLVs to micronutrient intake of women of reproductive age and children 2-5 years during the pre-planting, planting and harvest seasons in a rural farming community in Oyo State, Nigeria.

Methods: A purposively selected population of women of reproductive age (n=43) and children 2-5 years (n=34) who had lived in the community for ≥1year participated in the study. Socio-demographic characteristics and repeated household dietary assessment in pre-planting, planting and harvest seasons was done using food frequency questionnaire and two non-consecutive 24-hour dietary recalls. Adapted Total Dietary Assessment software was used to determine respondents' micronutrient intake. Data were analysed using descriptive statistics, and repeated measures ANOVA at $p<0.05$.

Results: Age of women and children were 32.5±8.8 and 3.5±0.9 years respectively, 36.4% of women had no formal education and 63.6% were farmers. Intake of TGLVs in the three seasons (pre-planting: 45.8±29.8 g; planting: 49.9±35.7 g; harvest: 43.4±28.2 g) showed no significant difference for women, but was significantly different for children (pre-planting: 25.2±10.1 g; planting: 31.2±24.1 g; harvest: 26.4±21.2 g, ($p<0.05$)). Contribution of TGLVs to women's micronutrient intake was higher in pre-planting season for folate (13.1%), iron (8.8%) and calcium (20.4%); planting season for vitamin C (55.1%) and vitamin A (RAE) (3.7%). Contribution of TGLVs to children's micronutrient intake was highest in planting season for vitamin C (45%), folate (10.1%) and iron (13.1%); harvest season for calcium (19.4%) and vitamin A (RAE) (3.5%).

Conclusions: Traditional green leafy vegetables contributed the most to micronutrient intakes when overall daily intakes were low: for women, in pre-planting, and planting seasons and for children in planting and harvest seasons.

Adequate consumption of these vegetables should be promoted among the people to meet their essential micronutrients needs through all seasons.

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BEVERAGE CONSUMPTION AND BODY MASS INDEX OF ADOLESCENTS IN ODEDA LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

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Background and objectives: The consumption of fructose, a component of table sugar and high fructose syrup has been associated with overweight and obesity with hazardous effect on health. Therefore, this study aimed to assess the relationship between beverage consumption and Body Mass Index of adolescents.

Methods: A structured questionnaire was administered to 400 adolescents from eight randomly selected secondary schools to assess their bio-data. Height and weight were measured using standard procedures and body mass index (BMI) for age was determined using WHO anthro plus. Dietary pattern, portion sizes of food consumed and nutrition knowledge were assessed using the semi-quantitative food frequency questionnaire and validated nutrition knowledge questionnaire respectively. Respondents physical activity was measured using the WHO global-activity questionnaire. Data was analyzed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics was used to generate frequencies and percentages while Chi-square tests was used to determine association between variables.

Results: About half (51%) of the respondents were males, 52.8% were within the age range of 15-19years and 56% were in the junior secondary school. The prevalence of underweight, overweight and obesity were 18.5%, 6.8% and 2.2% respectively. Carbonated and flavored drinks were the most frequently consumed beverage with an average intake of 500ml per portion. However, milk consumption was rather low (28ml per portion). Only 4.3% had poor nutrition knowledge while 47.3% had moderate nutrition knowledge. Most of the respondents (56.2%) were moderately active while 10% had low physical activity level. Respondents in senior classes had significantly higher nutrition knowledge than those in junior classes ($p= 0.001$). The male adolescents were more physically active than their female counterpart ($p=0.012$). In addition, consumption of carbonated and flavored drinks contributed significantly to BMI-for-age ($p=0.001$) however, no association was found between nutrition knowledge and BMI-for-age

(p=0.331). Activity levels was also not found to have significant impact on BMI-for-age of respondents (p=0.390).

Conclusions: High consumption of empty calorie carbonated and flavoured drinks of respondents affected to their body mass index-for-age and this may be responsible for the high prevalence of underweight among the respondents.

Keywords: Body Mass Index, Adolescents, Beverage Consumption, Physical activity.

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VALIDITY OF REPORTED NIGHT BLINDNESS AS AN INDICATOR OF VITAMIN A DEFICIENCY STATUS DURING PREGNANCY

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Background and objectives: Night blindness is considered as a simple and reliable population based indicator of Vitamin A Deficiency (VAD). Nonetheless, empirical evidence regarding its correlation with bio-markers of vitamin A is scarce. The purpose of the study was to assess the sensitivity and specificity of reported night blindness as an indicator of VAD during pregnancy.

Methods: The analysis was done based on secondary data collected for assessing the prevalence of VAD among pregnant women in rural Sidama, Southern Ethiopia. Night blindness – inability to see normally after dusk or at night during pregnancy – was determined based on self reporting. Sensitivity and specificity of night blindness were determined by taking serum retinol as the gold standard measure of vitamin A status. Serum retinol was determined using high-performance liquid chromatography (HPLC).

Results: The data of 700 pregnant women included in the analysis. About 37.9% of the women had VAD (serum retinol <0.7 µmol/l) and 39.7% reported night blindness. The mean (±SD) serum retinol among women with reported night blindness (0.77 ± 0.42 µmol/l) was significantly lower than their counterparts (0.88 ± 0.41 µmol/l) (t =3.704, p<0.000). Night blindness was significantly association with VAD (x2 =19.541, p<0.000). Nevertheless, its sensitivity and specificity to correctly classify the deficiency status were low, 50.2% and 66.7% respectively. Based on Kappa agreement analysis, significant but weak concord observed between the two indices (k= 0.047, p<0.000).

Conclusions: Reported night blindness, does not correlate strongly with serum vitamin A level.

Keywords: Night blindness, Vitamin A, Serum retinol

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STANDARDIZATION, PROXIMATE AND MINERAL CONTENTS OF SELECTED INDIGENOUS SOUPS IN SOUTH WEST, NIGERIA

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Background and objectives: Indigenous soups contribute significantly to the nutrient intake of the population. This study standardized and determined the proximate and mineral contents of indigenous soups commonly consumed in Southwestern Nigeria.

Methods: A multi-stage sampling technique was used to select 250 housewives in major cities of Lagos, Ogun and Oyo states. Data on the recipe of fifteen selected indigenous soups were obtained from the housewives using a structured questionnaire. The soups were standardized, prepared, homogenized, dried and analyzed for proximate and mineral contents using standard methods of AOAC.

Results: The moisture contents of the soups ranged from 16.83 g/100g (ekuku with plain soup) to 64.01 g/100g (cocoyam leaf soup), ash contents of the soups ranged from 3.44 g/100g (gbanunu soup) to 7.99 g/100g (igbo soup), crude fibre ranged from 4.10 g/100g (igbo soup) to 8.65 g/100g (egusi with bitter leaf soup), fat ranged from 6.49 g/100g (cassava leaf soup) to 44.73 g/100g (orunla with plain soup), protein ranged from 4.22 g/100g (efinrin soup) to 6.82 g/100g (cottonseed soup) while carbohydrate content ranged from 9.29g/100g (cottonseed soup) to 52.11g/100g (cassava leaf soup). Also, the calcium contents of the soups ranged from 1.80mg/100g (erimonu soup) to 240.00mg/100g (ekuku with plain soup), sodium ranged from 10.80mg/100g (efinrin soup) to 339.00mg/100g (ilasa with plain soup), potassium ranged from 6.20 mg/100g (gbanunu soup) to 775.00mg/100g (marugbo with plain soup), phosphorus ranged from 1.51mg/100g (ekuku with plain soup) to 97.01mg/100g (igbo soup), iron ranged from 0.11 mg/100g (cassava leaf soup) to 22.15 mg/100g (efinrin soup) while zinc ranged from 0.02 mg/100g (cocoyam leaf soup) to 4.39 mg/100g (marugbo with plain soup).

Conclusions: High moisture of these indigenous soups suggest that the soups had low nutrient contents. However, high consumption of some of these indigenous soups may contribute significantly to the micronutrient intake of consumers.

Keywords: Indigenous soups, Standardization, Nutrient contents.

SOCIOECONOMIC DISPARITIES AND NUTRITIONAL QUALITY OF FOOD PURCHASES IN FRANCE: 40 YEARS OF HOUSEHOLD PURCHASES 1969-2010

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Background and objectives: The evidence of a social gradient in health and food-related diseases shows the crucial role of nutritional quality of diets. However socioeconomic disparities in diet quality have seldom been studied on the long-term. The aim of this study was to analyse the evolution of the nutritional quality of food purchases of French households from 1969 to 2010 and to assess the disparities in nutritional quality according to income and education.

Methods: Time series of food purchases for food-at-home were built based on two representative household surveys: INSEE and Kantar. The average quantities purchased per capita each year were calculated for each food item and aggregated into 80 groups. Food quantities were converted in energy and nutrients using CIQUAL food composition database. The nutritional quality of purchases was estimated by the Mean Adequacy Ratio (MAR), i.e. the mean percentage of daily recommended intakes for 15 key nutrients calculated on a 2000kcal basis. Socioeconomic disparities were measured by disaggregating the above computations according to the household income quartiles from 1969, and to four educational levels of the household head from 1978. We also computed the MAR by income and education level.

Results: All income quartiles showed a similar trend of improvement of the MAR from purchases between 1969 and 2010. However the MAR remains higher for the richest income quartile (75.3 to 86.0) than for the lowest one (66.4 to 80.1) throughout the whole period. By education levels from 1978, we found a higher MAR for higher education level than for lower one (82.5 vs 71.9) but with closer values at the end of the period (83.5 vs 81.5).

Conclusions: During the last four decades, households with higher income or higher education have food purchases of better nutritional quality. Disparities of nutritional quality have decreased according to education but not according to income.

Keywords: Socioeconomic disparities, Food purchases, Nutritional quality.

MIXED GREEN LEAFY VEGETABLES POWDER CONSUMPTION IMPROVES ANAEMIA STATUS OF GHANAIAN SCHOOL CHILDREN

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Background and objectives: Anaemia is a public health problem among Ghanaian school children. Green Leafy Vegetables are the cheapest and most readily available sources of micronutrients and can potentially contribute to reduction of deficiencies and improve human health. This study assessed the effect of Mixed Green Leafy Vegetables Powder (MGLVP) on anaemia status of School Children in Adaklu District in Volta Region.

Methods: The study was cross-sectional at baseline and a three month intervention phase. Study participants; school children 4 - 9 years of age were randomised into intervention group (given MGLVP soup or stew) + school lunch) and Control group (school lunch only). Participants were fed five consecutive week days for three months. Data collected at baseline and end-line involved the use of appropriate standard procedures for the following: height and weight measurements; dietary data collected by 24-hour recall and haemoglobin concentrations, by HemoCue Haemoglobinometer. Participants' blood samples were examined for malaria parasitemia and stools for helminthes using Giemsa stain and Kato-Katz techniques. Changes in baseline and end-line within and between groups were compared using paired and independent sample t-tests. Binary logistic regression was used to identify predictors of anaemia.

Results: At the end of the study, although the mean haemoglobin concentration increased in both groups, the between group difference (0.3g/dl) was significant, p = 0.021. The prevalence of anaemia at baseline was 41.5 % in the intervention group and 37.3 % in the control group. By the end of the study the intervention group registered 28.3% compared to 36.1% in the control group; p = 0.011. Malaria prevalence increased among both study groups by the close of the study; 35.7% at baseline and 40 % at end-line. The mean prevalence of stunting was 12.3% and 14.7 % in the intervention and control respectively. The control group who consumed no MGLVP were 2.8 times at higher risk of being anaemic than the intervention group (p = 0.036).

Conclusions: Mixed Green Leafy Vegetables Powder (stew or soup) improved haemoglobin concentration and minimized the prevalence of anaemia among study participants.

Keywords: Anaemia, Mixed green leafy vegetable powder, Micronutrients, Malaria.

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EFFECT OF RED PALM OIL BEANS STEW ON SERUM VITAMIN A AND HAEMOGLOBIN CONCENTRATIONS OF SCHOOL CHILDREN IN GHANA

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Background and objectives: Vitamin A deficiency, anaemia and parasitic infections are among the major nutritional and health problems confronting Ghanaian school children. The study assessed the impact of red palm oil beans stew consumption on the serum retinol and haemoglobin levels of Ghanaian school children in a malaria endemic setting.

Methods: This was a pre-post nutrition intervention study. It involved 142 children, six to 12 years old. Participants were selected by simple random sampling. Data was collected at baseline after which participants consumed red palm oil beans stew three times a week for a period of six months and data collection repeated. Dietary data was collected using Food Frequency Questionnaires and 24 hour recall. Serum retinol and haemoglobin were measured with High Performance Liquid Chromatography and Haemocue Haemoglobinomter respectively. Malaria parasitaemia and hookworms were examined by microscopy from blood films and stool samples using the Giemsa-staining and Kato-Katz techniques. Data was analyzed with Statistical Package for Social Sciences version-23. Mean values for outcome variables were compared between baseline and endline using paired t-test.

Results: Majority of the participants (82.4%) consumed cereals. Many of them also (98.6%) never consumed dairy or dairy products. Mean serum retinol concentration at baseline and endline were 12.1 ± 6.6µg/dl and 16.2 ± 6.4µg/dl, respectively. The mean change in retinol concentration within intervention periods at baseline and endline (4.1 µg/dl) was significant at p<0.05. The mean haemoglobin concentration at baseline was 119.4 ± 10.6 g/l and 126.0 ± 9.3 g/l at endline, significant at p<0.05. A reduction of prevalence between baseline and endline with significance of p<0.05 were as follows: vitamin A deficiency (VAD) from 93.6% to 76.2% and anaemia from 30.3% to 11.3% whilst malaria parasitaemia was from 67.6% to 62.7%. The prevalence of anaemia among VAD participants was 36.2 % at baseline and 12.1 % at endline.

Conclusions: Red palm oil beans stew consumption increased the haemoglobin and serum retinol concentrations and minimized prevalence of anaemia and vitamin A deficiency (especially severe vitamin A deficiency) among the study participants.

Keywords: Vitamin A deficiency, Anaemia, parasitic infections, School children, Malaria.

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VITAMIN D INSUFFICIENCY AND RISK OF METABOLIC SYNDROME IN ELDERLY ADULTS WITH TYPE 2 DIABETES MELLITUS

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Background and objectives: An increase in the prevalence of vitamin D deficiency (VD) in the elderly adults (AM) has recently been observed. Various risk factors have been described such as inadequate sun exposure and insufficient calcium intake. This deficiency causes secondary hyperparathyroidism, accelerated bone turnover, bone loss, osteoporosis, and osteomalacia if it is a long-term and severe shortage. Recent studies have demonstrated the importance of VD in neuromuscular function, and its deficiency has been related to functional alterations and risk of falls in the elderly.

Objective: to determine the prevalence of deficiency (ID) of VD in the elderly population of the Hospital and its relationship with the Metabolic Syndrome (MS).

Methods: We included patients who attended the nutrition service of César Milstein Hospital between March and May of 2016, with Diabetes Mellitus (DM) who were not known their VD value. VD deficiency was defined as values ranging from 20.1 to 29.9 ng/ml, mild deficiency 20 to 10.1 ng/ml, severe deficiency at <10 ng/ml. Overweight was defined as a body mass index (BMI) ≥ 28 kg/m2 and obesity ≥ 32 kg/m2. P <0.05 statistically significant.

Results: The sample size was 175 patients, 56% women, the median age was 71 years. The prevalence of VD deficit was 80%, of these 38.6% (N=54) had insufficiency, 47.85% (N=67) mild deficiency and 13.33% (N=19) severe deficit. The sample was divided into 2 subgroups: normal weight and overweight-obesity. Among patients with BMI <27.9, the ID was 32.85% (N=46) and 67.15% (N=94) in the subgroup with BMI> 28 (p of 0.014). No significant differences were found associated with age, sex, or glycosylated hemoglobin.

Conclusions: The results suggest that ID of VD would be a prevalent factor in AM, even more in those with overweight and obesity. It would be of fundamental importance the opportune diagnosis and the supplementation of VD, thus we would be pre-

venting the risk of falls and all the complications that this deficit brings for AM.

Keywords: Vitamin D, Metabolic Syndrome, Elderly Adults, Type 2 Diabetes Mellitus.

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VITAMIN D DEFICIENCY IN CHILDREN (6-18 YEARS) RESIDING AT HIGH ALTITUDE REGIONS OF HIMACHAL PRADESH, INDIA

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Background and objectives: High prevalence of Vitamin D Deficiency (VDD) has been documented from different plain regions of India. Limited data is available on VDD amongst children residing at high altitude region of country. Hence, the present study was undertaken with an objective to assess the prevalence of VDD and associated risk factors amongst children in the age group of 6-18 years residing at an altitude of 1000mts and above.

Methods: A community based cross-sectional study was conducted in the year 2015-2016. Three districts (namely: Kangra, Kullu and Shimla) of Himachal Pradesh state, India was selected for the present study. In each district thirty clusters/schools were identified using Population Proportionate to Size (PPS) sampling methodology. In the identified school, all the children in schools were enlisted. Twenty children per school were selected by using random number tables. A total of 1848 children (Kangra: 610; Kullu: 612; Shimla: 626) in the age group of 6-18 years were enrolled. The data on socio economic status, physical activity, sunlight exposure was collected. The blood samples were undertaken and serum 25-hydroxyvitamin D, intact parathyroid hormone, serum calcium, phosphorous, albumin and alkaline phosphate were assessed using standard procedures.

Results: Eighty one percent (Kangra), 80.0% (Kullu) and 93.0% (Shimla) of school age children were found vitamin D deficient as per serum 25(OH) D levels (less than 20ng/ml).

Conclusions: A high prevalence of VDD was also found in children residing in high altitude regions of Himachal Pradesh, India.

Keywords: Vitamin D deficiency, Parathyroid hormone, Children, India.

Conflict of Interest Disclosure: The author whose name is listed, certify that he has NO affiliation with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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SODIUM BENZOATE IN SOFT DRINKS, A HEALTH THREAT FOR CHILDREN

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Background and objectives: The association between dietary habits –including sugary soft drinks intake- and the increasing obesity epidemics and its co-morbidities has been established worldwide. Argentina has been among the top ten countries with the largest daily intake of both regular and low calorie soft drinks in the last 10 years. The scenario completes with the data that nearly 60% of the adult argentine population is overweight or obese; 11% presents T2DM and the number of overweight and obese children is constantly growing. The aim of this study was to evaluate the presence and level of preservatives employed in these beverages since sodium benzoate –present in most of them- has a very low Adequate Daily Intake (ADI), thus representing a serious health risk, particularly for those children who habitually replace water by these products.

Methods: The levels of sodium benzoate (INS 211) and potassium sorbate (INS 202) by high performance liquid chromatography and pH (Methrom E 632) were determined in the most frequently regular and low/zero calories consumed drinks (n=30).

Results: The concentration of sodium benzoate and potassium sorbate ranked from 120 to 450 mg/l and 80 to 460 mg/l respectively and the rank of pH from 2.29 to 3.93. The preservatives were not detected in the two regular cola drinks in which the values of pH were the lowest neither in the pasteurized fruit juices.

Conclusions: Beverages with sodium benzoate as preservative present the risk that children (20-30 kg body weight) may exceed the ADI for sodium benzoate (0-5mg/kg bw) with a daily intake of only two portions (200ml/portion) of the drink.

We conclude that a habitual consumption of soft drinks represents a serious health menace, not only due to the high sugar concentration in the regular ones, the very low acidic pH determined in all of them, but also due to the frequent or daily intake of sodium benzoate present in most of them.

Keywords: Sodium benzoate. Soft drinks. ADI.

ANEMIA PREVALENCE ESTIMATES IN CAMBODIAN WOMEN VARY WIDELY BY METHOD OF HEMOGLOBIN MEASUREMENT AND TYPE OF BLOOD SAMPLE COLLECTED

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Background and objectives: Hemoglobin (Hb) concentration is often measured in field settings using a portable hemoglobinometer, or in laboratories using a hematology analyzer. Discrepancies in measurement between these methods have been reported, which may be the result of the sample collection method typically employed (capillary vs. venous blood, respectively). Our aims were to compare Hb concentrations in fasting venous blood of Cambodian women using a hemoglobinometer and a hematology analyzer, and further, to non-fasting capillary blood from the same women using the same hemoglobinometer.

Methods: Blood was collected in July 2015 from n=28 Cambodian women (18-45 years) in Kampong Chhnang province who were recruited to an iron supplementation trial. Enrolled women had a Hb ≤117 g/L based on a HemoCue® 301. Hb was measured in fasting venous blood using a HemoCue® 301 and a Sysmex XN-1000 hematology analyzer, and in non-fasting capillary blood using the same HemoCue®.

Results: Mean Hb concentrations in fasting venous blood were significantly higher with the HemoCue® as compared to the Sysmex analyzer (123 vs. 118 g/L, respectively, P<0.05); and both were higher than mean Hb concentrations in non-fasting capillary blood from the same women using the same HemoCue® (110 g/L, P<0.05, repeated measures ANOVA). Anemia prevalence estimates (Hb <120 g/L) varied widely across methods: 39%, 64%, and 100%, respectively.

Conclusions: The 5 g/L bias in Hb concentration in fasting venous blood resulted in a substantial and clinically relevant difference in anemia prevalence (39% vs. 64%). Further, mean Hb concentrations in non-fasting capillary blood from the same women using the same HemoCue® were significantly lower as compared to fasting venous blood (using both methods). Overall, there are three sources of potential variability (capillary vs. venous, hemoglobinometer vs. hematology analyzer, and fasting vs. non-fasting); all may have contributed the observed discrepancy in Hb concentrations in our study. These findings are important for the determination of appropriate recommendations of blood collection procedures for Hb measurement. More research is warranted to investigate the possible discrepancies between hemoglobinometers and automated analyzers, and to examine the extent to which a fasting or non-fasting state can influence Hb concentrations.

Keywords: Anemia, Capillary, Hemoglobin, Point-of-care, Venous.

NUTRITIONAL HEALTH OF UNIVERSITY ADMINISTRATIVE STAFF: RISKS AND OPPORTUNITIES

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Background and objectives: Health is a complex state influenced by dynamic individual, social and organizational systems. Non-communicable diseases are leading causes of death among adults and have been increasing in the adult population since 1999 but no information is currently available on the nutritional health status of university employees in South Africa.

The aim of this research was to describe the nutritional health status of university administrative staff.

Methods: A descriptive study conducted among all permanent administrative staff of UWC. Participants were recruited via email invitation. Following approval from the Senate Research Ethics Committee, informed written consent was obtained from participants with assurance of anonymity, safe clinical practice and strict confidentiality. Feedback on measurements was given to individual participants and referrals for treatment made were necessary. All interviews and anthropometric assessments were conducted by dietitians trained as fieldworkers. Clinical assessments were obtained by a nurse practitioner with phlebotomist training following standardised operating procedures. SPSS was used for data analysis.

Results: Seventy eight staff members participated during the two week period of data collection (52% response rate). Eighty five percent of men and 80% of women were overweight or obese with 28% of men and 67% of women presenting with a waist circumference indicative of a high risk for chronic diseases of lifestyle. Twenty-eight percent men and 15% had a blood pressure greater than 140/90. Only two of the men have been previously diagnosed with hypertension. Thirty-four percent of men and 22% of women reported daily cigarette smoking whilst more than 40% reported that they never do moderate intensity exercise whilst 83% of men and 59% of women watched between 1-3hours television daily. Not surprisingly only 40% of men and women regarded themselves as having optimum health.

Conclusions: Risk factors for chronic diseases of lifestyle are highly prevalent. Investment in comprehensive health promotion could be beneficial to individual staff members and the university at large.

Keywords: Administrative staff, Obesity, Chronic diseases of lifestyle, Hypertension, Health promotion.

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HYPOCALORIC DIET- A GOOD THING OR A BAD THING?

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Background and objectives: Obesity is associated with highly elevated risks of adverse health outcomes. We evaluated obese patients during a hypocaloric diet to see the nutritional impact assessment regarding macro and micro nutrients and the impact on the health.

Methods: A sample of 126 overweight and obese subjects were investigated. Using a 7-day food self-recorded questionnaire, we evaluated the nutritional content of food intake before and after the program: total kilocalories, carbohydrates, proteins, lipids, cholesterol, vitamins A, B1, B2, B3, B5, B6, B12, C, D, E, folic acid, and minerals like calcium, iron, magnesium, phosphorus, zinc, copper, manganese, selenium, and sodium. We assessed anthropometric data, laboratory data and resting metabolic rate.

Results: Data analysis at the end of nutritional intervention program showed significant changes in all parameters except for metabolic rate estimated. 91.18% of men and 85.87% of women recorded overall improved weight while fat percentage decreased. The prevalence of normal intake of protein and carbohydrates decreased significantly after the intervention: 67.95% and 15.38% of patients had adequate protein intake (p <0.001) and, respectively, carbohydrates (p = 0.006).

At the end, only 12 to 30% of patients had recommended nutritional intake, depending on the vitamin evaluated.

80% of patients consumed excessive vitamins B12, B2, B3 and B6. More than 80% of patients had deficient intake of vitamin D and E.

At the end of the intervention we observed to be significantly fewer patients covering the recommended daily allowance for calcium and magnesium.

Although there have been deficient intake of minerals, laboratory parameters such as magnesium, calcium and plasma iron were not significant changed at the end of nutritional intervention.

Conclusions: Because of the results regarding anthropometric data which get improved, we can say that hypocaloric diet is a good thing. Considering that the participants in this study were compliant in terms of nutritional recommendations, it can be said that, due to the inefficiency to correct the deficiency and excessive intake of vitamins and minerals, we need to pay more attention to the nutritional recommendations during an interventional program.

Keywords: Obese, Diet, Vitamins, Minerals, Overweight.

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EVALUATION OF THE MENUS OFFERED TO PRESCHOOL CHILDREN IN THE CITY OF BOTUCATU. SP

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Background and objectives: In infancy, children need to receive adequate amounts of nutrients for proper development. The National School Feeding Program (PNAE) aims to collaborate for the development, biopsychosocial growth, income, learning and formation of healthy eating practices of the school. The present study aims to evaluate the supply of nutrients to preschool children, comparing with the parameters established by the PNAE (2009).

Methods: Micronutrients and macronutrients were evaluated for 29 days and compared to the values recommended by PNAE, for preschoolers between 4 and 5 years of age who receive two or more meals per day. To evaluate the composition of the meals, each item present in the cooking in kilos and the quantity in kilos of prepared vegetables, already considering the correction factor, was noted. The calculation of calories, macronutrients and micronutrients of the menu was done with the help of the Microsoft Office Excel 2007 program, following the nutritional composition of the Food Composition Chart (UNICAMP, 2011), the Food Composition Chart (UNIFESP, 2016) and the nutritional label of foods used in the preparations.

Results: The average results were: 450.9 Kcal; Carbohydrate 68.9g; 19.9g proteins; Lipids 10.0g; Fibers 15.2mg; Ca 774.9mg; Fe 10.0mg; Mg 195.3mg; Zn 5.9mg; Vit A 405.2μg and vitamin C 34.4mg. With respect to macro or micronutrients, all have met the needs proposed by the PNAE. This is due to compliance with the regular supply of fruits and vegetables, milk sources and variation of the menu.

Conclusions: It was concluded in this evaluation that the supply of nutrients to preschool children, provided by the Pilucatu Pilot Kitchen, meets the parameters established by the PNAE.

Keywords: Legislation; School Feeding; Nutritional needs; Childhood.

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URINARY CALCIUM IN MOROCCAN SCHOOL-CHILDREN AND ADOLESCENTS

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Background and objectives: Worldwide, deficiency in calcium increases the risk of developing diseases like osteoporosis and fracture risk at the later life. Depending on the World health organization reports, calcium deficiency is one of the most important deficiencies compared to other micronutrients deficiencies. In Morocco, data on calcium deficiency is limited because there are no specific studies in National level that identified the risks associated to this deficiency Thus; the aim of this study is to evaluate the nutritional profile of calcium in a representative sample of Moroccan children and adolescents.

Methods: 131 children and adolescents aged between 6 and 18 years were recruited from public schools at Rabat and its regions in the framework of descriptive cross-sectional study. For each participant, socio-economic and morbidity status were assessed, and anthropometric parameters were measured. Calcium assessment was estimated through 24 hour urine measurements by ICP-MS.

Results: The findings of this study showed that the mean of urinary calcium was 72.48mg/day. About 73% of children and adolescents present a urinary calcium deficiency. There were no significant differences related to sex towards calcium excretion and its correlation with nutritional status was shown negative.

Conclusions: The present study show that children and adolescents in Rabat and regions present serious calcium deficiency.That leads us to reflect on the various tools needed to remedy this deficit and to response to objectives of the national strategy to combat micronutrient deficiencies.

Keywords: Calcium deficiency. Children. Adolescents. urinary calcium excretion. Morocco

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PREDICTING STANDING HEIGHT FROM HEIGHT PROXIES FOR THE DETERMINATION OF BODY MASS INDEX (BMI) OF OLDER PERSONS IN ABIA STATE, NIGERIA

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Background and objectives: Use of BMI to determine nutritional status is limited by height (Ht) measurement, which is often unreliable because of spinal deformities. The study aimed at predicting standing height of older persons using height proxies of arm span, knee and sitting heights and comparing the BMI calculated from the actual standing and predicted standing heights.

Methods: This cross sectional study used multi-stage random technique to select 200 older persons aged $\geq$ 60years living in two Local Government Areas of Abia state, Nigeria. Persons with spinal deformities and osteoporosis were excluded. Weight (kg), standing height, arm span, knee and sitting heights (m) were measured using standard procedures. Linear regression analysis was used to obtain regression equation for predicting standing Ht from each of the Ht proxies. BMI (kg/m2) was calculated using actual standing Ht and the predicted heights. Pearson correlation was used to compare actual standing Ht and BMI from actual standing Ht with predicted standing Hts. Results were expressed as mean and standard deviations. Statistical analyses were done using IBM SPSS Statistics (version 20) and significance judged at P<0.05.

Results: Regression equations were obtained for men: standing Ht = 1.23±0.25(arm span); 1.36±0.52(knee Ht); 1.47±0.23(sitting Ht) and for women: standing Ht = 1.35±0.14(arm span); 1.43±0.29(knee Ht); 1.48±0.15(sitting Ht); revealing that in predicting standing height from arm span for men, the expected value of the standing height when the arm span is zero is 1.23 and for every additional meter in arm span, standing height is expected to increase by 0.25m. Standing Ht estimated from arm span in men had the highest correlation value (r= 0.296). Significant relationship (p<0.05) existed between actual standing Ht and the predicted Hts. BMI from actual standing Ht correlated significantly (P<0.05) with those predicted from height proxies in both men and women.

Conclusions: Standing heights predicted from height proxies using the regression equation obtained in this study can be used to estimate actual standing height of older persons who may have problem standing for height assessment. BMI calculated from actual standing height significantly and positively correlated with those obtained from predicted heights proxies.

Keywords: Height, BMI, Older persons, Prediction, height proxies

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DIETARY INTAKE AND NUTRITION KNOWLEDGE OF COMPETITIVE TABLE TENNIS PLAYERS

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Background and objectives: A proper diet is important for improving sports performance and health. Athletes may have poor nutrition knowledge, which may negatively impact food behavior. The analysis of athlete´s dietary intake may help in the elaboration of nutrition interventions. The objective of the present study was to evaluate and compare the dietary intake and nutrition knowledge between adult and adolescent table tennis players. To our knowledge, this is the first study that assessed the food behavior and nutrition knowledge of table tennis players.

Methods: Forty two competitive athletes responded a three-day food diary and a validated nutrition knowledge questionnaire. Body weight and height were also measured. Nutrient and food portions were adjusted for misreporting using the residual method and compared to athletic guidelines. Pearson correlations were performed between nutrition knowledge and dietary intake for each nutrient.

Results: Athletes of both groups showed a high prevalence of inadequacy in the ingestion of cereals, vegetables, dairy and sweets and more than a half of the adolescents were inadequate in fruits and legumes. Adolescents showed a lower ingestion of vitamins A, C, B5, B6, calcium, zinc and phosphorus. Both groups showed a high prevalence of inadequacy in the ingestion of nutrients, however, adolescents showed a higher inadequacy in vitamin C, B6, B9 and phosphorus. Between group analysis showed that adults had higher nutrition knowledge than adolescents. Statistical analysis in adults showed significantly negative correlations between basic nutrition knowledge and the ingestion of cereals (r= -577), legumes (r= -796) and vitamin b2 (r= -770). Negative correlations were also found between total nutrition knowledge and sodium intake (r= -485). In adolescents, there was a positive moderate correlation between sports nutrition knowledge and the ingestion of vitamin B5 (r= 0,436).

Conclusions: Adolescents showed a higher prevalence of nutrient inadequacies and a lower nutrition knowledge than adults.

Keywords: Table tennis, nutrition knowledge, sports nutrition

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ANALYSIS OF DIETARY COMPONENTS OF PREGNANT WOMEN WITH UNCOMPLICATED GESTATIONAL HYPERTENSION AND GESTATIONAL HYPERTENSION COMPLICATED BY HYPOTHYROIDISM

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Background and objectives: A woman's diet is said to be the most important factor in determining intrauterine growth. In the case of improper diet the hormonal and/or circulation disorders may lead to intrauterine growth restriction. The aim of the study was to determine differences in average daily intake of selected nutrients in women diagnosed with hypertension during pregnancy and women who, in addition to being diagnosed with hypertension, had also been diagnosed with hypothyroidism before pregnancy.

Methods: The test subjects were divided into two groups. Group I – women diagnosed with hypertension in the first trimester of pregnancy. Group II - women diagnosed with hypertension in the first tri-mester of pregnancy and diagnosed with hypothyroidism before pregnancy. The women's eating habits and dietary composition were analyzed based on a dietary questionnaire. Portion sizes were verified using "The Album of Photographs of Food Products and Dishes. The questionnaire allowed the researchers to determine daily consumption of each particular dietary component over a one-week period. The DIETA FAO program was used to estimate the quantity of the aforementioned components.

Results: Hypertensive women have been observed to have higher BMI values both before pregnancy and during pregnancy, as well as higher daily intake of mono- and polyunsaturated fatty acids. There was also a significantly higher intake of vitamin A and nearly twice as high intake of tyrosine in the group of women with hypertension. In both groups folate, iodine and vitamin D intake below daily demand was observed.

Conclusions: The pregnant women's intake of the dietary components which are important for the fetus was higher in mothers with gestational hypertension without complicated pre-existing hypothyroidism. Women with uncomplicated hypertension or complicated pre-existing hypothy-roidism were characterized by lower iodine and vitamin D intake compared to daily requirements. Women with pre-existing hypothyroidism were characterized by lower intake of essential fatty ac-ids which are also important for the nervous system during development of fetus and also in many other metabolic and energy processes. In the group of women with pre-existing hypothyroidism, lower intake of tyrosine, the fatty acid necessary as a substrate in thyroid hormone biosynthesis, was observed.

Keywords: pregnancy, hypertension, hypothyroidism

COMPARISON OF DIETARY DIVERSITY SCORE (DDS) ACCORDING TO THE SOCIO-ECONOMIC STATUS AMONG RURAL MIDDLE SCHOOL CHILDREN IN THE NORTHWEST OF MOROCCO

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Background and objectives: Diversity score (DDS) is not associated with the staturo-ponderal status or gender among the rural middle school children (12.3 to 19.74 years), in the northwest of Morocco. The purpose of the present study was to compare the dietary diversity score (DDS) according to the Socio-economic status among these adolescents.

Methods: The DDS represents the number of the 11 most frequented food groups (grains, sweet tea, fatty substances, dairy products, vegetables, sweets, poultry, fruits, legumes, red meat, fish) consumed during the preceding 7 days by 300 middle school children (15.45 years± 1.64) of the only middle school in the rural commune of Sidi El Kamel in northwestern Morocco. The general survey was used to record demographic and socio-economic characteristics of subject (age, gender, sibling rank, household size, function of parents, their educational level). The comparison of averages of DDS by socio-economic status, is done by the Mann-Whitney test and the Kruskal-Wallis test at 5% error.

Results: 9% of students haven't a diversified feeding (with DDS less than or equal to 7 of 11 food groups), against 91% had DDS strictly greater than 7 of 11 food groups, in average (9.3; ± 1.33) food groups on 11 groups consumed during the preceding 7 days. the diversification of food is only related to the paternal function. (χ2 = 2.25; df = 5; P = 0.033 <0.05). The children whose parents are farmers or workers, have a high rate of food diversification of 60% and 13% respectively.

Conclusions: The good dietary diversity among adolescents in rural areas is linked to easy access to cereals, vegetables, dairy products via agricultural function of the father.

Keywords: Dietary Diversity Scores , socio-economic status, rural middle school children, Morocco.

COMPLEMENTARY FEEDING PRACTICES AND STUNTING AMONG INFANTS AND YOUNG CHILDREN IN THE NORTHERN PROVINCE OF RWANDA

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Background and objectives: Stunting remains a serious challenge in Rwanda despite the success achieved at reducing acute malnutrition. The aim of this research was to study the factors associated with stunting in Musanze District in the Northern Province of Rwanda, with particular focus on assessing anthropometric, dietary intake and the overall complementary feeding practices.

Methods: A cross-sectional survey was conducted in 2015 with 138 children aged 5 to 30 months. Anthropometric status of children and mothers was assessed using z-scores for height-for-age (HAZ) and body mass index (BMI) respectively. Dietary intakes were estimated using a 24hr recall questionnaire. Multiple linear and logistic regression models were performed to study the predictors and risk factors of stunting respectively.

Results: The stunting prevalence in children was 42%. Among children, only half had been exclusively breastfed. Most of the children fell into the low dietary diversity score group (62%) with the majority of children consuming plant-based diet with little to no animal source foods. Overall the nutrient intake was below the dietary recommendations for breastfeeding children. Higher BMI of caregivers and higher intake of dietary zinc positively predicted height-for-age. Age increased the risk of stunting while exclusive breastfeeding and the use of deworming tablets were protective.

Conclusions: Encouraging exclusive breastfeeding, the use of deworming tablets and timely introduction of complementary foods rich in bioavailable nutrients can contribute in reducing the risk of stunting in children in the Northern Province of Rwanda. Dietary diversification by including locally available and nutritious products can greatly contribute in increasing the micronutrient intakes in children.

Keywords: stunting, dietary intake, complementary feeding practices, exclusive breastfeeding, Rwanda

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PREVALENCE OF ANAEMIA AND ITS ASSOCIATED FACTORS AMONG ADOLESCENT FEMALES IN OKRIKA, RIVERS STATE, NIGERIA

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Background and objectives: Unlike children and women of reproductive age, adolescents have not been the focus of anaemia research in sub-Saharan Africa. Adolescence is a vulnerable period in the human life cycle for the development of nutritional anaemia. Girls are more likely to be victims due to added burden of menstrual loss. The study examined the prevalence of anaemia and its associated factors among adolescent females in Okrika, Rivers State, Nigeria.

Methods: In a cross-sectional design, 400 adolescent females in secondary schools were recruited using a multistage sampling technique. Validated questionnaires were used to collect data on sociodemographic characteristics and other factors associated with anaemia (malaria occurrence, use of mosquito nets, sources of helminthic infection such as unsafe drinking water and poor toilet facilities and menstrual history). A food frequency questionnaire was used collect data on food intake. Haemoglobin and packed cell volume were analysed in blood samples of the girls using standard procedures.

Results: Mild-moderate anaemia (Hb=7-11.9 g/dl) and severe anaemia (Hb<7g/dl) was found in 77.5% and 1.3% of the girls, respectively. Malaria was reported by 59.3%, 44.8% do not use mosquito nets, 42.2% drink unsafe/untreated water and 67.5% do not have good toilet facility. About 20% of the girls were experiencing irregular menses. More than half of the girls consumed at least one animal source of iron foods daily (meat-67.5%, fish-62.5%, periwinkle-51.5%). Family size correlated negatively (r=-0.336, P<0.05) and mother's occupation correlated positively (r=0.606, P<0.01) with haemoglobin levels of the girls.

Conclusions: Anaemia and its associated factors are prevalent among adolescent females in Okrika. Though, the adolescent females consumed adequate representation of iron rich foods, other risk factors of anaemia such as malaria and irregular menses were prevalent. The significant association of family size and mother's occupation with haemoglobin levels suggest a significant effect of these factors on the risk of anaemia in the girls. The results indicate that adolescent females are as vulnerable as under-five children. Therefore, special attention is needed to meet the iron requirement of this group. A holistic intervention is necessary to address these risk factors.

Keywords: Anaemia, adolescent females, risk factors, haemoglobin

Further collaborators:
Staff of the Department of Human Nutrition and Dietetics, Michael and the school heads and teachers who facilitated our access to their students

144/649

USUAL MICRONUTRIENT INTAKES OF YOUNG CHILDREN IN THE PHILIPPINES ARE SEVERELY INADEQUATE

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Background and objectives: The prevalence of stunting, underweight and micronutrient deficiencies are persistently high among Filipino children. Up to now, age-specific assessments of micronutrient intakes in this population are scarce. The objective of this study was to evaluate usual intakes of selected micronutrients of young children from the 2013 National Nutrition Survey in the Philippines.

Methods: Trained interviewers collected 24-hour dietary recalls from caregivers of a nationally representative sample of 2427 children aged 3 to 5 years. A second 24-hour recall was collected from 50% of the sample. Micronutrient intakes were estimated using data from the food composition tables developed by Food and Nutrition Research Institute and usual intake distributions of micronutrients were calculated using the PC-side program from Iowa State University (version 1.0). The distributions were compared with estimated average requirements (EAR) recommended by the Philippine Dietary Reference Intakes 2015. Usual intakes from the following nutrients were estimated: vitamin A, thiamine, riboflavin, niacin, vitamin C, iron, calcium and phosphorus.

Results: High prevalence of inadequate micronutrient intakes defined as the percentage of children with intakes less than EARs were found for all the vitamins and minerals except for niacin. In an ascending order, the prevalence of inadequate nutrient intakes were 11.3% for niacin, 38.2% for phosphorus, 43.9% for vitamin A, 45.2% for riboflavin, 45.2% for thiamine, 56.7% for vitamin C, 76.7% for iron and 82.8% for calcium.

Conclusions: This study demonstrated that usual micronutrient intakes of young children aged 3-5 years in the Philippines were severely inadequate. To gain insights behind the inadequate nutrient intakes and form effective measures to combat the inadequacies, further studies understanding the food sources of nutrients and the regional and socioeconomic disparities in this Filipino population are underway.

Keywords: Usual intake, micronutrients, infants, young children, the Philippines

Conflict of Interest Disclosure: Liya Denney is an employee of Nestec, S.A. (Nestlé Research Center), Lausanne.

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144/658

DIETARY INTAKE OF ADOLESCENT SOCCER PLAYERS

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Background and objectives: A proper diet is important for improving sports performance. However, athletes may have nutritional inadequacies related to the adoption of erroneous feeding strategies. The analysis of athlete´s dietary intake may help on the elaboration of nutrition interventions. The objective of the present study was to evaluate the dietary intake of adolescent soccer players.

Methods: Fifty-four teenage athletes from three professional clubs answered to a three-day food record. The nutrient intake was estimated and compared with the recommendations for athletes. Body composition was obtained by skin folds.

Results: The athletes presented a percentage of fat of 14.5 (5) percent. The analysis of energy and macronutrients showed that athletes had a low intake of calories, carbohydrate, fiber, monounsaturated fat and poly-unsaturated. About vitamins, vitamin A, C, E and B6 had the highest percentage of inadequacy. Among the minerals, who stood out on the nutritional inadequacy were calcium, folate and magnesium.

Conclusions: The athletes presented a proper body composition, however showed inadequacies both in intake of macronutrients as well as vitamins and minerals.

Keywords: Dietary intake, adolescents, soccer

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ONE YEAR ADMINISTRATION OF OMEGA-3 SUPPLEMENTS REDUCES ATHEROSCLEROSIS PROGRESSION AND OXIDATIVE STRESS IN OBESE PATIENTS

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Background and objectives: According to studies, obesity and inflammation are related to important cardiovascular and metabolic complications. The objective of this study was to asses the impact of omega-3 supplements on the progression of atherosclerosis and oxidative stress.

Methods: 290 obese patients, without clinical evidence of atherosclerosis, aged 65 ± 8.4 years, were assigned to 2 groups: group A (140 patients) received only diet according to American Heart Association recommendations; group B (150 patients) received the same diet plus omega-3 fatty acids supplements (1 g eicosapentanoic acid, 1 g docosahexanoic acid, 0,1 g α-tocopherol acetate). BMI > 30 kg/m2 was used as criteria for obesity. Body fat mass (BFM) and body fat percent (%BF) were measured using bioimpedance analysis (BIA). Oxidative stress was determined using FormOx monitor tests on a blood drop. Intima-media thickness (IMT) was measured for atherosclerosis progression. Patients were evaluated at baseline, after 6 and 12 months.

Results: After 12 months, all parameters were significantly improved in group B (diet plus omega-3 supplements) than in group A: LDL-cholesterol was 158 ± 17.4 mg/dl versus 172 ± 18.9 mg/dl (p<0.002), HDL-cholesterol was 59 ± 11 mg/dl versus 50 ± 12 (p<0.05), triglycerides were 121 ± 46 mg/dl versus 136 ± 56 mg/dl (p=0.002) and fasting plasma glucose was 104 ± 12 mg/dl versus 112 ± 14 mg/ dl (p<0.0001). FormOx monitor registered decreased Fort units in group B patients 248 ± 48 Fort units versus 270 ± 78 Fort units in group A (p<0.0001).

Progression of atherosclerosis was more delayed in group B, comparative with group A: IMT on left commune carotid artery was 0.608 ± 0.04 versus 0.622 ± 0.068 mm (p=0.001) and IMT on right commune carotid artery was 0.590 ± 0.048 vs. 0.611 ± 0.056 mm (p<0.0001). IMT was also correlated with %BF (p<0.001), waist-to-hip ratio (WHR) (p=0.002), leptin levels (p<0.001), adiponectin levels (p<0.05), leptin to adiponectin ratio (p<0.001) and oxidative stress (p<0.001).

Conclusions: One year administration of omega-3 fatty acids supplements improves cardiovascular and metabolic parameters, decreases oxidative stress and delays progression of atherosclerosis.

FOOD-TO-FOOD FORTIFICATION OF PEARL MILLET INSTANT PORRIDGE TO INCREASE IRON AND ZINC NUTRITIVE VALUES

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Background and objectives: The most prevalent micronutrient deficiencies in Sub-Saharan Africa are iron, zinc and vitamin A. Information on food sources rich in provitamin A is readily available, however the efficacy of specific plant foods, used to complement cereal-based diets, to address iron and zinc deficiencies is seriously lacking. The objective was to evaluate the effect of plant foods high in iron and zinc, combined with provitamin A, on the mineral nutritive value of pearl millet instant porridge.

Methods: Dried plant crops (moringa leaves, baobab fruit pulp, hibiscus calyces, mango fruit pulp, and carrots) were analysed for mineral, total phenolics, condensed tannin and phytate contents. The effects of adding 30% provitamin A source (49% carrot and 51% mango blend) and 5% & 15% moringa, hibiscus or baobab to whole pearl millet instant porridges on iron and zinc bioaccessibilities (in vitro dialysability) was determined. The iron and zinc contents and bioaccessibilities were compared to the RDA and absolute (physiological) requirements (AR) of children aged 2-5 years, respectively.

Results: Instant pearl millet porridge fortified with 15% moringa had the highest iron content and could provide approximately 33% and 15% of the iron and zinc RDA, respectively of 2-5 year old children. However, all plant crops had phytate:iron and phytate:zinc molar ratios above the critical levels (1:1 and 15:1, respectively). Despite the high iron contents of moringa (58.4 ± 4.5 mg/100 g, db), 15% addition to pearl millet decreased the percentage bioaccessible iron. Compared to pearl millet porridge alone, moringa addition (5%) roughly doubled the iron and zinc AR, whereas moringa (15%) had the same contribution to iron and zinc AR of 2-5 year olds. Addition of 15% baobab resulted in the greatest significant ($p \leq 0.05$) increase in percentages and amounts of bioaccessible iron (129% and 225%, respectively) and zinc (154% and 181%, respectively), despite the substantial amounts of condensed tannins (228 ± 270 mg CE/100 g). The addition of baobab increased the contribution towards iron and zinc AR approximately 3 fold, probably due to the high organic acid content.

Conclusions: Including baobab in a cereal based diet, shows potential to increase the iron and zinc nutritive values.

Keywords: Dialysability Iron Zinc Bioavailability

BREAST MILK INTAKE IN A GROUP OF EXCLUSIVE OR PARTIAL BREASTFED INFANTS FROM ARGENTINA: PRELIMINARY STUDY

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Background and objectives: Exclusive breastfeeding is recommended during the first six months of an infant´s life. There is evidence that the early introduction of formula or complementary foods reduce levels of breast milk (BM) intake. The aims of this study were to determine the intake of BM and water from non-breast milk sources (W non-BM) in exclusive breastfed (EBF) and partial breastfed (PBF) infants, and to estimate macronutrient intake in these groups.

Methods: This study was performed in 18 mother-infant pairs at 4 months to birth from Entre Ríos and Buenos Aires provinces. Dose- to the mother deuterium-oxide turnover technique (DMDOT) was used to measure breast milk intake. Mothers received an oral dose of deuterated water and 6 samples of saliva were collected from mother and baby during a period of 15 days. Deuterium enrichment was determined in a Shimadzu FTIR-spectrometer-Affinity to obtain the intake of BM (mL/d) and W non-BM (mL/d). Infants were classified into EBF (n = 11) or PBF (n = 7) categories based on a 24-hour recall to the mother. Macronutrient intake from BM was calculated using WHO data on breast milk composition. We considered that the volume of W non-BM, obtained from the DMDOT technique, was from formula so intake of energy (kcal/day), protein (g/day), fat (g/day), and carbohydrates (g/day) was estimated using the nutritional composition of the commercial infant formula that mothers referred. Energy and protein requirements were calculated according FAO recommendations.

Results: Results are expressed as Mean (IC95%). BM intake was significantly different between groups (EBF: 950.2 (818.2-1082.2) vs PBF: 710.0 (570.6-849.4), p<0.05). W non-BM was significantly higher in PBF compare to EBF (170.0 (-17.0-357.0) vs 15.2 (3.1-27.3), p<0.001). Taking into account only BM intake, all EBF infants met their energy and protein requirements as well as 57% of PBF infants.

Conclusions: Knowing breast milk intake, obtained by DMDOT as the reference method, is relevant to investigate the extent to which the breast milk is being replaced by the consumption of other foods and for evaluating infant feeding pattern and nutritional adequacy. Supported by PB04 and OIEA RLA 6071.

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ASSOCIATIONS BETWEEN FAT FREE MASS AND MUSCLE STRENGTH AND PHYSICAL PERFORMANCE IN A GROUP OF OLDER WOMEN FROM ARGENTINA

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Background and objectives: Low muscle mass and physical performances occur with advancing age. The aim of this study was to analyze the association between the fat free mass (FFM) and muscle strength and physical performance in older individuals.

Methods: 23 older women (60 - 84 years old), who attended recreational centers for elderly in Buenos Aires province, Argentina, were assessed. Body weight (kg) and height (m) were determined and body mass index (BMI) was calculated (kg/m2). %FFM and %Fat mass (FM) were evaluated by deuterium dilution technique. Handgrip strength (HS, kg) was measured using a Jamar ® Hydraulic Hand Dynamometer. Physical performance was evaluated by Gait speed (GS, m/s) and Timed get up and go test (TGUG, s).

Results: 30% overweight and 50% obesity were observed with %FM = 43.1 ± 4.7 (IC95% = 41.1-45.1). BMI and %FM were associated (r=0.87; p<0.0001). HS, GS and TGUG (mean ± DS (IC95%)) were 20.07 ± 3.50 (18.56-21.59); 1.42 ± 0.33 (1.23-1.57) and 8.73 ± 2.16 (8.01-9.38), respectively. HS significantly decreased with age (p<0.0279) but no significant differences were found neither in GS (p<0.8052) nor TGUG (p< 0.7332); however, TGUG tended to increase in older women. %FFM was associated to GS (r=0.58, p<0.0046) and it was inversely associated to TUGT (r=-0.51, p<0.0163).

Conclusions: In this preliminary report, it was found a high obesity degree and associations between FFM and muscle strength and physical performance tests in older women who participate in recreational activities. At present, adult women with greater physical deterioration are being evaluated as these associations could be important risk factors for adverse events like falls, fractures, daily living disabilities and independence loss. Supported by PB04 and IAEA RLA 6073.

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EFFECT OF MILK ADDED WITH COCOA POWDER ON APPARENT CALCIUM ABSORPTION IN AN EXPERIMENTAL MODEL IN RATS

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Background and objectives: Calcium (Ca) absorption from foods varies between 30-40%, and is conditioned by the presence of components that stimulate or inhibit it. Low intakes of Ca during childhood and adolescence could condition the subsequent loss of bone mass in adulthood, resulting in a high incidence of osteoporosis. Therefore, Ca bioavailability becomes a key factor to reach or maintain a critical peak bone mass. The addition of chocolate or cocoa powder to milk is a popular nutrition habit. Cocoa powder contains oxalic acid (450-480 mg/100g), an inhibitor of calcium absorption. However, calcium bioavailability studies regarding oxalate impaired effect are contradictory. Therefore, the effect of milk added with cocoa powder on the apparent calcium absorption (ACaA%) was studied in an animal model including young and adult rats.

Methods: Thirty-six Wistar rats at weaning (6/group) were fed:1)a control diet prepared according to the American Institute of Nutrition (C); 2) a semisynthetic diet prepared with whole milk powder reduced in lactose (77 mg lactose/g milk) (M), and 3) the milk diet added with cocoa powder (MC).The three diets were isocaloric (4.1 kcal/100g diet) and supplied the same amount of Ca (0.5 g/100g diet). Three groups of rats received control or experimental diet from weaning (age=23 days) up to 33 days old (T1); other three groups of young adult rats (age=49 days) were fed the same diets up to 66 days old (T2). At T1 and T2, food intake was recorded and feces were collected during the last three experimental days to determinate ACaA% = [(CaI - CaF)/CaI] x100. Ca intake (CaI) (mg/d) was calculated from Ca concentration in diets. Microwave acid digestion for Ca diets and Ca feces (CaF, mg/d) was done in Parr Bombs (Parr Instrument Company). Ca concentration was determined by atomic absorption spectrometry (Perkin Elmer AA400).

Results: At T1, MC had lower ACaA% than M and C: 45.0±3.9 vs 82.9±6.4 vs 69.0±3.3, respectively; at T2 ACaA% was: 21.1±5.5 vs 54.5±9.1 vs 71.1±3.0, respectively (p<0.0001).

Conclusions: These results suggest that the addition of cocoa powder to milk may result in a decrease apparent calcium absorption in rats, either earlier or later in life.

Keywords: Calcium absorption, milk, cocoa powder, rats.

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DIETARY SUPPLEMENT INTAKES AMONG HIGH SCHOOL MALE ATHLETES

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Background and objectives: Dietary supplements are intended to make up for nutrient deficiency in daily life and to improve sports performances. We clarified the status of supplement usage, comprehension, and nutrient intakes for high school male athletes from the questionnaires.

Methods: In total, we surveyed 239 people with a football club (64 members), a tennis club (75), a baseball club (45) and track-and-field club (55) belonging to the male athletic clubs of N University Highschool. The self-administered questionnaires on supplements and nutrient intakes (food frequency questionnaire) were distributed and collected later.

Results: The rate of supplement intake was 35% overall. The track-and-field club was significantly higher with 65.5% than the others and were the same level as top athletes. The main purpose of intake for 60% of all subjects was "increasing muscle and weight", and 40% for "fatigue recovery". 80% of baseball members took supplements for "increasing muscle and weight", and 70% of track-and-field for "fatigue recovery" which was significantly high. The breakdown of "no reason" was 30% for "enough in the usual diet", 20% for "seems to be bad for health" and "bothers to use", and 10% for "expensive", 50% for "not interested in". As for the nutrients, protein intake was 70%, carbohydrates 30%, both amino acids and vitamins were 10%. The track-and-field was significantly high in 30% of amino acids. The timing of intake was "before going to bed" "after exercise" and "during exercise" which were high. 80% of subjects answered "read" or "read and understand" of nutritional labeling of supplements and 50% were careful with "usage quantity" or "intake time". The sources of information are "at a sports store"40%, "from the Internet" and "from friends or parents" were 30%.

Conclusions: In contrast to team play, individual competitive edge is directly connected with the high intake rate of the track-and-field club. Some members took supplements despite the fact that they didn't understand the suitable amount of nutrient intake. Since supplement intake is ultimately based on athletes' self-control, supervisors, and coaches must understand the need of athletes and cooperate with registered dietitians, including correct knowledge for legally prohibited additives or doping substances.

Keywords: dietary supplements ,high school male athletes,sports performances,nutrient intakes

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DETERMINATION OF NIACIN ACTIVITY IN WHEAT GERM USING QUINOLINATE PHOSPHORIBOSYLTRANSFERASE DEFICIENT MICE

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Background and objectives: Taking enough niacin and tryptophan is important to prevent pellagra and maintain niacin nutrition. Although wheat germ contains tryptophan and high amount of niacin, matured cereal grains generally show low bioavailability of niacin. This is because several factors such as food matrix, chemical structure and presence of bound form affect bioavailability of B-group vitamins in foods. In the present study, we investigated niacin activity including bioavailability of niacin and conversion of tryptophan to nicotinamide in wheat germ using quinolinate phosphoribosyltransferase deficient (QPRT-KO) mice, which lack tryptophan-nicotinamide pathway.

Methods: Wild type (WT) and QPRT-KO mice were fed a control diet containing 0–30 mg/kg nicotinic acid or 60% wheat germ diet for 28 days. Urine nicotinamide metabolites, and blood and liver NAD and total nicotinamide were measured. These biomarkers were compared between mice fed control diets and wheat germ diets, and niacin activity in wheat germ was determined.

Results: Urinary nicotinamide metabolites strongly correlated with nicotinic acid intake in both WT and QPRT-KO mice fed control diets, and the linear regression equation was determined. Bioavailability of niacin in wheat germ was calculated to be 79 ± 10% using the equation and urinary nicotinamide metabolites in QPRT-KO mice fed wheat germ diet. Conversion ratio of tryptophan to nicotinamide was also determined in mice fed wheat germ diet, and was 1.3 ± 0.2%, same ratio as mice fed 20% casein diet. NAD and total nicotinamide in the liver and blood were same in mice fed control diets and 60% wheat germ diet.

Conclusions: Wheat germ shows high niacin activity both in bioavailability of niacin and conversion ratio of tryptophan to nicotinamide. When present results apply to human, wheat germ may contain 8 mgNE/100 g of bioavailable niacin which corresponds to 50% of RDA for adult men. Wheat germ can be a good niacin source to prevent pellagra and maintain niacin nutrition.

Keywords: vitamin, biovailability, biomarker, nutritional assessment.

ASSOCIATIONS BETWEEN INTRA-ABDOMINAL FAT, PHYSICAL ACTIVITY, DIET, AND BLOOD PRESSURE IN OBESE CHILDREN

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Background and objectives: Obesity is thought to be an important contributing factor to the development of elevated blood pressure (BP) in children, and intra-abdominal fat (IAF) has been identified as the main determinant of several metabolic disorders. Changes in central adiposity and BP can occur in response to physical activity (PA) and a balanced diet. The aim of this study was to examine the associations among PA, fat distribution, mainly abdominal fat, nutrition and BP in obese children.

Methods: Seventy-eight obese children (n = 43 boys, age = 7.8±1.3 years, weight = 46.9±10.3 kg, FMP = 40.8%, BMI = 25.1±3.4 kg/m2) participated. Total body fat and IAF were assessed by dual energy x-ray absorptiometry (DXA). The abdominal region was delineated by an upper horizontal border located at half of the distance between acromion and external end of iliac crests, a lower border determined by the external end of iliac crests and laterally to any trunk soft tissue. PA was objectively assessed on 7 consecutive days by accelerometry (Actigraph TM GT3X). BP was measured using an automated BP monitor. Adherence to a Mediterranean diet was estimated by a modified version of the Trichopoulou questionnaire (removing item 8). Spearman rank correlation coefficient were used to explore associations between variables.

Results: No child met PA recommendations (≥60 minutes daily of moderate-to-vigorous PA). The prevalence of elevated systolic BP and diastolic BP was 1.3% and 13.2%, respectively. There were significant associations between systolic BP and IAF (rho = 0.324, p<0.01); MVPA and %IAF (rho = -0.526, p<0.001); and the nutrition questionnaire score and %IAF (rho = -0.298, p<0.01). There was no association between PA and BP.

Conclusions: There is a positive relationship between IAF and blood pressure, and a strong negative relationship among PA, diet and IAF in obese children. Adherence to a Mediterranean diet and the performance of MVPA could help to reduce visceral abdominal fat in obese children.

Keywords: obesity, childhood, DXA, exercise, nutrition.
Further collaborators:

ANTHROPOMETRIC STUDY BY SOCIOECONOMIC STATUS IN SEMI-URBAN SCHOOLCHILDREN IN KENITRA CITY IN NORTH-WEST MOROCCO

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Background and objectives: The nutritional problem among schoolchildren, in rural and urban areas has been the subject of several studies, while the semi-urban environment remains to be unveiled. The present study aims to evaluate the nutritional status according to the socio-economic status of schoolchildren aged from 6 to 16 years, from Imam Boukhari school in the Kenitra city in northern Morocco.

Methods: The anthropometric survey was conducted among 239 schoolchildren of average age (10.22 ± 2.10), weight and height were measured according to the procedure recommended by WHO (World Health Organization), The anthropometric indices adopted are: weight-for-age, and height-for-age and body mass index (BMI), determined by the Z score calculated according to the WHO growth references 2007 (5-19 years). The socio-economic status of schoolchildren was assessed by a questionnaire that refers to age, gender, household size, parental education, and the job of the parents.

Results: The finding showed an underweight of 4.3% (<10 years), stunting (6.3%), thinness (3.8%), a low rate of risk of overweight (4.3%) and obesity (0.9%). The socio-economic status of parents is quite low: The size of the household is 5 persons (42.7% of households have more or equal to 5 persons). The illiteracy

among parents is high 31.5% (25.1% of fathers, 38% of mothers), 58% of fathers have a low monthly income, as well as 79.1% of mothers are not engage in any paid occupation. In addition, a CH2 test of independence at 5% error revealed an independence between the socio-economic factors and the various anthropometric indicators.

Conclusions: The sample studied suffers from moderate malnutrition, with no socio-economic effect on nutritional status. The semi-urban environment showed a slight regressive effect on the prevalence of malnutrition in relation to the rural environment.

Keywords: schoolchildren, semi-urban, nutritional status, socio-economic status

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DIETARY PATTERNS DESCRIBED BY PRINCIPAL COMPONENT ANALYSIS AND SODIUM INTAKE IN HEALTHY ADULTS

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Background and objectives: Dietary patterns (DP) are widely used to assess nutrients intake. High sodium intake has been described as a modifiable risk factor for hypertension and cardiovascular disease. Identification of risk factors in healthy populations, makes it possible to propose preventive interventions. The propose of this research was to identify dietary patterns in healthy adults describing its relationship with sodium intake.

Methods: Longitudinal study in 130 healthy men and women. DP were identified by principal component analysis (PCA); dietary sodium derived from multiple 24 hour recalls and quantified according to the content of sodium in food.

Results: Five DP were identified: DP-I characterized by consumption of cereals and sugars, DP-II by meat and canned food; DP-III by fruits, vegetables, oils-fats, and the lowest amount of sodium (prudent), DP-IV by meat; and DP-V by dairy products. In this healthy subjects, consumption of fruits, vegetables, cereals and legumes explains 69% of the variance, and men exceed daily sodium intake recommendations.

Conclusions: Prudent DP is practiced only by 20% of participants. Healthy men in this study consume very high amounts of sodium in their diet. Interventions in DP are necessary in disease prevention and health promotion strategies.

Keywords: dietary patterns, principal component analysis, sodium.

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IRON INTAKE AND STATUS: HOW ARE THE RESIDENTS OF SÃO PAULO, BRAZIL

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Background and objectives: Worldwide, iron has been a target of studies, because of the functional consequences related to its deficiency. In Brazil, since 2004 was introduced the policy to fortify wheat and corn flours with iron for all population, which reinforcing the importance of nutritional iron status monitoring. This study aimed to estimate the prevalence of dietary iron inadequacy and its blood status.

Methods: Data were obtained from the 2015 Health Survey of Sao Paulo (n 880; age range 12 to 93 years), a cross-sectional population-based study developed among residents from urban area of São Paulo, Brazil. Dietary iron intake was measured using two 24-h dietary recalls, and it was assessed in Nutrition Data System for Research programme. The dietary iron content of foods was checked and when necessary corrected using data from Brazilian food composition tables. Usual iron intake was estimated using the Multiple Source Method programme. Probabilistic approach was used to estimate the prevalence of inadequate intake. Haemoglobin and serum ferritin concentrations were assessed in fasting blood samples. The presence of anaemia was established by haemoglobin concentrations < 120 g/dL (male adolescents with 12 to 14 years); < 130 g/dL (men with 15 years and older), and < 120 g/dL (all non-pregnant women); and low serum ferritin was defined as serum ferritin concentrations < 15 μg/L.

Results: The prevalence of iron inadequacies varied from 1.6% to 13.8% in men, and from 7.3% to 40.5% in women. Otherwise, the prevalence of anaemia was from 0.0% to 10.5% in men, and 0.0% to 13.8% in women, and low serum ferritin varied from 0.0% to 3.0% in men and 1.7% to 18.4% in women.

Conclusions: Women showed to be more vulnerable to nutritional iron deficiency. Prevalence of iron inadequacy assessed by dietary intake overestimate iron deficiency when compared to blood status.

Keywords: Dietary iron. Iron deficiency. Nutrition survey. Nutritional status.

NUTRITION KNOWLEDGE AND FOOD PORTIONS INGESTION OF ADOLESCENT SOCCER PLAYERS

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Background and objectives: Athlete´s Nutrition knowledge may improve food choice and dietary ingestion, however, studies have shown that athletes have poor nutrition knowledge. The analysis of athlete´s nutrition knowledge and dietary intake may help in the development of specific nutrition intervention strategies. The objective of the present study was to evaluate the nutrition knowledge and food portions intake of adolescent soccer players.

Methods: Fifty-four athletes from three professional clubs responded to a three day food record and a validated questionnaire about nutritional knowledge and sources of information on nutrition. The ingestion of food portions was estimated and compared with the recommendations for the Brazilian population.

Results: The athletes had a hit percentage of 44.7 (25.6) percent in the test of knowledge in nutrition. The most commonly used source of nutrition information for athletes was the coach, followed by the internet and friends. The athletes presented a low consumption of vegetables, fruits and a high intake of oils and fats. The main difficulties reported by athletes for the adoption of healthy eating were the and the lack of time and willpower. There was no correlation between knowledge in nutrition and the ingestion of food portions.

Conclusions: The athletes presented low knowledge in nutrition and reported using sources of nutrition information of low reliability. In addition, they presented an inadequate food intake.

Keywords: Nutrition knowledge, teenagers, soccer

IRON, VITAMIN B12, AND FOLATE BIOMARKERS AND ANEMIA IN WOMEN PARTICIPATING IN A RANDOMIZED TRIAL OF DOUBLE-FORTIFIED SALT IN DARJEELING, INDIA

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Background and objectives: The objective of this analysis was to examine the associations between iron, vitamin B12, and folate biomarkers and anemia among women of reproductive age participating in a randomized efficacy trial of double-fortified salt in India.

Methods: Participants were 244 women (18-55 y) enrolled in a randomized efficacy trial of double-fortified salt in Darjeeling, India. Iron status [hemoglobin (Hb), serum ferritin (SF), soluble transferrin receptor (sTfR), and total body iron (TBI)], inflammatory biomarkers [C-reactive protein (CRP) and -1 acid glycoprotein (AGP)], serum vitamin B12, and serum folate were evaluated at enrollment. Anemia was defined as hemoglobin <120 g/L; iron deficiency was defined as serum ferritin <15.0 μg/L (TBI<0.0 mg/kg, sTfR>8.3 mg/L); and inflammation was defined as CRP >5 mg/L or AGP >1 g/L. Vitamin B12 deficiency and insufficiency were defined as <148 pmol/L and <221 pmol/L; and folate deficiency defined as serum folate <6.8 nmol/L. Linear and binomial regression models were used to examine the associations between micronutrient biomarkers and hemoglobin concentrations and anemia, respectively.

Results: At baseline, 52.9% of women were anemic (Hb<120 g/L), 44.3% were iron deficient (SF<15.0 μg/L), and 42.6% had iron deficiency anemia (Hb<120 g/L and SF<15.0 μg/L); 25.0% had elevated CRP or AGP (CRP>5 mg/L or AGP>1 g/L). B-vitamin deficiencies were also common at enrollment: 30.3% of women were vitamin B12 deficient (<148 pmol/L), 63.5% were vitamin B12 insufficient (<221 pmol/L), and 83.2% had folate deficiency (<6.8 nmol/L). Increased serum ferritin, sTfR, and TBI levels were associated with significantly higher hemoglobin concentrations at baseline. Higher total body iron was associated with lower risk of anemia at baseline, while iron deficiency (SF<15.0 μg/L) and inflammation (CRP>5.0 mg/L) were associated with increased risk of anemia; B-vitamin deficiencies were not significantly associated with risk of anemia. The risk of anemia at baseline was 1.6 times higher among women with iron deficiency (SF<15.0 μg/L), compared to women with replete iron status (RR: 1.61; 95% CI: 1.29, 2.01; p<0.0001).

Conclusions: The prevalence of iron, vitamin B12, and folate deficiencies and anemia were high in this population. Iron deficiency and inflammation were associated with significantly increased risk of anemia.

Keywords: Anemia, micronutrient, iron, B-vitamin, fortification

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ASSESSMENT OF NUTRITIONAL STATUS, EATING HABITS AND THEIR DETERMINANTS AMONG MAKERERE UNIVERSITY STUDENTS, UGANDA

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Background and objectives: Back ground: Eating habits determine the health status of individuals (Walter and willet, 2003). A healthy eating habit involves having at least three main meals a day and healthy snacks in between. WHO recognizes the importance of improving diet and lifestyle for prevention of chronic diseases like diabetes and hypertension. However, increased industrialization, technology and changing lifestyles have led to change in eating habits of students, tending to much lower consumption of vegetables, fruits and whole grains with high consumption of foods high in fats, free sugars or salt that lead to chronic development of diseases. Eating habits and their determinants vary across cultures, while information about these nutrition-related factors would help in the development and implementation of effective nutritional programs in the universities that may act as a deterrent against unhealthy eating habits since universities provide an ideal means for reaching out to a large number of young adults. Objective: To identify the eating habits, their determinants and assess the nutritional status among Makerere university students.

Methods: A self-administered questionnaire was filled by 393 students (47.8%) females and (52.2%) males. Eating habits and demographics were recorded while blood pressure, height, weight were measured and BMI calculated. Data analysis was performed using SPSS version 16.

Results: Most of the respondents had unhealthy eating habits like unhealthy snacking (85% of students) with 42.1% snacking on cookies and very few (1.0%) on vegetables. Their eating habits were mainly influenced by availability of time, accessibility of eating places, availability of food stuffs, tastes and preferences. Most of the students (96.1% and 76.9%) had good nutritional status basing on waist circumference and BMI respectively. According to BMI, 15% of the students were overweight and 8.1% underweight. Basing on WC, 3.9 % of the respondents were obese. Most of the students had high blood pressure (46%). Nutritional status (based on waist circumference) was significantly (p<0.005) associated with eating habits.

Conclusions: Most University students had unhealthy eating habits. There is a need of nutrition intervention programs that can improve the eating habits of University students.

Keywords: Eating habits, health status, snacking, and nutrition intervention.

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PREDICTORS OF SUB-CLINICAL VITAMIN A DEFICIENCY IN SENEGALESE 6 MONTHS LACTATING WOMEN

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Background and objectives: Plasma retinol (PR) and breast milk retinol (BMR) were indicators recommended by WHO for assessing vitamin A status of lactating women at subclinical level. PR is homeostatically controlled, and was usually affected by infections/inflammation. BMR may reflect recent dietary intake but it is currently unknown if the level was influenced by systemic infections. Thus, this study aimed to evaluate the performance of BMR and PR to detect vitamin A deficiency (VAD) among the Senegalese lactating women, and the relationship between BMR and their inflammatory status.

Methods: An experimental study was undertaken in 184 non-pregnant lactating women at 6 months post-partum, randomly selected in suburbs of Dakar (Senegal). The indicators measured were: plasma, casual and full breast milk retinol concentrations by HPLC, fat content of fresh milk by creamatocrit, plasma C-reactive protein (CRP) and alpha 1-acid-glycoprotein (AGP) by immuno-turbidimetry. Receiver operating characteristics (ROC) analysis was used to compare the performance of BMR (expressed as μmol/L and μg/g fat) and PR to predict VAD among the Senegalese lactating women.

Results: PR detected 3.3% of VAD among the women. BMR, expressed by μmol/L (≤1.05 μmol/L) in casual and full milk, detected 22.7% and 21.6% of VAD, respectively. When expressed by μg/g fat, the prevalence of VAD (BMR<8.8 μg/g fat) were 10.3% and 8.2% using casual and full milk, respectively. ROC-analysis showed that the area under the curve of BMR μg/g fat in full milk (AUC=0.949; 95% CI: 0.917-0.981) was higher than the others indicators to predict VAD. No significant relationship was found between CRP/AGP and BMR.

Conclusions: PR detected the lowest prevalence of VAD among the women. However, according to WHO, BMR μmol/L indicated moderate VAD while PR as well as BMR μg/g fat suggested that VAD was not a major concern among the Senegalese 6 months lactating's women living in Dakar. None of the predictors was related to systemic inflammation.

Keywords: Vitamin A deficiency, breast milk retinol, plasma retinol, lactating women, Senegal.

RISK OF ABDOMINAL ADIPOSITY AMONG BRA-ZILIAN SCHOOLCHILDREN, 2002, 2007 AND 2012/13

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Background and objectives: Waist circumference (WC) is a sensitive marker for abdominal obesity in the pediatric age group. It has emerged as an index of pediatric adiposity that predicts fat mass as well as or better than body mass index (BMI). The purpose this study was to describe trends of the abdominal adiposity among 7–10-year-old children by investigating changes in the prevalence of the risk of abdominal adiposity.

Methods: A school-based sample of 7–10-year-old children participated in three cross-sectional studies in 2002 (n=2,936), 2007 (n=1,232) and 2012/13 (n=1,531) in Florianopolis, southern Brazil. The prevalence of the risk of abdominal adiposity was assessed using the 91st centile of the British reference as cut-off points.

Results: In 2012/13, 26,3% of the students were identified in risk of abdominal adiposity, with a substantial increase since 2002 (22,1%) and 2007 (24,6%) (p trends=0,001).

In girls, the prevalence of abdominal adiposity was 21% (2002), 21,8% (2007) and 25,9% (2012/13) (p trends=0,001). In boys the prevalence of abdominal adiposity was 23,2% (2002), 27,3% (2007) and 26,8% (2012/2013) (p=0,056).

Conclusions: Over the period studied (2002-2012/13) an increase of the risk of abdominal adiposity among schoolchildren was identified. This finding is a concern because of its association with disease risk including clustering of metabolic and cardiovascular disease risk factors. The prevalence of risk of abdominal obesity among children has become a public health problem, which would arouse special attention and an urgent need for school intervention programs.

Keywords: abdominal obesity; children; trends

PERFORMANCE OF THE GLOBODIET-BRAZIL-IAN VERSION SOFTWARE FOR DIETARY INTAKE ASSESSMENT

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Background and objectives: GloboDiet is a software that conduct the interview of the 24-hour dietary recall (R24h) guided by a standardized routine. The successful experience of adapting this software in different cultural contexts in Europe led to the extension of the project to Latin American countries. Brazil was one of the selected countries to start the LA-DIETA project in collaboration with IARC, and a Brazilian version of the GloboDiet software was developed. Actually. there is a need to evaluate the performance of the Brazilian version of the GloboDiet compared to others software that have being used to estimate the dietary intake in Brazilian studies. The aims of the study were to estimate food consumption using the GloboDiet Brazilian version software and verify the agreement between the estimated intake of energy, carbohydrates, protein. and lipids on the GloboDiet versus Nutrition Data System for Research – NDSR software.

Methods: A sub-sample of 100 adult individuals was drawn from a representative sample of the resident population in the urban area of São Paulo - ISA-Capital 2008. A R24h was collected in pencil and paper for all participants and the data obtained was entered using both NDSR and GloboDiet Brazilian version. Bland and Altman analysis and Kappa statistic were used to evaluate the agreement between the software, considering the tertiles of energy and macronutrients.

Results: The mean (SD) obtained for energy, protein, carbohydrate and lipids in the NDSR were 2386.47(444.25)kcal, 100.08 (35.33)g, 286.75 (84.02)g, and 87.34(28.32)g, respectively. In comparison, the mean(SD) obtained to GloboDiet of those same variables were 2279.67(655.50)kcal, 92.94(38.35)g, 277.62(93.86)g, and 83.12(33.69)g, respectively. The mean (95%CI) of the differences between two measurements for energy, protein, carbohydrate and lipids were 106.8 (-961.3; 1174.9)kcal, 7.142 (-58.6;72.9)g, 9.1(-128.9;147.2)g and 4.2(-64.0;72.4)g, respectively. From the Kappa

statistic, it is possible to notice a slight and significant agreement(p <0.05) between the data of the software; the obtained values of Kappa were 0.28 for energy and lipids and 0.35 for carbohydrate and protein.

Conclusions: The GloboDiet Brazilian version estimated similar dietary intake (energy and macronutrients) compared to NDSR. However, further research is needed to validate the dietary intake assessment obtained using GloboDiet.

Keywords: GloboDiet, NDSR, software validation, R24h dietary recall, dietary intake assessment.

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SODIUM EXCRETION IN A GROUP OF YOUNG ADULTS FROM ARGENTINA: RELATIONSHIP TO BODY MASS INDEX AND BLOOD PRESSURE

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Background and objectives: Elevated sodium intake has been associated with a number of NCDs. To evaluate sodium intake, 24-h urinary sodium excretion (24-h UNa) was estimated using predictive equations from measured sodium concentrations in a spot urine sample.

Methods: 470 students (361 women and 109 men), aged 25.5±3.5 years, from Universidad de Buenos Aires, Argentina, were studied. Anthropometric measurements and supine blood pressure were determined. A spot urine collection was obtained to determine sodium, potassium and creatinine excretion. To estimate 24-h UNa, the INTERSALT equation was used.

Results: The mean estimated 24-h UNa (mg/d) was 2596 (95%CI: 2534 – 2658) and, as expected, was significantly higher in men than in women (3028.5±862 vs. 2465.4± 568; p< 0.0001). The 24-h UNa (mg/d) of overweight/obese students was significantly higher than in the normal weight students (2997±660 vs. 2512±662; p< 0.001). The 24-h UNa (mg/d) of pre/hypertensive students was significantly higher than in the normotensive students (2751±811 vs. 2473±545; p = 0.0003).

Conclusions: The highest estimated sodium intake was related to overweight/obesity and hypertension. The estimated 24-h UNa pointed out a sodium dietary intake increased in 81% of women and 85% of men, exceeding the current World Health Organization (WHO) recommendation of 2 g sodium per day.

Keywords: Urine Sodium, Salt intake, Blood pressure, Overweight, Hypertension.

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USE OF NUTRITIONAL SUPPLEMENTS IN NORMAL ADULTS. NEIGHBORHOOD NEW CITY-ASUNCIÓN-PARAGUAY

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Background and objectives: When analyzing the diet of the population, nutritional supplements (SN) should be taken into account. Its great free supply, in the market, favors its consumption without Prescription medical, representing risks for the health.
There are Evidence that contraindicates its use in normal adults, such as the Preventive Services Task Force, United States, February 24, 2014 (Health Day News); Research by Dr. R. Redondo, Regional Sports Medicine Center, Castilla-León Regional Government.
Few scientific studies on the use of NS make it difficult to orientate the problem of its use, misuse and abuse. Paraguay, does not present studies in this regard.
Objectives: To know the consumption of nutritional supplements, in adults, Ciudad Nueva-Asunción-Paraguay neighborhood.
Knowing age, reason for consumption SN in adults and who indicates.

Methods: Method: Observational, descriptive study, transverse cut. Non-probabilistic sampling of consecutive cases, in normal adults, 18 to 70 years, healthy.
Research carried out in October, 2016.
Data were collected by self-completed survey, with informed consent of the respondent.

Results: Result: Interviews with 220 adults, men and women. 80% of respondents consume SN. Men 40% to increase muscle mass, the elderly to improve quality of life-sexual vitality.
Women, 60% to decrease body fat, vitality, rejuvenate, prevent cancer, cholesterol, diabetes.
L-carnitine (10%), protein (15%), amino acids (25%), vitamins-minerals (34%), food substitutes (6%), natural leaf products . They consume NS more than 40 to 60 years, followed by young adults from 18 to 30 years.
60% consume without medical indication; Recommended by friends, coach, media, internet.
Older adults prefer SN in milks, powders, infusions of herbs-seeds or fruits, and the active compounds or their utilities can not be determined.

Conclusions:
- The consumption of NS must indicate and supervise a health professional.
- It is not prudent to use them freely, since they are not safe for health.
- People should be educated to get nutrients from a healthy diet, rather than using SN.

Keywords: SN :nutritional supplements

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AMINO ACID PROFILE OF DIFFERENT PRODUCTIVE LINES OF CHICKEN, TURKEY AND PORK MEAT

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Background and objectives: The nutritional composition of meat has varied through time due to industrialization of production systems, genetic improvement and lean carcasses design experienced by domestic animals.

Objective: Compare the amino acid (AA) composition of cuts of chicken, turkey and pork meat with standards utilized for the evaluation of AA of the Chilean diet.

Methods: The samples of chicken cuts (wings, breast, thigh, leg, liver and gizzard), turkey (whole, breast, thigh and leg) and pork (veiled chop, ribs, fillet, leg, shoulder, bacon-loin and heart), were given by the company Agrosuper and selected by the investigators. The samples where homogenized and freezed at -20°C before the analysis. A T-Test was performed to estimate the difference between AA analysis and AA composition referred by the FAO 1981.

Results: Chicken thigh had less concentration for all AA (p<0,05) according to the standard, meanwhile, fillet and shoulder had higher amount of almost all AA (p=0,05), except for isoleucine, which had lower concentration (p<0,05). All turkey cuts presented a smaller amount in relation to the standard for phenylalanine (p<0,05). The whole turkey presented higher concentration of threonine, leucine, and lysine (p=0,02, 0,01 and <0,0001 respectively); the breast had higher concentration of leucine and lysine (p=0,03 and 0,002) and lower in valine (p=0,03); the thigh had less amount for all AA except for arginine, leucine and lysine (p=0,41, 0,08 and 0,86 respectively); turkey leg had higher concentration of leucine and lysine (p=0,006 and 0,006), and less of proline, valine, methionine, phenylalanine (p=0,02, 0,04, 0,03 and 0,01).

Conclusions: There is a difference between the AA composition of some cuts of chicken, turkey and pork meat and the standard. An explanation for this situation could be the genetic and nutrition improvement of these animals that modified their nutritional composition.

Keywords: AA: Amino acids

144/976

NUTRITIONAL EVALUATION OF AUTISTIC CHILDREN

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Background and objectives: Autism is nowadays described by some authors as Autism Spectrum Disorders, a type of neurodevelopmental disorder with different degrees of severity. It is commonly characterized by communication, social interaction and imagination deviances. Regarding nourishment, it is commonly observed food refusal, indiscipline and hyper-selectivity among these children, which may lead to cases of malnutrition. This research aimed to assess the nutritional status of autistic children aged five to fourteen years, who attend a unit of the Association of Parents and Friends of Exceptional Children (APAE), through the Body Mass Index, and verify their dietary characteristics.

Methods: It was evaluated 14 children of both sexes, aged between five and fourteen years, who attend a unit of the Association of Parents and Friends of Exceptional Children (APAE). It was applied a survey about children's eating habits and preferences to the parents. By calculating the BMI/age it was measured the nutritional condition of each child. The data obtained from anthropometric measurements were related to the results of the survey about children's eating habits applied.

Results: It was observed that 50% of the children had difficulty accepting hard and dry food and in extreme temperatures (hot or cold). Only 50% of them showed a good acceptance of new food. 66.6% of the children who needed assistance to feed themselves were overweight or obese. Concerning the nutritional status, it was observed that the rate of overweight children was very high (57%), which is not common in children with autism spectrum disorders. Parents did not have a correct perception of the nutritional status of their children, since most of the mothers (64.28%) underestimated the children's weight, which may be a factor that causes overweight..

Conclusions: The rate of autistic and obese children is very high, following what has been happening with children through out the country. The use of restrictive diets should be weighed and always accompanied by specialized professionals. Most parents did not have an adequate perception of the nutritional status of their offspring, which could result in late diagnosis and intervention and consequently nutritional problems that could be avoided if detected previously.

Keywords: autism, eating habits, nutritional status

144/980

VALIDITY OF A FOOD-FREQUENCY QUESTION-NAIRE FOR DIETARY INFLAMMATORY INDEX: THE JPHC FFQ VALIDATION STUDY

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Background and objectives: Inflammation is related to the development of many cancers and diet plays a central role in the regulation of inflammation. The dietary inflammatory index (DII TM) is a literature-derived dietary index designed to assess the impact of diet on people's inflammation status. All studies validating the DII have been conducted exclusively in Western populations, heretofore not in Eastern populations whose dietary habits are very different from those in the West. Therefore, the aim of this study is to validate, in a Japanese population, DII scores derived from a food frequency questionnaire (FFQ) with DII scores calculated from 28-day dietary records (DR) in the Japan Public Health Center-based prospective study (JPHC Study).

Methods: Validation studies were conducted in 1994 (Cohort I, n=215) and in 1996 (Cohort II, n=350). In each study the DRs were collected over one year. The FFQ was distributed before and after DR collection. DII scores calculated from both dietary assessment tools were compared. Spearman's rank correlation and weighted kappa coefficients were calculated from energy-adjusted DII. Density method was used for energy adjustment.

Results: Median (min, max) energy-adjusted DII for men and women from DR were -1.00 (-4.47, 2.02) and -2.15 (-5.43, 1.16) in Cohort I and -1.61 (-4.86, 2.29) and -2.70 (-5.49, 1.62) in Cohort II, respectively. Correlation coefficients for validation analysis for men and women were 0.35 and 0.39 in Cohort I, and 0.48 and 0.47 in Cohort II, respectively. Weighted kappa coefficients in men and women were 0.82 and 0.85 (Cohort I), and 0.86 and 0.86 (Cohort II), respectively. Correlation coefficients for reproducibility analysis for men and women was 0.63 and 0.59 in cohort I, and 0.63 and 0.62 in cohort II, respectively.

Conclusions: DII assessed by FFQ was valid when compared to the DII derived from DRs.

Keywords: Validation study; FFQ; DII; inflammation

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NUTRITIONAL ASSESSMENT AND THE INFLUENCE OF BREASTFEEDING IN PATIENTS WITH DOWN SYNDROME

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Background and objectives: Studies indicate that most of the children and adolescents with Down Syndrome present overweight or obesity due to genetic, environmental and physiologic aspects. Since the nutritional factors can help the improvement in these individuals' quality of life and prevent pathologies related to the bad feeding, the adaptation of the Down Syndrome bearers to a healthy feeding is fundamental, starting from the breast feeding period. Thus, these are the aims of this research: evaluate the difficulties of the breastfeeding and the occurrence of early weaning in children bearers of Down Syndrome and also verify the influence of the breastfeeding on its nutritional state.

Methods: The nutritional evaluation was accomplished in APAE children of a municipal district in the countryside of São Paulo and a questionnaire was the period of breastfeeding. The sample was composed by 16 children with age varying from 3 to 6 years old and the anthropometric evaluation was accomplished through weight/age and height/age which were analyzed through the specific growth curves for the population with Down Syndrome by Mustacchie e Cronk.

Results: The classification of the nutritional state showed that all the participants turned eutrophic. In agreement with the obtained results, 83,3% of the mothers who received formal orientations were breastfeeding, as recommended by the World Health Organization (WHO -OMS), superior result to those mothers who did not receive that orientation type. Factors such as work, age and primiparous mothers have not influenced the breastfeeding time. The main difficulty relate was getting the baby to breast which is a responsible factor for 71,4% of the breast feeding desertion among the mothers who could not breastfeed for six months or over.

Conclusions: Qualified professionals' attendance becomes necessary so that the difficulties are resolved, making exclusive mothers' breast feeding desertion a practice less common in this population.

Keywords: Down Syndrome, mother breastfeeding, nutritional state

SELF-ADMINISTERED STRUCTURED FOOD RE-CORD FOR MEASURING INDIVIDUAL ENERGY AND NUTRIENT INTAKE IN LARGE COHORTS: DESIGN AND VALIDATION

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Background and objectives: Introduction: Several instruments were developed to assess group or population dietary intake, but all have strengths and weaknesses that affect their specific application. Additionally, there is no self-administered close-ended dietary record previously employed in Argentina to assess current food and nutrient intake by recording food intake on a daily basis.

Objective: We designed and validated a self-administered structured food record (NutriQuid, NQ) representative of Argentine population food consumption pattern to measure individual energy and nutrient intakes in adults.

Methods: Materials and methods: Records were loaded onto a database using software that checks a regional nutrition information system (SARA program), quantifying automatically energy and nutrient intake. NQ validation included two verification phases: 1) NQ construct validity comparing records simultaneously kept by healthy volunteers (45-75 years) and a nutritionist who provided the meals offered (reference), and 2) whether NQ reflected our target population consumption (calories and nutrients), weekday consumption differences, respondent acceptability and ease of data entry/analysis. Data analyses included descriptive statistics, repeated measures ANOVA, intra-class correlation coefficient, nonparametric regression and cross-classification into quintiles.

Results: The first validation (study group vs. reference) showed a slight underestimation (10%) of carbohydrate, fat and energy intake. In the second one, 109 volunteers (91% response) completed the NQ for seven consecutive days. Record-keeping took about 9 min/day and data entry 3-6 min. Mean caloric intake was 2240±119 kcal/day (42% carbohydrates, 17% protein, 41% fat). Intake significantly increased over the weekend.

Conclusions: Conclusion: NQ is an easy and efficient tool to assess dietary intakes in large samples.

Keywords: close-ended food record,nutrition evaluation,validation,self-administered food record.

ASSOCIATION OF BODY IMAGE DISSATISFACTION AND BODY MASS INDEX TRAJECTORY OF STUDENTS FROM RIO DE JANEIRO: ADOLESCENT NUTRITIONAL ASSESSMENT LONGITUDINAL STUDY - ELANA

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Background and objectives: Adolescents have concerns related to body and appearance, which makes them more vulnerable to body image dissatisfaction (BID) that is defined as the negative evaluation that the individual has in relation to your body, i.e. the difference between the body realized and desired by the individual. The aim of this study was to examine the effect of BID on the Body Mass Index (BMI) trajectory among students from public and private schools from Rio de Janeiro, Brazil.

Methods: Prospective cohort study entitled "Adolescent Nutritional Assessment Longitudinal Study " was composed of two cohorts of students. Data regarding of 809 adolescents from middle school (2010 until 2013) and 1131 students from high school (2010 until 2012) were analyzed. BID data was performed using the body silhouettes scale composed by 9 silhouettes ranging from the corresponding extreme thinness to obesity. The BID was considered by the difference between the image that the adolescents judged to be their current and the one they would like to have. BMI (weight/height2) was calculated. Linear mixed effects models were used to assess the BMI trajectory according to the levels of BID (-1, -2: desire to have larger silhouettes; +1, +2, +3: desire to have smaller silhouettes).

Results: In the middle school, girls from private schools who wanted to have smaller and bigger silhouettes gain less BMI units (BID levels: -1: 1.7 kg/m²; 1:1.9 kg/m²; 2: 1.4 kg/m²) than girls who were satisfied with their body image (2.8 kg/m², $p < 0.05$). In high school, girls from private schools who wished to have smaller (BID levels: -2: 1.2 kg/m²) and bigger silhouettes (BID levels: 1: 1.1 kg/m²; 2: 1.4 kg/m²; 3: 1.4 kg/m²) experienced greater BMI in-

crease compared to girls who were satisfied with their body image (0.5 kg/m², p < 0.05). There was no association between BID and BMI trajectory for girls from public schools and boys from private or public schools.

Conclusions: The findings suggest that BID may be related to BMI trajectory in girls from high socioeconomic status and contribute to comprehend the relation of BMI trajectories and BID during adolescence

Keywords: body dissatisfaction, body mass index, adolescents, longitudinal study

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144/1028

ASSESSMENT OF FASTING BLOOD GLUCOSE LEVEL OF UNDERGRADUATES IN ABEOKUTA OGUN STATE NIGERIA

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Background and objectives: Impaired Fasting Glucose (IFG) is a condition where Fasting Blood Glucose (FBG) is above normal but not high enough to be considered diabetic. Impaired fasting glucose is linked with many co-morbid diseases such as obesity, the prevalence of impaired fasting glucose concentration among undergraduates in Ogun state South-West Nigeria.

Methods: A purposive sampling technique was used to select three hundred undergraduate students willing and ready participant. A pretested structured questionnaire was used to obtain the socio-economic information of the undergraduates. Fasting blood glucose, weight, height and blood pressure were determined using glucometer, weighing scale, heightometer and sphygmomanometer respectively.

Results: The result of the study showed that the prevalence of IFG among undergraduate in South West Nigeria was 11.0% (n=33) of total participants. A higher prevalence of impaired fasting glucose (IFG) was found with females than males. Body mass index of the subject reviewed that (11.0%, n=33) were underweight, (61.0%, n=183) had normal weight, (27.3%, n=82) were overweight and (0.7%, n=2) were obese.

Conclusions: In conclusion, some of the participants had abnormal FBG (11%, n=33). Nutritional program/workshop should be organized by the institutions to enable undergraduates make a healthy, responsible lifestyle choices and consume a well-balanced diet.

Keywords: None

144/1037

A BODY SHAPE INDEX (ABSI) AS AN ADIPOSITY MEASURE AND DIET QUALITY IN MEN: A CROSS-SECTIONAL STUDY (MEDISH PROJECT)

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Background and objectives: Accurate and simple adiposity measures have been in the forefront of research since the controversies around measures utilising only one or two parameters arose. We hypothesised that a new, combined adiposity measure – a body shape index (ABSI) [1] – may be a superior indicator of a diet quality comparing to others. Objective: to assess an association of ABSI and other commonly used adiposity measures with a diet quality in men.

Methods: In all, 246 men 19-50 years old participated in the study. Diet quality was assessed using food frequency questionnaire (KomPAN). Two diet quality scores were created: prohealthy (pHDI) and non-healthy (nHDI) based on KomPAN procedure [2]. Five measures were investigated: ABSI (ABSI=WC/BMI^2/3 multiplied by Height^1/2), body fat percentage (%BF), body mass index (BMI), waist-to-height ratio (WHtR) and waist circumference (WC). The associations between adiposity measures and diet quality scores were evaluated by multivariate logistic regression, adjusted for age and physical activity.

Results: Very high risk (ABSI z-score≥0,798) was found in 18.7% men; obesity (%BF≥25% or BMI>30kg/m^2) in 33.3% or 9.8%, respectively; central obesity (WHtR>0.5 or WC>102cm) in 41.9% or 11.4%, respectively. Men in the upper tertile of pHDI were less likely to be in the top (very high risk) category of ABSI (odds ratio, OR=0.24, 95%CI confidence interval, 95%CI:0.08;0.75; adjusted OR=0.19, 95%CI:0.04;0.90). Men from the upper tertile of nHDI were more likely to be in the obese category of %BF (OR=2.60, 95%CI:1.20;5.62; adjusted OR=3.31, 95%CI:1.32;8.30). No significant associations with diet quality were found in terms of BMI, WHtR and WC.

Conclusions: Among all adiposity measures studied, only ABSI and body fat percentage were associated with diet quality, regardless of adjustment for age and physical activity. In the obesity context ABSI can be considered as a good indicator of higher quality diet and body fat percentage as an indicator of a low diet quality in men.

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Keywords: ABSI, adiposity, diet quality scores, FFQ, men

144/1079

DEUTERIUM COMPARED TO 15N-LABELING TO DETERMINE DIGESTIVE AND METABOLIC FATE OF MILK PROTEINS

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Background and objectives: The intrinsic labeling of dietary proteins with 15N is convenient to determine their digestive and metabolic fate. The use of 15N ammonium salts and/or nitric oxide allows the uniform labeling of proteins in ruminant products and plants, but this procedure cannot be used for all protein sources. Deuterated water is an alternative but its accuracy has not been assessed. We aimed to compare the performance of 15N and 2H.

Methods: Milk was labelled from 4 goats receiving orally 5g of 15N ammonium sulfate (99 %) for 4 consecutive days. Eighty or 160 mL $2H_2O$ (98%) was given in drinking water for 1 or 3 consecutive days. Milk was collected for 5 days. Proteins were purified from milk and their 15N and 2H enrichments determined. Labelled protein digestibility was assessed in twelve rats receiving a single test meal. Rats were sacrified 4h (n=6) or 6h (n=6) after the meal. Dietary proteins were quantified in gastrointestinal segments (stomach, duodenum, jejunum, ileum, caecum and colon) by elemental analyzer coupled to isotope ratio mass spectrometer.

Results: The 15N enrichment in milk proteins increased during 3 days to a value of 1%. Whatever the dose of $2H_2O$, 3 days administration enabled a better 2H enrichment, reaching 0.032 % and 0.051% with 80 and 160 mL, respectively. In rats, the digesta to meal enrichment ratio was strongly correlated between 15N and 2H in the stomach (R=0.94) and in the ileum (R=0.91) but the correlation was lower in the caecum (R=0.64). In the colon, no 2H enrichment was found in contrast to 15N. The recovery of dietary protein was similar with both tracers in the stomach, and tended to be lower in the caecum with 2H (P=0.08). Orofaecal digestibility was slightly higher using 2H than 15N (98.2 ± 0.3% vs 97.6 ±0.1%, P= 0.001) but orocaecal digestibility was similar.

Conclusions: Deuterium labeling of dietary protein appears as convenient as 15N to follow the digestive fate of protein sources. The discrepancies between 15N and 2H observed in the colon is probably due to the bacterial metabolism. However, the impact on the determination of digestibility was slight.

Keywords: Protein quality, stable isotopes, protein bioavailability, dietary protein, digestibility

144/1082

THE EFFECT OF PROTEIN INTAKE AND PROTEIN DISTRIBUTION ON MUSCLE STRENGTH AND MUSCLE FUNCTION IN PHYSICALLY ACTIVE ELDERLY

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Background and objectives: The effect of protein intake and protein distribution on muscle strength and functionality has mainly been studied in frail elderly, while physically active elderly show age-related declines in muscle strength as well. Therefore, it is of high interest to study the effects of amount and distribution of protein intake on muscle strength and -function in physically active elderly.

Methods: The amount of protein intake and its distribution over the day were assessed using two 24-hr recalls and average values were calculated. Based on protein intake, participants were allocated to a sufficient and non-sufficient protein intake group, based on the cutoff value of ≥1.2 g/kg bw/day or <1.2 g/kg bw/day. Skewness of distribution was calculated as coefficient of variance (CV). Based on the CV participants were divided in tertiles. Muscle strength and function were measured by handgrip strength and the Short Physical Performance Battery (SPPB), respectively.

Results: 82 participants (79% male, 84±2 yrs) with a daily physical activity of 11.8±6.5 METhr/day were enrolled in this study. The average SPPB score was 10.3±1.6 and the handgrip strength was 36±8 kg for males and 25±4 kg for females. A sufficient protein intake was associated with higher SPPB score compared to the non-sufficient protein group (11.1±0.9 versus 9.9±1.7, P=0.001). Handgrip strength showed no significant differences between protein intake groups for both sexes (both P>0.05). Regarding protein distribution pattern, no significant differences were found between tertiles for SPPB score or handgrip strength (all P>0.05).

Conclusions: Higher protein intake in physically active elderly seems to be related to improved muscle function, but this effect

was not found for muscle strength. Distribution of protein intake had no effect on muscle strength and function in active elderly.

Keywords: Protein distribution, physical functionality, muscle mass, sarcopenia.

144/1089

BODY COMPOSITION OF THE POLISH SKI JUMPERS

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Background and objectives: The results of the wind tunnel experiments and simulated ski-jumping models suggest that body weight and body composition of ski jumpers have tremendous impact on performing a long ski jump. Lower Body Mass Index (BMI) correlates with longer jump and in a response to this conclusion, controlling body weight and active weight loss have become popular among ski jumpers. Thus, the purpose of this study was to evaluate body composition and body symmetry of Polish elite male ski jumpers and its comparison with non-athletic Polish male of the same age and body height.

Methods: For the research a group of ski jumpers (n=18; mean age: 20.1) and non-athletic male volunteers (n=18; mean age: 20.9) as a control group have been chosen. Body composition was assessed using segmental bioelectrical impedance analyzer InBody S10, Biospace. Differences between control group and ski jumpers were tested with the Student t-test and 95% confidence intervals (CI) were calculated for the inter-group differences. Statistical analysis was performed with Statistica 10 software package.

Results: Ski jumpers were 13.1 kg lighter than controls (95% CI 6.8 to 19.4, P < 0.001). Body Cell Mass and Bone Mineral Content had greater values in a control group but the differences were not significant. Total fat mass and body fat % were 5.2 kg (P < 0.001) and 4.5% units (P < 0.001) lower in ski jumpers. Lean-to-fat mass ratio was 4.5 units greater in ski jumpers (95% CI 2.6 to 6.4, P < 0.001). Ski jumpers' perfect body symmetry (lack of right or left body side domination) appeared to be a feature significantly differentiating - in control group both right arm and right leg turned out to be dominant.

Conclusions: Body composition of polish ski jumpers, despite the lower body weight, indicates healthy proportion between fat tissue and lean tissue. It is very likely that perfect body symmetry observed in ski jumpers is an effect of their training specificity, but the possibility that this symmetry is an individual primary feature, influencing a success rate in this sport discipline cannot be ruled out.

Keywords: ski jumpers, body composition, BMI, body symmetry

144/1101

DIETARY SOURCES OF FREE SUGARS IN EUROPEAN CHILDREN´S DIET: THE IDEFICS STUDY

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Background and objectives: Introduction: The effects of free sugars on health have received worldwide attention in research and public health. Consistent information on sugar content of foods and sugar intake in children is required.

Objective: To report dietary free sugars consumption and their different types and food sources in European children.

Methods: Design: The present research are results from a multicenter study in children, the IDEFICS (Identification and prevention of dietary and lifestyle induced health effects in children and infants) Study. A total of 8308 children (50.9 % males) of eight survey centers aged 2-9 years were studied. The participants were a subset of the original sample (n=16228) with complete data on dietary data obtained using at least one 24-h recall. Sugars intake was assessed as total sugars, free sugars and energy intake.

Results: Mean total energy intake was 1613.1 (SD 452.8) kcal/d for boys and 1489.4 (SD 390.7) kcal/d for girls. The percentage contribution of total sugars to daily energy intake was 23.7%. Free sugars intake provided 15.1% to daily energy intake. Girls had significantly (p < 0.001) lower intakes of energy, carbohydrates, total sugars and free sugars, compared with boys. When examining by age groups, the intake of free sugars was significantly higher in older boys and girls than in younger ones, for all food groups except for coffe, tea, herbal and similars group. The main contributor to free sugars intake was the group of 'Soft drinks' (23 g/d), followed by 'Fruit juices manufactured' (21.1 g/d) and 'Fruit and fruit juices' (13.7 g/d).

The main food contributors to free sugars intake are shown in Figure 1.

The percentage contribution of free sugars to daily energy intake, per countries, is shown in Figure 2.

Conclusions: This study provides important information about the pattern of sugar intake in European children. High intake of sugar remains an important nutritional problem in children of many European countries. Continued and coordinated efforts are required at a national, community and individual level to reduce the intake of total sugars.

Keywords: sugars, children, intake, Europe, IDEFICS

144/1133

DEVELOPMENT OF A TOOL TO AID CAREGIVERS' RECALL OF SNACKS AMONG CHILDREN 12-23 MONTHS OF AGE IN KATHMANDU VALLEY, NEPAL

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Background and objectives: Twenty-four hour recalls are commonly conducted with caregivers to measure dietary intake of children. However, recall bias can result in under-reporting of certain foods. This research assessed the accuracy of caregivers' recall of their child's food/beverage consumption in order to develop a recall-aid for use in a dietary assessment of young children in Kathmandu Valley, Nepal.

Methods: Ten children 12-23 months of age were observed for 12-hour periods (7am-7pm), with all feeding episodes noted in detail; the following day, a semi-quantitative 24-hour recall was conducted with the primary caregiver. A pictorial recall-aid tool was developed based on these formative research findings, and piloted among caregivers from varying socio-economic backgrounds. A final version was used in a quantitative 24-hour recall of 401 young children.

Results: Comparison of what children consumed during observations and what caregivers reported in subsequent 24-hour recalls found that snacks fed to children between meals were commonly omitted; these included: biscuits, fruits, milk, candy, and porridges. Observations also found that multiple caregivers provided snacks to children. Images of these forgotten foods/beverages were compiled in the recall-aid, which was distributed to survey participants 2-3 days prior to interview. Participants were instructed to keep the aid with their child so that anyone feeding could indicate foods/beverages fed. In the quantitative survey,

82.3% of caregivers used the recall-aid; in 43.6% of these cases, the recall-aid captured at least one food/beverage omitted during recall. The mean number of forgotten foods/beverages captured by the recall-aid was 2, with a range of 1-9. Of caregivers with food/beverage omissions, 47.2% forgot candy/chocolates, 36.8% savory snacks (instant noodles/chips), 36.1% biscuits, 34.7% fruits (apple/banana/grape/ orange/pomegranate), 16.0% milk, and 4.9% porridge.

Conclusions: Because snacks may be fed spontaneously and by multiple caregivers, these foods/beverages may be omitted in 24-hour recalls for young children. Capturing these items in dietary assessments is important, as they cover food categories relevant for certain IYCF indicators, and their omission may result in misrepresentation of diet quality. Use of a context-specific recall-aid may assist in capturing consumption of these otherwise missed foods/beverages and further validation of such tools is needed.

Keywords: diet assessment, IYCF, Nepal, nutrition, 24-hour recall

144/1140

CORRELATIONS BETWEEN SERUM 25(OH)-VITAMIN D AND FAT MASS, FAT-FREE MASS AND TOTAL BODY WATER IN ADULTS OF BOTH SEXES WITH DIFFERENT BODY MASS INDEX

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Background and objectives: We assessed the correlations of serum vitamin D with body composition parameters.

Methods: 109 men and 155 women (20-60 years) participated. Body composition was recorded by bioelectrical impedance (Tanita BC 420 MA, Tanita Inc., Japan): % body fat (% BF); fat mass (FM), fat-free mass (FFM), total body water (TBW). The fat mass index (FMI) and fat-free mass index (FFMI) were calculated. Serum 25(OH)Vitamin D Total was measured by electro-hemi-luminescence on an Elecsys 2010 analyzer (Roche Diagnostics, Switzerland).

Results: 27.2 % of the participants had normal weight, 24.6 % - overweight, 29.2 % - class I obesity, and 18.9 % – class II or III. 33.3 % had vitamin D deficiency, 40.2 % - insufficiency. Vitamin D was weakly and inversely correlated to most of the variables except for age, height, FFM, FFMI and bone mass. The FM and FFM were correlated to vitamin D only in obesity class II and III. In men the FFM, the FFMI, the TBW and the BM were not correlated to vitamin D, while in women they were.

Conclusions: Serum 25(OH)vitamin D is tightly correlated to FM, % FM and %TBW but not to FFM or TBW.

144/1160

DIETARY PATTERNS OF BRAZILIAN ADOLESCENTS ASSOCIATE WITH ANTHROPOMETRIC AND LIFESTYLE FACTORS

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Background and objectives: Dietary and physical activity patterns in Brazil have foment an increase in the prevalence of overweight and obesity, which are beginning in the early stages of life. Therefore, the aim of this study was to identify dietary patterns of Brazilian adolescents and to determine the associated factors.

Methods: It was a cross-sectional study with 446 adolescents aged 10-19 years, enrolled in a public school in Goiânia, Goiás. Brazil. Dietary intake was assessed by a usual food recall. Socioeconomic, anthropometric and lifestyle data were collected through classical protocols. Principal component factor analysis with Varimax rotation was used to identify dietary patterns. Factor scores were calculated and then used in multiple linear regression to evaluate socioeconomic, anthropometric and lifestyle factors associated with the patterns.

Results: Four dietary patterns were identified and together explained 38.8% of the food consumption total variance. These patterns were denominated: 1) traditional Brazilian meal (characterized by cereals and roots, legumes, meats, vegetables and sugar-sweetened beverages), 2) traditional snack (which included farinaceous snacks, butter and margarine, dairy and sweets, and was inversely associated with processed meat consumption), 3) processed snacks (processed meat, yellow cheese and farinaceous snacks), and 4) junk food (composed by candies, fatty snacks, sugar-sweetened beverages and pastas, and inversely associated with intake of fruits). The pattern "traditional Brazilian meal" was inversely associated with BMI and female sex. The pattern "traditional snack" was inversely associated with BMI and positively associated with greater time sitting at the weekend. The pattern "junk food" was associated positively with the greater daily time in front of television. Only this latter pattern did not present an inverse association with commuting to school by car.

Conclusions: Adolescents' dietary patterns were associated with anthropometric and lifestyle variables, so that a diet based on traditional Brazilian foods is recommended because it seems to favor lower BMI values.

Keywords: Factor analysis, Adolescent, Feeding behavior, Food consumption.

144/1163

PREVALENCE AND FACTORS ASSOCIATED WITH UNDERWEIGHT, OVERWEIGHT AND OBESITY AMONGST ELDERLY POPULATION LIVING AT HIGH ALTITUDE REGIONS OF RURAL UTTARAKHAND, INDIA

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Background and objectives: Nutrition is an important element of health in the geriatric population. Geriatric has an increased risk of malnutrition due to physiological changes such as reduced metabolic rate, loss of appetite, difficulties in chewing, and various co-morbidities. Objective: To assess the nutritional status and its associated risk factors amongst geriatric population aged ≥ 60 years living in high altitude regions of rural Uttarakhand, India.

Methods: A community-based cross-sectional study was conducted during 2015-2016 in District Nainital. Thirty clusters were identified using population proportionate to size sampling method; 30 geriatric subjects were selected from each cluster. Study population included 981 geriatric aged 60 years and above. Standard procedures were used to determine the height and weight and the BMI was calculated from the results of the measurements of weight (kg) and height (cm) (kg/m2). Data was entered in MS Excel 2007 and analyzed using SPSS version 20.0. Univariate and multivariate analysis was done to identify factors associated with underweight and overweight.

Results: About 26.6% geriatric were underweight, 18.0% were overweight and 4.6% were obese. In univariate analysis male gender, low education, low income, chewing problem, less number of meals was found to be associated with underweight, while overweight/obesity was found to be associated with age, female gender, higher level of education and income.

Conclusions: In rural India prevalence of underweight and overweight was found to be high amongst geriatric. There is a need for geriatric nutritional intervention in rural population.

Keywords: Geriatric, Nutritional Assessment, Underweight, Overweight.

144/1168

IN HAITIAN WOMEN AND CHILDREN, IRON AB-SORPTION FROM WHEAT FLOUR FORTIFIED WITH NAFEEDTA IS HIGHER THAN FROM FLOUR FORTIFIED WITH FERROUS FUMARATE AND IS NOT AFFECTED BY H. PYLORI INFECTION

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Background and objectives: The prevalence of iron deficiency in Haiti is high and a program of iron fortification of wheat flour has been proposed; however, there are no data on iron bioavailability from iron fortificants in Haitian women or children, two key target groups. We aimed to investigate the bioavailability of ferrous fumarate (FeFum), NaFeEDTA and their combination from fortified wheat flour.

Methods: We recruited 22 healthy mother-child pairs in Port au Prince, Haiti for an iron absorption study. We administered stable iron isotopes as FeFum or NaFeEDTA in low-extraction wheat flour bread rolls consumed by all participants in a randomized, cross-over fashion. In a final meal, consumed only by the women, FeFum+NaFeEDTA was administered. The amount of iron used in the test meal was chosen to simulate the fortification level currently discussed by the Haitian government. We measured iron absorption by using erythrocyte incorporation of stable isotopes 14 days after consumption of each meal, and determined iron status, inflammatory markers and H. pylori infection.

Results: Iron absorption (geo mean (95% CI) was 9.24 (6.35,13.44) and 9.26 (7.00,12.31) from FeFum and 13.06 (9.23,19.10) and 12.99 (9.18,18.39) from NaFeEDTA in mothers and children, respectively (p<0.05 between compounds). Iron absorption from FeFum+NaFeEDTA was 11.09 (7.45,17.34) and did not differ from the other two meals. H. pylori infection did not influence iron absorption in either group or meal.

Conclusions: In conclusion, in Haitian women and children consuming low extraction wheat flour, iron absorption from Na-FeEDTA was 40% higher than from FeFum, and the combination FeFum+NaFeEDTA did not significantly increase iron absorption compared to FeFum alone. In the context of Haiti, where the high costs of NaFeEDTA may not be affordable, the use of FeFum at 60 mg Fe/kg flour may be a preferable, cost-effective fortification strategy.

Keywords: Iron absorption,ferrous fumarate,NaFeEDTA,-Flour fortification,Haiti

144/1173

BIOFORTIFIED BEANS WITH IRON REGENERATE HEMOGLOBIN VALUES IN ANEMIC RATS

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Background and objectives: Iron deficiency affects more than 2 billion people worldwide, being the most common and serious micronutrient deficiency. Some strategies for preventing iron deficiency anemia include food fortification and iron supplementation. Biofortification has the potential to become a sustainable, inexpensive, and effective solution. The goal was to evaluate the iron bioavailability in rats fed with biofortified beans.

Methods: The Iron biofortified beans were developed by the Brazilian Agricultural Research Corporation (EMBRAPA) and used as flour for preparing experimental diets. Some analyzes such as chemical composition, mineral quantification and antinutritional factors were performed only with the flour; the iron determination with both, flour and prepared experimental diet. Lastly, the depletion-repletion hemoglobin method was used to evaluate in vivo the iron bioavailability, thus the induction of iron deficiency anemia. The test was conducted with 32 anemic wistar rats. The rats were distributed in 4 groups and fed with diets containing 12 mg iron/kg supplied from ferrous sulfate sources, biofortified beans (Pontal and Agreste), except for the fourth group on the iron-free diet. After 14 days of repletion, hematological parameters such as hemoglobin repletion efficiency, hemoglobin gain and relative biological value were analyzed.

Results: At the end of the repletion, parameters such as the iron bioavailability, the hemoglobin gain and the iron gain of hemoglobin of group of biofortified grains did not present significant differences when compared to the group that consumed ferrous sulfate, with respective values of 91%, 2.78 (g/dL) and 1.76 mg. Our biofortified cultivars had iron concentrations 50% higher than the common bean varieties, in which 100 grams of cooked biofortified beans provide between 7.6 to 8.5 mg of bioavailable iron, corresponding to 40% of the Dietary Reference Intake (DRI) recommendation for women of childbearing age and 80% of DRI's for 4-to-8-years-old children.

Conclusions: Our results confirm that biofortification can be considered a promising strategy in the anemia recovery. However, researches involving humans with iron deficiency anemia are necessary to evaluate the efficacy of biofortified beans, since this is a sustainable and low-cost strategy to be implemented in public health programs.

Keywords: biofortified beans; biofortification; iron bioavailability; iron deficiency.

Further collaborators:

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ENTERAL NUTRITION IN THE PUBLIC CHILDREN´S HOSPITAL OF CORRIENTES: EVALUATION OF THE PRESCRIPTION CHARACTERISTICS

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Background and objectives: In order to achieve an adequate nutritional intervention in hospitalized children, a diagnosis and monitoring of the nutritional status must be performed before and during hospitalization, and this diagnosis must be known by all health staff. However, there is no yet an integrated system of the clinical histories (CH) data storage in Corrientes, especially concerning to Nutrition Service. The creation of this system would favor a consensual analysis and the elaboration of a specific regulation for the provision of pediatric nutritional support in the public health of the province. Objective: To know the characteristics of Enteral Nutrition (EN) prescribed in hospitalized patients at the Children's Hospital (Corrientes, Argentina) in order to improve the pediatric EN provision system.

Methods: A descriptive study in patients hospitalized at Children 's Hospital, Corrientes, during September/2016. The EN pre-scription circuit, CH, Lactarium orders and nutrient ingredients purchase worksheets were analyzed. Descriptive statistics were used to evaluate relationships between demographic, clinical and economic variables.

Results: Of a total of 254 hospitalized patients during the study period, were observed 110 childrens with indication of EN (46 females, 64 males), in Interment Room 58%, ICU 28%, Burns 8%, Hemato-oncology 6%. The age was 3.42±4.02 years. The prevalent diagnosis at admission was respiratory disease (24%), while others included: burns, appendicitis, epilepsy, cancer, congenital malformations and accidents, cuts and fractures. During September, the time of internment was: 8.67±7.97 days and consumption of EN: 8.33±7.12 days. Patients received the different formulations from the powder individual ingredients prepared in Lactarium, orally, by nasogastric tube or gastric button. The CH analyses revealed that the attending physicians indicated EN regarding patient weight percentile and basic disease requirements in 80% of the cases, while only 20% of the children had nutritionist indication of an appropriate diet.

Conclusions: The clinical histories failed to reflect the necessary data to decide the nutritional support to be supplied, operating according to daily requirements. This research serves as a basis for the development of a pediatric AE provision Program in the Public Health system of Corrientes.

Keywords: Enteral Nutrition, Pediatric Nutrition, Public Health Nutrition

Further collaborators:

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144/1178

HAND DYNAMOMETRY IN ELDER ADULTS LIVING IN AN URBAN DESTITUTE COMMUNITY IN GUAYAQUIL CITY

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Background and objectives: Handgrip strength (HGS) reflects both integrity and functionality of skeletal muscle mass (SMM). HSG has been customarily used for detecting loss of active SMM. SMM loss is associated with disability and mortality in elder subjects. Ageing population is rapidly increasing in Ecuador.

A window of opportunity was opened to document HSG values in Ecuadorian elder subjects.

Methods: One-hundred-and-one elder subjects (Females: 74,3%; Average age: 70,5 ± 9,0 years) living in an urban destitute community in the city of Guayaquil (Ecuador). HSG was measured on both hemibodies with a mechanical dynamometer (Lafayette Inc., United Sates). HGS values were distributed according with age. Additional body composition (BC) measurements were performed with a professional bioimpedance machine (BodyStat Inc., United States).

Results: Average BMI was 27,5 ± 5,4 Kg.m-2. BC measurements were influenced by subject´s sex. Males sustained higher HGS values, regardless of dominant arm. HGS values decreased with age.

Conclusions: HGS depends upon sex, dominant arm, and age.

Keywords: Muscle Mass; Hand Grip Strength; Dynamometer; Frailty; Sarcopenia; Geriatric Assessment; Aging.

Further collaborators: Sergio Santana Porben. Medical doctor, Profesor of Biochemestry. Ciudad de la Habana

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144/1185

THE INFLUENCE OF MINERAL STATUS ON THE ACADEMIC PERFORMANCE

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Background and objectives: A balanced nutrition supplying the right amount of minerals is absolutely essential for the development of the brain , a normal cognitive function , and is a major influencing factor of behavior . This fact is even more important in the school-aged children but little has been studied on the actual extent in which mineral deficiencies actually affect the academic performance .

Methods: The study used a very simple non-invasive method observing mineral deficiencies in fingernails in 46 boys and 38 girls age 3-11 from Kindergarten and Elementary, and 33 boys and 21 girls age 12-18 from Middle and High School . Pictures were taken and their GPAs were collected for reference .

Results: In the age group 3-11 , zinc deficiency was found in 26.09% boys and 23.68% girls , while iron deficiency was present in 13.04% boys and 7.89% girls. In the age group 12-18 , 47.62% girls and 36.36% boys were zinc deficient , while 24.24% boys and 9.52% girls showed to be iron deficiency . Selenium and calcium deficiencies were found in isolated cases . Observations of the behavior were found to be concordant with the GPA and some previous ITBS scores addressing particularly the attention spans , concentration and comprehension .

Conclusions: Overall , this easy way of identifying eventual mineral deficiencies as early as possible by observing the fingernails proved to be a valuable method to trigger the students with problems and help improve academic performance while promoting the general health and improved behavior , through nutrition

Keywords: minerals , academic performance , fingernails

144/1197

NUTRITIONAL STATE AND BODY COMPOSITION OF ELDERLY CONSULTANTS IN OUTPATIENT MEDICINE IN CASABLANCA - MOROCCO

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Background and objectives: Senescence represents a public health problem and its management is partly conditioned by assessed nutritional profile of the person. Thus, we have found it useful to conduct a study whose objective is to assess the nutritional state and body composition of the elderly Moroccan consulting in geriatric service in Casablanca region.

Methods: This is a cross-sectional survey of 62 elderly subjects: Aged over 60 years, selected from the database of the geriatric service of a Moroccan public hospital, from April to September 2015, in Casablanca. A questionnaire was used to identify socio-demographic characteristics and a grid to identify anthropometric (weight, height, body mass index (BMI), Calf circumference (CC) and brachial (CB)) and body composition indicators (lean mass (LM), fat mass (FM), Total cellular water (TCW), intracellular water (IW) and extracellular water (EW)) for each subject.

Results: The 62 subjects in the study represented a sex ratio of 0.5 and mean age, BMI, LM and FM were respectively 65.5 ± 6.8 years, 26.2 ± 4.8 Kg/m2, 64.3 ± 8.6 kg and 34.9 ±8.7 Kg. 53.2% (n=33) of sample were in overweight (BMI> 18 Kg/m2) affecting women more (p<0.001). Significant differences between male and female subjects were recorded for LM and FM measurements (p <0.001) TCW (p<0.01), and EW (p<0.01). Negatively significant correlations were found between BMI and TCW (r = -0.3, p = 0.003) and EW (r = - 0.3, p = 0.003) and FM (r = -0.6, p<0.001) and positively significant between BMI and CB (r =0.6, p<0.001) and CC (F=0.7, p<0.001) and between TCW and EW (r = 0.7, p <0.001) and LM (r =0.5, p<0.001). The model of the multiple descending linear regression showed that FM is an associated factor with TCW (beta= -0.1, p= 0.05) in the elderly of our study.

Conclusions: At the end of this study, we concluded that the evaluation of the nutritional state of elderly was useful to prevent any risk of late complications and to allow early management.

Keywords: elderly, nutritional, body composition, Morocco

144/1239

IRON ABSORPTION FROM BEANS WITH DIFFERENT IRON CONTENTS EVALUATED BY STABLE ISOTOPES

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Background and objectives: Introduction: Brazil is a major beans producer and consumer and is part of the basic diet of the population. The introduction of biofortified crops such as beans with higher iron content is a useful tool in preventing iron deficiency diseases, as anemia. Thus, the measurement of the absorption of minerals is essential to evaluate the use of biofortified foods. Objective: This study evaluated the iron bioavailability of common beans cultivars BRS Estilo, with low iron content and BRS Pontal, that present intermediate iron content, in man through reliable techniques, not yet used in Brazil. The beans were produced by EMBRAPA.

Methods: Subjects and Methods: 29 young adult volunteers were divided into 2 groups: Group CB (13 subjects) received 100g of common beans (BRS Estilo) cooked labeled with iron 58 (58Fe) and Group BB (16 patients) received 100g target to biofortification beans (BRS Pontal), cooked and labeled with iron 58 (58Fe). The next day they receive the reference dose of ferrous sulfate enriched iron-57 (57Fe). After consumption was conducted isotopic evaluation of iron, for measurement of iron incorporation into erythrocyte.

Results: The difference between iron absorption from the meal containing common bean and that from the meal containing target to biofortification bean examined by means of a paired t test, were considered significant at $P<0.05$. The groups CB and BB did not differ in hemoglobin or serum ferritin concentrations. Serum ferritin ranged from 41 to 298 μmol/L. Mean isotopic ratio of iron absorption from the meal with common beans was 0.409% (±0.040%) and mean iron incorporation from the meal with biofortified beans was 0.407% (±0.038%).

Conclusions: The iron absorption from the common beans and target to bifortification beans was not significantly different. This study tested a single food; if its results are considered in making programmatic decisions, consideration must be given to the balance between iron absorption enhancers and inhibitors in the whole meal. The multiple meal study is necessary to evaluate the real iron absorption. The challenge for the global health community remains how to tackle this efficacious intervention and implement it in a large scale.

Keywords: Biofortification, iron bioavailability, beans, iron deficiency.

Further collaborators:

144/1252

PSYCHOSOCIAL AND FUNCTIONAL STATUS IN HOSPITALIZED GERIATRIC PATIENTS WITH MALNUTRITION

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Background and objectives: Malnutrition has been associated with adverse outcomes such as functional disability, morbidity, mortality, and longer stays in the hospital. It is also a risk factor for frailty, particularly in older people. Physical function and psychological factors apparently contribute to dietary condition. Identification of those related status and treatment of malnutrition earlier can lead to improved clinical outcomes. This study was to investigate psychosocial and functional status of hospitalized geriatric patients with malnutrition screened by Mini Nutritional Assessment (MNA) tool at a regional hospital in Hsinchu, Taiwan.

Methods: We screened all hospitalized patients aged 65 years or older by using MNA from April to November of 2014 and excluded patients with confusion, terminal cancer and non-malnutrition caused by hypoalbuminuria. A total of 374 patients were screened and asked for attending the project if they were malnourished from screening. There were 160 patients included and their demographic characteristics, 3-day 24-hour diet recalls, anthropometric and biochemical data, Geriatric Depression Scale Short Form (GDS-SF) and Activities of Daily Living (ADL) scores were collected and analyzed. Statistical analysis for categorical variables was performed by the Chi-Square and t-tests, and Person's correlation test was used for two continuous variables.

Results: The mean age of 160 subjects (84 men and 76 women) was 77.0±6.8 years old. According to ADL and GDS-SF results, 43.5% of the patients were functionally dependent and 47.5% of them were with mild to severe depression. The results showed that protein intake was significantly related to body mass index (BMI),

mid-arm circumference (MAC), triceps skinfold (TSF), and grip strength. Patients' GDS-SF and ADL scores were correlated to their age and MNA.

Conclusions: About half of the hospitalized geriatric patients had functional and depressive problems and those were related to their nutritional status. Dietary intake especially protein intake was associated with many anthropometric measurements which were positively related to their daily activities.

Keywords: geriatric patients, activities of daily living, geriatric depression

Further collaborators:
Ai-Ting Lee

HEAD CIRCUMFERENCES AND BODY MASS INDEX ARE PRESERVED IN THE PRESENCE OF HIGH STUNTING PREVALENCE AMONG 4-7 YEARS OLD CHILDREN FROM WESTERN HIGHLANDS OF GUATEMALA

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Background and objectives: Stunting is suggested to be associated with suboptimal cognitive development, obesity, and chronic degenerative diseases. Researches on physical brain growth, as reflected in head circumference Z-scores, has been focusing on early childhood. Little is known about the brain growth nor how early is the onset of obesity during later childhood. The purpose of this study was to investigate circumferential measurements in preschool children with an extreme degree of linear growth retardation.

Methods: Body height, clothing-adjusted body weight, and circumferential measurements were obtained from 212 children, aged 4-7 years, 87 boys and 125 girls, from two rural areas with high prevalence of stunting in Western Guatemala. Conventional Z-scores for height, weight and head circumference, as well as body mass index (BMI), were derived; whereas waist circumference (WC) values were further divided by height to obtain waist-to-height ratio (WHtR) and neck circumferences values were compared with findings from other settings.

Results: The stunting prevalence was 63.2%, higher than the national under-five average of 46.5%, and similar to the Maya-indigenous rate of 61.2%, and higher among girls (65.6%) than boys (59.8%). Prevalence of underweight was 33%, with no instance of thinness, defined as < -2 SD in BMI-for-age (BAZ). Despite the highly prevalent stunting, median head circumference Z-scores (HCZ) was within the normal range (-0.65, 95% CI -0.72, -0.55),

with only 1 value (0.5%) below -2 SD. NC was lower than in peers in other countries' reports. HC, NC, and WHtR values were lower in stunting children than non-stunting (p < 0.001). No obesity (BAZ >2 SD) was observed among the sample.

Conclusions: In the presence of linear growth retardation and underweight, head circumference is relatively preserved. At this age, obesity is virtually non-existent in preschoolers with widespread short stature,and neither waist nor neck circumferences appear to be increased.

Keywords: Stunting; cognitive development; head circumference; obesity; Guatemala

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MALNUTRITION AND ASSOCIATED FACTORS AMONG HOSPITALIZED GERIATRIC PATIENTS

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Background and objectives: Malnutrition negatively impacts on overall health status, morbidity and mortality. It is also a risk factor for frailty, particularly in older people. Nutritional status has been also shown to relate to many factors in the elderly. Identification and treatment of malnutrition earlier can lead to improved clinical outcomes. This study was to investigate nutritional status of hospitalized geriatric patients and its associated factors if they were malnourished or at risk of being malnourished.

Methods: We screened all hospitalized patients aged 65 years or older by Mini Nutritional Assessment (MNA) and Nutrition Risk Screening 2002 (NRS 2002) from April to November of 2014 and excluded patients with confusion, terminal cancer and non-malnutrition caused by hypoalbuminuria. A total of 374 patients were screened and asked for attending the project if they were malnourished from screening. There were 160 patients included and their demographic characteristics, 3-day 24-hour diet recalls, anthropometric and biochemical data and Activities of Daily Living (ADL) were collected and analyzed.

Results: The mean age of 374 subjects (193 men and 181 women) was 77.1±6.8 years. The NRS 2002 categorized 49.7% of patients as being malnutrition, and MNA categorized 19.5% and 52.4% of patients as being malnourished and at risk of being malnourished respectively. The average body mass index (BMI) of patients was 24.0±8.1 and only 9.2% was under 18.5. Weight status of the patients was significantly related to nutritional status. Age was associated with BMI, MNA, NRS 2002, hemoglobin, and total lymphocyte counts.

Conclusions: Results of this study identify multiple modifiable factors associated with the problem of malnutrition in hospitalized geriatric patients. Anthropometrical malnutrition as well as inadequate dietary intake at hospital were related to functional impairment and clinical outcomes.

Keywords: Malnutrition, geriatric patients, risk factors

Further collaborators:

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144/1270

RELIABILITY AND VALIDITY OF THE MEDITERRANEAN DIET ADHERENCE SCREENER AMONG THE IRANIAN ADULTS

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Background and objectives: Validated dietary assessment methods specific to population and food habits are needed for dietary assessment. Therefore, the aim of study was to assess the reliability and validity of the 14-point Mediterranean Diet Adherence Screener (MEDAS) among the Iranian adults.

Methods: Study was carried out on adults aged ≥ 43 who were admitted to a tertiary hospital in Rasht in the North of Iran, for elective angiography. Study was conducted in a country with a Shiite majority with religious restrictions, for this reason we eliminated some items and modified the MEDAS in the Farsi version by backward -forward method. We applied reliability analysis using model alpha, with SPSS to interpret the effects of each item of MEDAS in its internal consistency.

Results: After correcting the item scores, coefficients of Kuder-Richardson-20 was calculated 0.598. The mean ±SD of 13 items MEDAS was 5.82 ±1.90. None of Corrected Item-Total Correlation coefficients were negative. According to three categories of adherence to the Mediterranean diet, 42.5%, 50% and 7.5% participants had low, medium and high adherence to a Mediterranean diet respectively.

Conclusions: In spite of eliminating and making a few changes in questions due to religious reasons, the coefficients of Kuder-Richardson-20 did not decrease in reliability analysis. The MEDAS was translated and modified for the first time into Farsi. Administering this tool in future researches will help to understand how Iranian adhere to the mediterranean diet, aiming at improving cardiovascular health.

Keywords: Reliability, Validity, Mediterranean Diet Adherence Screener, Iranian adults

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144/1279

ANALYZING PROTEIN OXIDATION PERTURBATIONS AND ITS ROLE IN PROTEIN METABOLISM

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Background and objectives: Protein intake has been suggested to play an important role in development of obesity; on one hand in newborn, where excess protein intake might stimulate development of obesity in later life. On the other hand, protein consumption is promoted for weight management. At present, no formal recommendations for the upper limit of protein intake have been presented. Information about rate-limiting steps in protein catabolism is scarce. We therefore studied the role of protein oxidation in this process.

Methods: To monitor protein oxidation we have developed a noninvasive 13C-protein breath test using naturally enriched 13C-milk protein (fractions). We used this technique to analyze the kinetics of protein oxidation and its interfering factors. Breath samples were collected and analyzed by Isotope Ratio Mass Spectrometry

Results: Whey was oxidized for 28.6% ± 6.8% (mean ± sd) during 240 min, compared to 22.9% ± 6.2% for glucose. Maximal milk protein oxidation was measured at a rate of 0.06 g/min, leading to a maximal oxidation capacity of 1.3 g/kg bw/day. Combining 30 g 13C-whey with 30 g glucose resulted in a 49% increase of whey oxidation. A three day low protein diet and/or exercise preceding the breath test resulted in a decrease in protein oxidation of ~20% and ~40% respectively.

Conclusions: Oxidation of whey protein is quantitatively of high importance and not down regulated by concomitant administration of glucose. Analyzing biological variations in acute protein oxidation in various target groups, in defining the upper limit of intake, might be relevant.

Keywords: protein oxidation, protein metabolism, breath test, naturally enriched 13C-milk proteins,

Conflict of Interest Disclosure: The naturally enriched 13C-milk protein has been made available as an in kind contribution by Hanze Nutrition B.V., which is owned by co-author prof. dr. R.J. Vonk. There are no other conflicts of interest.

144/1298

DIFFERENCES IN ANEMIA DIAGNOSIS OBTAINED USING VENOUS VERSUS CAPILLARY BLOOD: BIOLOGICAL BASIS AND POLICY IMPLICATIONS

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Background and objectives: Anemia is recognized as a high priority health issue globally. The World Health Assembly (WHA) has set a target for 50% reduction in the prevalence of anemia in women of reproductive age by 2025, and relevant data will be needed to inform progress. However, factors affecting anemia diagnosis need to be considered to ensure accurate and comparable estimates of hemoglobin concentration and anemia prevalence (across countries and within countries over time). Possible sources of variability include: 1) differences between automated laboratory methods and portable devices, 2) differences between individual devices of a given type (e.g., different automated laboratory equipment or individual field instruments), 3) methodological errors due to sample collection technique, particularly for capillary samples and, 4) normal biological differences between venous and capillary blood, and as modified, for example, by age and sex.

Methods: In this presentation we will provide an in-depth literature review of the biological basis for differences in venous versus capillary blood and on the potential for systematic differences in hemoglobin concentration from diverse analytical platforms that cannot be attributed to sample collection technique. We will then use data from a recently completed survey in the state of Uttar Pradesh, India, (and other data sets if needed) to illustrate the implications that the choice of such method and the consistency of its use across multiple surveys may have on prevalence estimates and ultimately policy making.

Results: Ongoing

Conclusions: Forthcoming

Keywords: anemia, hemoglobin, diagnosis, capillary, venous

144/1306

CALCIUM SUPPLEMENTATION AMONG TARGETED PREGNANCIES: A LIFE SAVING STRATEGY TO REDUCE THE RISK OF ECLAMPSIA AND MATERNAL AND NEWBORN DEATHS

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Background and objectives: Maternal mortality ratio in Afghanistan is 372 deaths per 100,000 live births, which is the highest in the south Asian region. Hypertension during pregnancy increases the risk of eclampsia, newborn and maternal deaths. The World Health Organization (WHO) recommends calcium supplementation for pregnant women after the 20th week of gestation until the end of pregnancy, particularly among those at higher risk of hypertension. The objective of this study was to determine the effect of calcium supplementation to targeted pregnant women reduced the occurrence of eclampsia and related maternal mortality in one province of Afghanistan.

Methods: Quantitative methods were used to collect and analyses the data from health facilities including the provincial hospital in 15 districts of Kunar provinces during the life of the calcium supplementation pilot project, and comparison of reported eclampsia cases with the same period in the last year.

Results: The pilot project was implemented in Kunar province located in west part of Afghanistan. The project targeted pregnant women (N=785) in 15 districts of the province during a six-month period. They received 1.5-gram calcium tablet per day from the 20th week of gestation onwards through all health facilities. The project was funded by Common Humanitarian Fund and implemented by PU-AMI the main health care implementing Non-Governmental Organization (NGO) in the province. The analysis of data from Kunar provincial hospital register books (which is the only health facility for treatment and follow-up of pregnancy revealed complications including eclampsia in the province) revealed that during the life of the project (from Jun-Nov 2015) total of 50% reduction in the number of eclampsia cases admitted in the hospital compared to the same period in 2014.

Conclusions: Calcium supplementation among target pregnant women is associated with a reduction in eclampsia cases, in Kunar province, Afghanistan.

Keywords: Calcium supplementation ,Pre-eclampsia & Eclampsia ,Mathernal nurtality

DIETARY INTAKE AND METABOLIC PHENO-TYPES IN A COMMUNITY-DWELLING COLOMBI-AN COHORT

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Background and objectives: The analysis of dietary intake includes different components that individually analyzed are insufficient to explain health risks. The aim of this study was to integrate anthropometric and metabolic indicators to the nutritional analysis to identify the risk prevalence in nutrient intake according to metabolic phenotypes.

Methods: Participants were part of an adult community-dwelling cohort, enrolled across five cities of Colombia, South America. Anthropometric and clinical parameters in blood were assessed, as well as blood pressure. Clinical parameters and blood pressure served to classify participants by metabolic status. The metabolic status and the body mass index (BMI) were used to classify participants in six metabolic phenotypes (lean, overweight and obese, crossed by healthy or abnormal metabolic state); dietary intake was assessed in these groups of participants.

Results: Independent of BMI, the healthy metabolic phenotypes had greater contribution of proteins from the diet, while the lean abnormal and overweight abnormal phenotypes had excess intake of carbohydrates and sugars. Importantly, healthy lean participants had the lowest prevalence of nutrient deficiency, while abnormal lean, overweight and obese participants showed greater risk of micronutrient intake deficiency, especially calcium, magnesium and zinc. All metabolic phenotypes had low fiber intakes.

Conclusions: We report a comprehensive way to analyze dietetic intake that integrates nutritional status and health-related parameters. This analysis let us identify important nutrients in intervention or nutritional therapy that would improve metabolic health. Our analysis makes use of clinical parameters routinely assessed and could be applied to individuals or groups with normal weight or overweight; these results can be useful in the clinical practice to detect early risk factors of disease and to guide dietetic interventions.

Keywords: Metabolic phenotype, metabolic status, BMI, nutritional assessment, intake indicators.

DAIRY AND CALCIUM INTAKE BY QUILOMBO-LAS FROM RIO GRANDE DO SUL- BRAZIL

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Background and objectives: Milk and derivatives are the main source of calcium and recent studies have shown benefits in reducing risk for diabetes and metabolic syndrome. Quilombola communities are traditional communities of African origin organized from the slavery process and for which food consumption data are scarce. Thus, the objective of this work was to evaluate the consumption of calcium and its source food in quilombola communities of Rio Grande do Sul (RS)- Brazil.

Methods: Descriptive, cross-sectional population-based study of quilombola communities in RS developed in 2011. A total of 634 families, from 17 quilombola communities in the state, were selected by size-proportional sampling. Altogether, 589 household heads were interviewed. Calcium intake was assessed through a 24-hour food recall referring to the day before the interview. The data were processed in the ADS Nutri software - which uses the Brazilian Food Composition Table - and analyzed in the SPSS 18.0 software. The recommended calcium recommendation was the RDA for adults. The consumption of milk and dairy products (milk, cheese and yogurt) was evaluated as a dichotomous variable, considering the consumption report or not in the previous day. Ethical approval was received from the Research Ethics Committee of Universidade Federal do Rio Grande do Sul.

Results: About 30.0% of the sample reported having consumed milk or dairy products the previous day, being primarily cows'milk, whole and direct from the producer. The prevalence of dairy products consumption in the previous day varied among the 17 communities studied: in some of them, household consumption was not mentioned by anyone and in others by 63.6% of respondents. In relation to calcium, median consumption was 266.4mg (IQ 161.8-429.4). Considering the daily recommendations of 1000mg for adults, only 2.4% consumed the recommended amount.

Conclusions: The quilombolas of RS presented a low consumption of calcium and milk and dairy products, which can be explained by the impoverishment of the communities and consequent limitation for the acquisition of dairy products. These have a high price, besides the difficulty of access to purchase in more isolated rural communities.

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THE IMPACT OF IRON SUPPLEMENTATION AND DAILY AEROBIC EXERCISE ON PHYSICAL FITNESS IN NON-ANEMIC CHINESE WOMEN

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Background and objectives: Background: Iron deficiency without anemia has detrimental effects on physical performance. However, the relationship between iron supplementation, daily aerobic training, and changes in fitness in untrained, non-anemic women remains unclear.

Objective: To determine whether iron supplementation increases fitness, measured as maximal oxygen consumption (VO2max), in trained and untrained women.

Methods: This randomized-control trial included 72 iron depleted, non-anemic women, defined as serum ferritin (sFer) < 25 μg/L and hemoglobin (Hb) >110 g/L. A double-blind study was conducted with a 2x2 design including iron supplements (42mg elemental iron/day) or placebo and daily aerobic training (five 25-minute sessions/week at 75-85% maximum heart rate) or no training. General linear models were used to evaluate the relationship between supplement type, training, and changes in fitness after 8 weeks.

Results: There were no baseline differences in any variable between groups. Additionally, there were no differences in compliance to training or supplementation. At endline, sFer significantly increased in the iron group (23.6 μg/L, p<0.01), but not the placebo group (6.0 μg/L, NS). Similarly, the trained group showed a significant improvement in VO2max (3.8 mL/min/kg, p<0.01), whereas there was no change in the untrained groups (-0.89 mL/min/kg, NS). There was a significant supplement by training-group interaction in models predicting VO2max (p<0.05). Specifically, the iron-untrained group had a greater change in VO2max than the placebo-untrained group (1.9 mL/min/kg, p=0.01), which remained significant when change in Hb was included in the model. No supplement effect was seen between the trained groups.

Conclusions: The data show that iron supplementation alone improves VO2max in untrained women. However, this improvement is masked by changes in fitness gained from regular aerobic exercise. The improvements in VO2max in the iron-untrained group were not affected by Hb concentration, suggesting that this change is independent of oxygen delivery to the muscles. Further analyses could help clarify whether other indicators of fitness such as energetic efficiency or the anaerobic threshold benefit from iron supplementation and whether an interaction exists between training and supplementation in these variables. These findings indicate that fitness in relatively unfit women could improve from daily iron supplementation, even without regular aerobic training.

Keywords: iron deficiency, aerobic exercise, physical performance, VO2max

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144/1375

CHEMICAL, PHYTOCHEMICAL AND ANTINUTRIENT COMPOSITION OF ALOE VERA (ALOE BARBADENSIS) SOURCED FROM THREE STATES OF SOUTH-EAST OF NIGERIA

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Background and objectives: Aloe vera contains multitudes of potentially active constituents of essential vitamins and minerals, enzymes, sugar, lignin, saponins and wealth of amino acids. The aim was to analyze quantitatively the Aloe barbadensis for proximate, anti-nutrient and phytochemical composition to find out if location affects their nutritional composition.

Methods: The aloe vera was collected from three different eastern regions. The proximate composition involves the moisture content, crude protein, crude fibre, crude fat, ash content and carbohydrate and it was determined using standard methods. The phytochemicals (saponins, alkaloids and flavonoids) and anti-nutrients (oxalate, tannin and phytate) were also obtained using standard methods. Mean, standard deviation and ANOVA was used to separate the means and p<0.05 was set to be a significant.

Results: Protein, fibre, fat and carbohydrates contents 1.57%, 0.15%, 0.04% and 1.72% respectively were highest in aloe vera sourced from Enugu State where protein was lowest in aloe vera sourced from Ebonyi State, and fibre did not differ significantly between aloe vera sourced from Anambra and Ebonyi States. Vitamin A (β-carotene RE), vitamin C (ascorbic acid), and vitamin B12 (Cyanocobalamin) content 51.64 μg RE//100g, 46.41mg/100g and 46.60μg/100g respectively were highest in aloe vera from Enugu State while vitamin A (β-carotene RE), vitamin C (ascorbic acid), and vitamin B12 (Cyanocobalamin) content 31.06 μg RE//100g, 36.46mg/100g, and 20.82μg/100g were lowest in aloe vera sourced from Ebonyi. However, iron content was highest (0.21mg/100g) in aloe vera sourced from Ebonyi State. Alkaloid and flavonoid were highest (1.60%, 2.40%) respectively in aloe vera sourced from Enugu State while alkaloid from aloe vera sourced from Anambra was lowest (0.50%) and flavonoid was lowest (0.97%) in aloe vera sourced from Ebonyi State. Saponin was highest (1.13%) in aloe vera in Anambra State but lowest (0.74%) in aloe vera sourced from Enugu State. Phytate, oxalate and tannin were highest in aloe vera sourced from Enugu, although Phytate of aloe vera sourced from Enugu and Anambra were statistically similar.

Conclusions: Nutrient contents of the Aloe vera varied in the different studied States which might be due to soil and seasonal differences of cultivation

Keywords: Aloe vera; nutrients; phytochemicals; Nigeria

144/1379

RELATIONSHIP BETWEEN BODY COMPOSITION AND PLAYING LEVEL IN RUGBY UNION PLAYERS

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Background and objectives: Body composition (BC) is a factor that can influence sport performance. Therefore, its assessment, especially with simple methods such as anthropometric measurements, is essential to optimize performance.

The purpose of this study was to analyze the relationship between playing level (PL) with BC in rugby union players of the Province of Córdoba (Argentina).

Methods: A total of 94 players were grouped according to PL in: a) State Team (ST) (n=24), the highest level, b) 1st Division (D1) (n=52), c) 3rd Division (D3) (n=18), the lowest level of performance. Thirty-three anthropometric variables were measured following the protocol of the International Society for the Advancement of Kinanthropometry (ISAK). Body composition was assessed using the five-way fractionation method, partitioning the body into anatomically defined adipose, muscle, skeletal, residual, and skin tissue masses.

Descriptive (mean ± SD) and comparative statistics were calculated with Stata 14 software. A one-way analysis of variance (ANOVA) with Bonferroni post-hoc test for differences was used for the comparison between PL. The statistical significance was set at $P < 0.05$.

Results: The basic characteristics of the sample were: age 25.1 ± 4.2 years, weight 93.5 ± 12.6 kg and height 180.1 ± 7.3 cm. PL was associated with height (D3 players were shorter than the other 2 groups; p = 0.005) and age (D3 players were older than the other 2 groups; p = 0.001), but not with weight (p = 0.35).

BC in absolute terms (kg) was associated with PL; D3 players had significantly less muscle mass (p < 0.01), bone mass (p < 0.05) and residual mass (p < 0.05) than the other 2 groups. As well, BC relative to body mass (%) was associated with PL; D3 players had significantly more adipose mass (p < 0.05) than the other 2 groups, and less muscle mass (p = 0.015) and bone mass (p = 0.001) than D1 players. The residual mass (%) was significantly different (p < 0.01) among all 3 groups (D1 > ST > D3).

Conclusions: The PL was associated to height, age and BC in rugby union players.

Keywords: Body composition,Anthropometry,Rugby.

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ANTHROPOMETRIC PROFILE, SOMATOTYPE AND BODY COMPOSITION OF RUGBY UNION PLAYERS ACCORDING TO PLAYING POSITION

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Background and objectives: The morphology and body composition (BC) are factors that can influence sport performance. Therefore, their assessment, especially with simple methods, such as anthropometric measurements, is essential to optimize performance.

The purpose of this study was to analyze the relationship between playing position (PP) with somatotype and BC in rugby players of the Province of Córdoba (Argentina).

Methods: The sample were 94 players. Thirty-three anthropometric variables were measured following the protocol of the International Society for the Advancement of Kinanthropometry (ISAK). The somatotype was assessed with Heath-Carter's method. Body composition was assessed using the five-way fractionation method, partitioning the body into anatomically defined adipose, muscle, skeletal, residual, and skin tissue masses. The players were grouped by PP into forwards (F) and backs (B).

Descriptive (mean ± SD) and comparative statistics were calculated with Stata 14 software. A Student's t-test for independent samples was used for the comparison between F (n=55) and B (n=39), with statistical significance set at $P < 0.05$.

Results: The basic characteristics of the sample were: age 25.1 ± 4.2 years, weight 93.5 ± 12.6 kg and height 180.1 ± 7.3 cm. PP was associated with height (F: 181.4 ± 7.3 cm vs. B: 178.1 ± 7 cm; p = 0.03) and weight (F: 100.0 ± 11.6 kg vs. B: 84.5 ± 7.3 kg; p < 0.0001), but not with age (p = 0.30).

The mean somatotype of the overall players was 4.1-6.9-1.0. With respect to somatotype components, endomorphy was greater (p < 0.0001) in F (4.7 ± 1.8) than in B (3.1 ± 1.1); the same relationship was observed in mesomorphy (F: 7.2 ± 1.3 vs. B: 6.5 ± 0.8; p = 0.004); ectomorphy was greater (p = 0.001) in B (1.3 ± 0.6) than in F (0.8 ± 0.8).

Regarding BC in absolute terms (kg), F had greater values (p < 0.0001) for all fractions of tissue masses than B. Relative to body mass (%), F had greater adiposity (p = 0.0001), but B had greater muscle, bone and skin mass (p<0.01).

Conclusions: The PP was associated to physical characteristics, somatotype and BC in rugby union players.

Keywords: Body composition,Somatotyp,Anthropometry,Rugby.

144/1390

NUTRITIONAL STATUS OF SCHOOL-ADOLESCENTS IN OGUN WEST SENATORIAL DISTRICT, NIGERIA

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Background and objectives: Adequate nutrition is the pivot for nutritional development. Promoting good nutrition among school-adolescents will not only enhance excellent academic performances but foster optimal national development. Hence, the thrust of this research was to assess the nutritional status of school- adolescents in Ogun West Senatorial District, Nigeria

Methods: A cross- sectional study on nutritional status of 375 school-adolescents drawn from 3 out of 5 Local Governments (LGs) in the district using multistage random sampling was carried out. Twenty-five participants were chosen from 5 schools(1 private and 4 public schools) in each LGA. Validated questionnaire was used to collect socio- demographic, daily food intake and anthropometric (height and weight) data. Food intake data were obtained through a-24 hour dietary recall and analyzed using WHO total diet assessment software. Height z-score and body mass index (BMI) were used to evaluate subjects' nutritional status. Descriptive statistics were obtained using SPSS (version 17.0) software. Analysis of variance was used to explore differences in nutrient intake and anthropometric indices at 5% significant level.Male/Female participants were 49.9% /50.1% with 51.2% being younger adolescents (10-14 years) and 48.8% being older adolescents (15-19years).

Results: Anthropometric findings revealed 16.3% stunting, 17.4% underweight, 65.6% normal weight, 12.5% overweight and 4.5% obesity. Stunting was significantly (p<0.05) higher in girls and public school-adolescents while underweight was significantly higher (p<0.05) in boys and public school –adolescents. The dietary intake analysis reflected adequacy of energy (77%), protein (85%), though mostly of plant origin), vitamin A (81%), iron (91%) and thiamine (90%). The intake of vitamin C, riboflavin, niacin and calcium were inadequate. Differentials of intake between genders, age-cohorts and school categories were insignificant (p>0.05).

Conclusions: There was prevalence of double burden of malnutrition among the adolescents. Consequently, there is need to implement nutritional intervention program in the district.

Keywords: Nutritional status, Body mass indices, school-adolescents, Ogun West District.

144/1414

NUTRITIONAL STATUS, FOOD SELECTIVITY AND NUTRITIONAL ADEQUACY OF CHILDREN AND ADOLESCENTS BETWEEN 6 AND 16 YEARS OLD WITH AUTISTIC SPECTRUM CONDITION

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Background and objectives: A healthy diet is essential for adequate growth and development. The autistic spectrum condition (ASC) presents some special characteristics, like hypersensitivity or altered sensory processing, that can hinder a feeding that meets all the nutritional requirements. The main objective was to analyze the nutritional status of 16 children between 6 and 16 years old with ASC.

Methods: This is an observational, descriptive and cross-sectional study, the nutritional status was assessed by anthropometry, nutritional adequacy through a seven-day prospective registration, and main gastrointestinal disorders and food selectivity by clinical interview.

Results: The results showed that 31% of participants had an adequate height and adequate BMI, 38% had an adequate height but their BMI indicated overweight, 6% had an adequate height but their BMI indicated obesity, 6% had an adequate height but his BMI indicated thinness, 13% had a low height and normal BMI and 6% had a low height and his BMI indicated overweight. About muscle mass, 31% of participants had an arm muscle area above average and 19% below average; according to abdominal perimeter only 1 participant presented metabolic risk. Also, age adjusted nutritional requirements indicated that the mean adequacy was: calories 112.5% (sd= 25.19%), protein 213.25% (sd=100%), calcium 38.25% (sd=22.46%), phosphorus 87.06% (sd = 45.12%), iron 86.81% (sd=28.21%), retinol 40.97% (sd=26.92%), thiamine 19.31% (sd=9.44%), riboflavin 34.68% (sd=15.14%), niacin 34.43% (sd=15.99%) and vitamin C 144.43%(sd=87.89%). The main gastrointestinal disorders were diarrhea in 13% of participants, constipation in 19% and flatulence in 13%, however, no food selectivity in number or type was found. It is highlighted that the percentage of adequacy of iron consumption with p = 0.068 was the one that most approached a significant correlation with the height-for-age index.

Conclusions: The analysis of the nutritional status of children and adolescents shows the existence of a double burden of malnutrition in 69% of participants, with high consumption of calories and proteins, that cause overweight, and at the same time an insufficient micronutrients consumption.

Keywords: autism spectrum condition, nutritional status, food selectivity, nutritional adequacy.

ASSESSMENT OF THE VALIDITY AND RELIABILITY OF THE DIETARY INDEX FOR A CHILD'S EATING (DICE) IN CHILDREN AGED 2 TO 8 YEARS LIVING IN AUCKLAND, NZ

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Background and objectives: Background: Completing a four-day estimated food record (4DFR) can be a high burden for parents, but New Zealand has no valid and reliable dietary index to assess the adherence of children to the New Zealand Food and Nutrition Guidelines for Healthy Children and Young People Aged 2 -18 years (NZFNG).

Aim: To examine the validity and reliability of the Dietary Index for a Child's Eating (DICE) in children aged 2 to 8 years living in Auckland, NZ.

Methods: Caregivers of healthy children (2-8 years) living in NZ were recruited by email and print advertising. Caregivers completed both 4DFR for their child, and the DICE online on 2 occasions, eight weeks apart, to assess reliability. The DICE consists of 17 questions that reflect current statements in the NZFNG, with greater adherence indicated by a higher score (maximum 100). Relative validity was assessed by comparing the DICE scores with 4DFR scores using Wilcoxon signed rank test, Spearman correlation coefficients, cross-classification, and weighted kappa (κ) statistic. For evaluating construct validity, the DICE scores were compared with energy and nutrient intake extracted from the 4DFR. Intra-class correlation coefficients (Cronbach's α) were used to assess the reliability of DICE.

Results: From a possible score of 100, the mean ± SD of DICE was 78.2±11.5 (range 47-100) and the 4DFR was 73.8±10.8. Pearson's correlation coefficient showed a high correlation between the total scores for DICE and 4DFR (r=0.72; P<0.001). Results from the weighted κ-statistic also showed that the DICE total score and 4DFR total score had very good agreement (κ=0.94). There were positive relationships between the DICE total score and vitamin C (r=0.53), folate (r=0.45), and calcium (r=0.44) (P<0.001). Those who were categorised in the highest tertile of DICE consumed higher fibre, vitamins A, C, D, folate (P<0.05), and calcium (P<0.001). Almost perfect agreement (0.87) was found through the Intra-class correlation coefficient for reliability test (P<0.001).

Conclusions: Discussion and Conclusion: Results from this study demonstrated that DICE is a valid and reliable tool for the assessment of children's adherence to a health-promoting diet, and could be used in certain circumstances instead of the more burdensome 4FDR.

Keywords: dietary assessment, diet index, validity, reliability

HIDDEN HUNGER IN INDONESIA: WHAT ARE STILL HIDDEN?

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Background and objectives: Indonesia has recognized the importance of addressing stunting (35% children 24-59 months) and obesity (12% age 0-59 months, 11% 13-15 years, 29% adult). However, little is known on the magnitude of the problem of hidden hunger in the country, nor integrating effort to combat them.

Methods: The authors conducted literature search of nationally represented data and interviews with key informants.

Results: . The national prevalence of anemia is available for all age groups, while information on the prevalence of iodine deficiency is only available for children and women, and vitamin A and D for children. The prevalence of anemia in children 6 to 23 months is 57% (2011) and in pregnant women 37% (2013). The prevalence of vitamin D deficiency is 43% in children (2011). Fortification of salt with iodine was mandated in 1975 and wheat flour with iron, zinc, folic acid, vitamin B1 and B2 in 2001. Iron and Folic Acid distribution to pregnant women and vitamin A supplementation to children 6-59 months and to post-partum women are on-going programs. However, less progress is made on fortifying other products. A pilot of multiple micronutrient (MNP) to pregnant women was tried in 2000, but no follow-up thereafter. Trials of home fortification of MNP to children 6 to 59 months started in 2008, which resulted in a decree of mandatory content of the powder in 2013. However, its use is left to the local government and unevaluated. Voluntary fortification of vitamin A in cooking oil started in 2012, but experienced delay on its mandatory implementation. The result of rice fortification pilot in 2016 is yet to be announced. Based on six nationally represented food intake data, inadequacies of calcium, iron, vitamin A and C are found in children. Based on the interviews, the following deficiencies are suspected: calcium, vitamin B12, D, and E.

Conclusions: National data of the following micronutrients need to be updated or made available: vitamin A, B1, D, E, folic acid, iron, zinc, selenium, iodine, and calcium.

Keywords: hidden hunger, micronutrient, deficiencies, fortification, Indonesia

144/1457

THE PILOT KOREAN KEY FOODS BASED ON DIET COMSUMPTION

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Background and objectives: This study was performed to develop the Key foods approach to select food for nutrient analyses of up-to-date National Food Nutrient Composition database by National Laboratory System(NLS) of the Ministry of Food and Drug Safety in Korea(KFDA), based on the United Stated Department of Agriculture(USDA) Key concept. The primary objective of NSL in Korea is to provide the best database to represent the nutrients consumed by the population of the nutrient profile for each offds identified as important in the food consumption. The key food approach assists NLS to prioritize foods that contribute significant amounts of nutrients of public health interest to the diet.

Methods: The Key Foods approach used 16 nutrients and energy (Key nutrients) of public health significance identified in the intake data from KNHAES 2013-2014. The recipe file from KNHANES containing the list of ingredients and their amounts was used to identify the Key Foods. At first food lists that contributed to the intake of each nutrient were selected using recipe code from raw data in KNANES. Then We determined foods that contributed the most to intakes across all key nutrients. After selecting foods list, Key Foods were identified as those food components that contribute up to 85% of any one nutrient.

Results: From this procedure, 570 primary Key Foods were aggregated, which account for approximately 90.5% of the contribution of the nutrient consumption for the Korean diet. 456 Key Foods were identified after further refinement procedure to insure that we have a representative list of what Koreans eat by considering some foods that are not widely consumed by the Korean population.

Conclusions: This Key Foods list will be used for updating and revising the KFDA Food nutrient composition database from 2017 and allow NLS to concentrate resouces for food composition analysis. We expect the updating database will give representative data for researchers, consumers, and policy makers.

Keywords: Key nutrients, Food nutrient composion database, Korean Key Foods

144/1465

THE RELATIONSHIP AMONG HOUSEHOLD FOOD INSECURITY, DIETARY DIVERSITY, AND MICRONUTRIENT INTAKE BETWEEN FARMING AND NON-FARMING HOUSEHOLDS IN SELECTED RURAL COMMUNITIES ACROSS GHANA

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Background and objectives: Improving nutrition requires both access to food, higher dietary quality and diversity and the understanding of the relationship among these indicators in different livelihoods. This study examined the relationships among household food insecurity, dietary diversity, and the micronutrient density adequacy of diets of children 2-5 years of age of farming (n=461) and non-farming households (n=147) in Ghana.

Methods: Household food insecurity (HFI) was measured using an adapted version of the USDA Household Food Security Core Module. A household dietary diversity score (HDDS) was calculated based on the number of food groups (12 maximum) from which a household consumed. Children's diet quality were assessed using data from 2-d, 12-hr weighed food records, for a sub-sample of 120 households.The nutrient density adequacy of eight micronutrients -vitamin A, vitaminB6, vitamin B12, vitamin C, calcium, folate, zinc and iron- were calculated by dividing individual nutrient densities by recommended nutrient densities based on age-specific energy requirements. The mean micronutrient density adequacy (MMDA) of children's diets was then calculated as the mean of all eight individual micronutrient density adequacies, capped at 1. Spearman's correlation was used to assess the relationship among HFI, HDDS and MMDA. Predictors of MMDA were examined with linear regression analysis.

Results: Fewer non-farming households were moderately or severely food insecure compared to farming households (63.3% vs.75.7% P=0.003). HDDS of non-farming households was significantly higher than that of farming households (mean ± SD: 10.0 ± 1.8 vs. 9.3 ± 1.9; P=0.0001). MMDA was not significantly different between the non-farming farming and households. There were negative correlations between HFI and HDDS and MMDA (rs = -0.38, p<0.001 and rs = -0.25, p=0.005 respectively). After controlling for wealth, caregiver's education, and the number of children <5 y in the household, HFI was negatively associated with MMDA only in non-farming households.

Conclusions: Non-farming households consume more diverse foods and were less food insecure compare to farming households. This study suggests the utility of HFI to predict adequate intake of micronutrients in the diets of 2-5 yr. olds may be limited to non-farming households and not farming households.

144/1484

CONSUMPTION OF ULTRA-PROCESSED FOODS AMONG JAPANESE MIDDLE-AGED ADULTS AND THE ASSOCIATIONS WITH DIETARY INTAKES AND BMI

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Background and objectives: Japan retained the top spot in terms of average life expectancy, and nutritionally balanced Japanese diet is thought as being an important factor. However, in Japan, consumption of processed foods has continued its upward trend in recent years due to the reason to easy to cook, and to be able to eat at anytime or anywhere. The present study aimed to estimate the consumption of ultra-processed foods(UPF), and determine its association with dietary intakes and body mass index (BMI) among Japanese adults.

Methods: Cross-sectional study data from the Saitama Prefecture Health and Nutrition Survey 2011 was used for analyses. Dietary intake was assessed using two non-continuous day dietary records. Foods were classified based on NOVA system. Sociodemographic factors, lifestyle, height and weight were obtained from self-administered questionnaire. BMI was calculated using self-measured weight and height. 376 (156 men, 220 women) subjects aged 30 to 59 years who completed non- continuous two-day dietary records and self- administered questionnaire were included for the analysis. We divided the subjects into three groups according to tertile of the contribution of UPF in the total energy intakes (% of total energy):Low group (<30.7%) ,Middle group(30.7≤andc48.9%),High group (48.9%≤). ANCOVA adjusted for sex and age, marital status, income, total energy was used for the association with dietary intakes. For the association with BMI, exercise habits, smoking status were additionally adjusted.

Results: The mean ± standard deviation contribution of UPF was 41.0±20.5. High group had a significantly greater intakes of total fat, saturated fat, smaller intakes of potassium, iron, vitamin K, dietary fiber than lower groups. Furthermore, High group had a significantly greater intakes of other cereals (except rice), confectioneries, smaller intakes of rice, vegetables than lower groups. In addition, BMI of High group tended to be higher BMI in women.

Conclusions: UPF consumption were significantly related to dietary intakes. Out findings suggest that higher consumption of UPF among Japanese middle-aged adults was associated with intake of unhealthy diet and greater BMI.)

Keywords: Ultra-processed foods, dietary intake, Body Mass Index, Japanese

144/1509

APPLICATION FOR MEASURING FREQUENCY OF EATING HIGH-FAT FOODS – COMPARISON WITH OTHER METHODS

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Background and objectives: Monitoring food intake is a challenge in nutritional studies. Ecological momentary assessment (EMA) may offer a solution, by enabling data collection on study participants' activities and states in real-time by means of a smartphone application (app). The aim of our study was to design and test the feasibility of an application for assessing the frequency of eating high-fat foods.

Methods: 30 subjects (15 men and women) were enrolled in Poznan, Poland for the so called Fat Taste Project. Usual frequency of eating high-fat foods were assessed with the Block Screening Questionnaire for Fat intake (Q1) and a version modified to include products typically consumed in Poland (Q2). We also developed an app that was loaded on a smartphone provided to each participant for use daily over 10 days. The app gave prompts four times per day to report on high-fat foods consumed since the last prompt. The app contained the same list of food items as Q2. Overall food intake was assessed with dietary records.

Results: The average total frequencies of eating high-fat foods per week were 17.1±1.5 (Q1), 32.7±2.2 (Q2), and 34.5±2.1 (the app). There were no significant correlations between % energy from fat and the frequencies of eating high-fat foods, irrespective of the method used. The results from Q1 and Q2 were correlated (r=0.78, p<0.001). There was also a correlation between the results from Q2 and the application (r=0.56, p<0.05) but in women only. The mean difference between Q1 and Q2 was 15.6, while between Q2 and the application 1.73.

Conclusions: Using the application for measuring frequency of eating high-fat foods does not significantly affect assessment of the overall mean frequency of eating those products. However, the detailed data analysis considering time intervals and types of products eaten is needed.

THE LEVEL OF HEMOGLOBIN AND THE MEAN CORPUSCULAR VOLUME (MCV) AMONG PRE-CONCEPTION WOMEN IN BANGGAI REGENCY

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Background and objectives: Because the most common cause of anemia in pregnancy is iron deficiency, it is important to study the level of hemoglobin and the mean corpuscular volume (MCV) in preconception women.The current study aimed to describe the level of hemoglobin and the MCV, which are iron status parameters in red blood cells, among preconception women in Banggai Regency.

Methods: The research was conducted in threesub-districts of Banggai district, namely, Luwuk, North Luwuk, and South Luwuk, from October 2016 to February 2017. The subjects were newlywed preconception women who were visiting the religious affairs office to register their marriages; who were 18-35 years of age; and who did not have serious diseases, such as tuberculosis, heart disease, or kidney failure. A total of 102 preconception women were recruited. Venous blood samples were extracted, and hemoglobin and the MCV were measured using the SLS-hemoglobin method. The normal values for hemoglobin and the MCV are 12 g/dL and 80-100 fL, respectively.

Results: The results showed that of 102 preconception women, 16 women (15.7%) had a hemoglobin level under 12 g/dL or reported anemia, and 21 women (20.6%) had an MCV below 80fL. Of the 16 women who had anemia, 12 women (57.14%) had an MCV under 80 fL, which indicated that their anemia was correlated with the iron parameters in red blood cells.

Conclusions: The results of study indicated that anemia is frequent in preconception women and that iron plays an important role in this anemia. This study indicates the importance of multi-micronutrient supplementation in preconception women

Keywords: Anemia, MCV, Preconception

Further collaborators: Inayah Hi. Zaini Dg. Taha, Researcher. Banggai District Health Office

PHYSICAL CHARACTERISTICS, PROXIMATE COMPOSITION AND ANTI-NUTRIENT FACTORS OF LABLAB BEAN (LABLAB PURPUREUS) VARIETIES GROWN IN KENYA

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Background and objectives: The lablab bean (lablab purpureus) is an important staple food in Kenya. It is well adapted to the local climatic conditions and plays an important role in food and nutrition security, particularly in the arid and semi-arid parts of the country. However, there is limited information on the nutritional value of the different varieties of the beans. The main objective of this study was to determine the physical characteristics, proximate composition and anti-nutritional factors of three lablab bean varieties.

Methods: The length, width and thickness of the seeds was determined using vernier calipers. Seed density was determined by water displacement. Hydration and swelling coefficients were determined by soaking the seeds in water and determining the water absorbed. Crude protein was determined by Semi-Kjedahl method while crude fat was determined by Soxhlet extraction. Phytic acid was determined using HPLC, while tannin content was determined by the Vanillin Hydrochloric method.

Results: The mean 100 seed weight was significantly different among the three varieties, and ranged from 26.1 g to 29.2 g. The length, thickness and width ranged from 9.7 to 10.7 mm, 5.2 to 5.6 mm and 6.8 to 7.4 mm, respectively. The hydration and swelling coefficients of the beans ranged from 130.7 to 147.2, and 125.1 to 153.3, respectively. The mean protein and energy content varied from 22.5 to 25.4%, and 347.4 to 353.7 Kcal/100g, respectively, and differed significantly among the varieties. There were significant differences in the phytic acid and tannin levels, which ranged from 533.4 to 723.6 mg/100 g, and 0.27 to 232.6% CE, respectively.

Conclusions: There is good potential to select for lablab varieties with good cooking and nutritional characteristics.

Keywords: lablab beans nutrition anti-nutritional Kenya

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HOW WELL DO DIFFERENT NUTRITION ASSESSMENT TOOLS MATCH? INSIGHTS FROM KENYA

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Background and objectives: Multifaceted indicators, scores and assessment tools exist to measure and depict food insecurity and malnutrition. However, most studies eventually only use one approach. Relatively little is known about how the results of different approaches relate, which is important to evaluate the reliability of the estimates and to better plan nutrition interventions. We contribute to the literature by comparing results from different assessment tools for the same households and individuals.

Methods: The study took place in two counties in Western Kenya in 2015 and included 809 households and 1,775 individuals. A 24-hour dietary recall and a 7-day food consumption recall were administered at individual and household level, respectively. At individual level, children between six and 59 month and male and female adults were targeted. Anthropometric measures were also taken. Pearson's correlation coefficient was used to evaluate the relationship between different measures.

Results: Household dietary diversity (HDD) depicts a usage of nine food groups per week. In contrast, the average individual dietary diversity score (IDDS) for adults and children depicts usage of six food groups. Average individual energy intake is 2237.43 kcal/day (± 961.59) and 1759.21 kcal/day (± 981.31) for adults and children, respectively. Significant correlation is found between energy intake (kcal) and different dietary scores for children and adults (e.g. adult energy intake and HDDS r=0.195***; adult energy intake and IDDS: r=0.258***; child energy intake and HDDS: r=0.244***). However, the magnitude of the correlation coefficients is mostly small. Looking into macro- and micronutrient levels, significant correlation is found only for selected nutrients and score combination and at adult level.

Conclusions: We tentatively conclude that there is a positive and significant relationship between different scores of the same households and individuals. However, further analyses are needed to understand the relationship across households, individuals and nutrient level. Additional research steps will be to look into the relationship between dietary quality indicators/scores and anthropometric measures.

Keywords: Nutritional assessment, Dietary Diversity, Correlation, Household, Individual

Conflict of Interest Disclosure: We wish to confirm that there are no known conflicts of interest associated with this publication and there has been no significant financial support for this work that could have influenced its outcome.

We confirm that the abstract has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

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A HUMAN CROSS-OVER STUDY TO TEST DIFFERENCES IN BIOAVAILABLE PROTEIN USING A DUAL STABLE ISOTOPE RATIO METHOD

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Background and objectives: Dietary protein quality has been recognised as a critical issue by international authorities. It depends on amino acid (AA) composition and bioavailability. We aimed to investigate whether differences in the amount of bioavailable AA can be measured using a dual stable isotope ratio method. The principle is the use of two differently labelled proteins in a single meal; one test protein (e.g. 15N-labelled) given at a normal dietary quantity and one protein (e.g. 13C-labelled) given at trace quantity. The ratio between the two labelled AAs in serum (15N/13C) reflects the relative bioavailable amount of the differently labelled AA in the meal. Here, we have tested the difference in the amount of bioavailable AAs between two meals, hypothesizing that a two-fold difference in the amount of test protein in the meals would proportionally cause different ratio (15N/13C) in the serum.

Methods: In a cross-over study, ten subjects ingested a 500 kilocalorie pudding containing either 50 or 25 gram of intrinsically labelled 15N-milk protein (1.9 atom percent excess (APE)) and 400mg intrinsically labelled 13C-spirulina (97APE), along with 10E% fat and 50 or 70E% carbohydrates. On both days, pudding was divided in nine portions provided every 20 minutes. Isotopic enrichment of total serum free AAs at baseline and in the postprandial period was determined.

Results: The meal containing 50 gram dose of 15N-milk protein compared to 25 gram 15N-milk protein, also resulted in two-

fold higher serum free AAs 15N-enrichment. Both meals contained 400mg 13C-spirulina, resulting in similar serum free AAs 13C-enrichment. The high protein meal resulted in a 15N/13C ratio of 11.04(±1.53 (mean±SEM)) at t=180 minutes and the low protein meal resulted in a 15N/13C ratio of 6.26(±1.27).

Conclusions: A two-fold difference in the ingested amount of bioavailable 15N-milk protein in our test meal resulted in a 1.8 fold difference in serum free AA 15N/13C ratio. We showed that using this dual stable isotope ratio it was possible to detect differences in the amount of bioavailable protein. Thus, the dual stable isotope ratio might be a potential method for the estimation of protein bioavailability and hence protein quality in vivo in humans.

Keywords: Protein quality, stable isotopes, protein bioavailability, dietary protein, isotopic ratios.

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VITAMIN D AND ITS RELATIONSHIP WITH OBESITY, DYSLIPIDEMIA AND DIABETES MELLITUS 2 IN ADULT WOMEN, LIMA - PERU

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Background and objectives: Vitamin D deficiency is considered a public health problem. The objective was to determine the relationship between vitamin D and obesity, dyslipidemias and type 2 diabetes mellitus in a group of adult women.

Methods: One hundred and ten adult women between 20 to 55 years were weighted and their height measured in order to obtain the BMI to define the nutritional status. Insulin, glucose, lipid profile and vitamin D (25 (OH) -D) were determined. With the first two we calculated the Homeostatic Model of Assessment Index (HOMA-I) and to define insulin resistance (RI) a HOMA-I ≥ 2,7. Holick cutoff points were used to categorize 25-hydroxyvitamin D level: deficient <20 ng/mL, insufficient 21-29 ng/mL and sufficient ≥ 30 ng/mL. We identified dyslipidemia as recommended by the Third Report of the National Cholesterol Education Program. The frequency of consumption was used to measure vitamin D intake. We calculated prevalence, average, SD, 95% CI, correlation of quantitative variables, and association of categorical variables.

Results: Forty nine percent of the respondents were insufficient and 2,7% deficient of 25 (OH) -D. The intake was about 3

ug/d. The lowest averages of 25 (OH)-D were for obese 31, RI women 28 and obese with RI 28,2 ng/mL. The highest prevalence (25 (OH) -D <30 ng/mL) was for the obese women (62.2%), those with RI (72.4%) and for obese with IR (76.5%). HOMA-I and triglycerides had a moderate negative relationship with serum 25 (OH) -D levels. The prevalence of deficiency + insufficiency had a significant association between 25 (OH) -D with IR and hypertriglyceridemia.

Conclusions: The deficiency plus vitamin D insufficiency showed an association with two variables that identify cardiovascular risk, which could explain the possible relationship of this vitamin with cardiovascular diseases

Keywords: Vitamin D; Obesity; Insulin Resistance; Dyslipidemia; Diabetes mellitus 2

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BODY WEIGHT CONTROL, NUTRIENT INTAKE AND RESTRAINED EATING BEHAVIOURS OF HEALTHY ADULTS

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Background and objectives: Dietary restraint is defined as the intention to restrict food intake in order to control body weight. The Restraint Scale (RS) is the most widely used measure for dieting to achieve or maintain a desired weight. Therefore the aim of this study was to evaluate the nutrient intake and BMI values of participants according to their restrained scale scores.

Methods: In order to determination a relation between nutrient intakes, anthropometric measurements and restrained scale scores of participants a questionnaire that consists restrained scale and some socio-demographic characteristics of healthy participants were administered by the face-to-face method. Participants' 24 hour food recall and anthropometric measurements were also taken by specialized dietitians. The results were evaluated by the statistical program SPSS.

Results: The mean energy value of the individuals was 2038.4 ± 678.34 kkal. According to the participants' 24-hour food recall, the average percentage of energy from carbohydrate, fat and protein intake were 47.9 ± 9.31%, 37.2 ± 8.66% and 14.9 ± 3.50%, respectively. According to RS, 37% of the participants had restricted eating behaviours. The mean energy value of the individuals with restricted eating behavior were 2209.2 ± 716.09 kkal, while the mean energy value of the individuals with restricted eating behavior were 1747.1 ± 503.74 kkal (p = 0.02). Similarly, individuals without restrained eating behaviors were found to have higher carbohydrate (g / day), protein (g / day) and fat (%) values compared to individuals with restricted eating behaviors and the difference was found to be statistically significant (p = 0.01 , 0.04 and 0.01, respectively). The mean BMI of women without restricted eating

behaviors was 23.1 kg/m2, while the BMI of women with restricted eating behaviors was 21.0 kg/m2 (p = 0.03). But there was no significant difference between the mean BMI values of individuals with and without restricted eating behaviors in men (p> 0.05).

Conclusions: The findings of this research suggest that restraint subscales are sensitive to nutrient intake of participants.

Keywords: Nutrient intake, body weight, restrained scale

144/1613

EFFECTS OF IODISED SALT AND IODINE SUPPLEMENTS ON PRENATAL AND POSTNATAL GROWTH: A SYSTEMATIC REVIEW

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Background and objectives: Globally, 161 million children are stunted. Stunted children have an increased risk of mortality and morbidities. Iodine is a key component of thyroid hormone, which influences the growth of skeletal and peripheral tissues. Inadequate dietary iodine intake is associated with stunted growth. We systematically reviewed the evidence for the effectiveness of iodine supplementation or fortification on growth (prenatal to 18 years).

Methods: Following Cochrane methods, we searched ten databases including two Chinese databases (latest search February 2017) for eligible studies. RCTs and non-RCTs controlled before-after studies, interrupted time-series studies and interrupted time series studies with repeated measures conducted in pregnant women and children aged 0-18 years, comparing the effectiveness of iodine (in any form, dose or regimen) to a placebo, non-iodised salt, or no intervention, on pre-and post-natal growth markers were assessed. Analyses were stratified by iodine status. We calculated mean differences (MD) with 95% confidence intervals (95%CI), and performed random-effects meta-analyses. The quality of the evidence was assessed using GRADE.

Results: Nineteen trials with 5733 participants were included in the review. Providing moderately-to-mildly iodine deficient pregnant women with iodine supplements may make little or no difference to offspring birth length (MD 0.01 cm (95% CI -0.39, 0.41cm); I2=0%; 3 RCTs, n=1106; low quality evidence). The impact of iodine supplements to severely iodine deficient pregnant women on offspring birth length is uncertain due to the very low quality of evidence (MD 4.7 cm (95% CI -1.6, 11cm); 1 non-RCT, n=456; very low quality evidence). Similarly, supplementing schoolchildren with iodine may make little or no difference to their height, irrespective of their baseline iodine status (MD -0.03 cm (95% CI -1.45, 1.39 cm); I2=28%; n=890; 4 RCTs; low quality evidence).

Conclusions: Despite the importance of adequate dietary iodine intake for normal growth during infancy, childhood and adolescence, there are few rigorous, adequately powered trials investigating the effectiveness of iodine supplementation or fortification on prenatal and postnatal growth during these life stages. Based on the limited, low quality data available, the impact of iodine supplementation or fortification on prenatal or postnatal growth outcomes remains uncertain.

Keywords: Iodine, iodine deficiency disorders, growth, stunting

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144/1618

NUTRITIONAL STATUS ASSESSMENT OF ELITE MALE CRICKETERS FROM GUJARAT, INDIA

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Background and objectives: There is lack of data on nutritional status of cricketers and therefore the study was planned to assess the anthropometry, body composition and dietary intake of the male cricketers 19-23 years of age (n=28). The subjects trained for 4 hours a day for 6 days a week at the academy and had an average 9 years of experience.

Methods: Weight, height and Waist- hip circumference were measured using standard procedures. Body mass index (BMI) was classified using Asia Pacific cut offs. Body composition analysis was conducted using Bio-electrical impedance method (Bodystat Quadscan 4000 unit). Dietary intake was assessed using 24-hour dietary recall method (3 days) and food frequency questionnaire was used for Iron and Calcium intake. The data for macronutrient intake were compared with the Recommended Dietary Allowances by National Institute of Nutrition (NIN) for Team event athletes while for micronutrients, RDA by NIN for non-athletic population were used as those for athletes are unavailable.

Results: The measured BMR of subjects was higher (1679±153 kcal/day) than the BMR for reference man (1587 kcal/day) calculated using formula by Indian Council of Medical Research. A typical short fat phenotype was observed even in the elite cricketers as indicated by the waist height ratio which identified 21% to be abdominally obese. Body composition revealed that only 46% subjects had normal body fat while 93% had normal lean mass. Thirty nine percent of cricketers were identified as overweight (28%) and obese (11%) by BMI. Percent energy contributed by Carbohydrate: Fat: Protein (50:35:15) compared well with the rec-

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ommended values (54:31:15). None of the subjects met the (RDA) for Energy (-48%), Carbohydrates (-52%), Protein (-47%) and Fat (-59%). Daily Iron (19.31mg) and Calcium intake (1572mg) met the RDA of 17mg and 600mg respectively. Iron rich foods consumed daily were whole wheat flour (96.4%), Lentil (7.1%) and Puffed rice (7.1%) while the Calcium rich foods were Milk (100%), Dried dates (42.9%), Curd (39.3%).

Conclusions: Overweight and obesity was prevalent even in elite cricketers along with central obesity. The deficits in Energy and macronutrients if not corrected may lead to impaired performance.

Keywords: Nutritional status, Elite Male Cricketers, Central obesity, Body composition

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ALTERNATE DAY DOSING, AND SINGLE MORNING DOSES RATHER THAN B.I.D. DOSING, MAXIMIZE TOTAL AND FRACTIONAL IRON ABSORPTION FROM ORAL IRON SUPPLEMENTS: STABLE IRON ISOTOPE STUDIES IN IRON-DEPLETED WOMEN

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Background and objectives: Oral iron supplementation (OIS) is a primary approach to treat iron deficiency, but there is no clear consensus on the optimal regimen, and compliance is often poor. Oral iron supplements acutely increase serum hepcidin (SHep); the duration and magnitude of this increase and its dose dependence could be used to optimize OIS to maximize absorption. In short-term studies (1-3) we defined the duration of the SHep increase, compared single day versus two consecutive daily doses and single versus twice a day (b.i.d.) dosing. In long-term studies (4), we compared iron absorption (60mg) from consecutive day dosing for 14 days versus alternate day dosing for 28 days (equal total dose) and (5) from 120mg given in daily doses versus split b.i.d. 60mg over 3 days.

Methods: In studies (1-3: n=54; 4: n=40; 5: n=20) labeled Fe [54Fe]-, [57Fe]- or [58Fe]-FeSO4 was given to fasting iron-depleted women (plasma ferritin <25μg/L). Iron absorption was measured as erythrocyte incorporation of iron stable isotopes 14 days later.

Results: Studies 1-3 showed an increase in SHep at 24h after doses of >60mg (P<.05), but not at 48h. Fractional iron absorption (FIA) decreased by 36% when 60mg was administered on the second day compared with the first day (P<.001). Total iron absorption (TIA) did not improve if 3 doses were administered within 24h (b.i.d.) compared to when only the 2 morning doses were given (P=.79). In study 4, TIA from alternate day dosing was increased compared to consecutive day dosing: geometric mean (-SD,+SD) 175.3 (110.3,278.5) versus 131.0 (71.4,240.5)mg (P=.001). SHep increased over time in both groups, with a time x group interaction (P<.001). In study 5, there was no difference in TIA over 3 days between single dosing and b.i.d: geometric mean (-SD,+SD) 40.7 (40.9,40.6) versus 44.7 (44.8,44.5)mg, respectively; b.i.d. dosing increased SHep over the 3 days compared with single day dosing (P<.05)

Conclusions: In both short- and long-term studies in iron-depleted women: 1) FIA and TIA are higher from 60 mg doses given on alternate days versus consecutive days; and 2) an iron dose (120 mg) split b.i.d. does not increase TIA compared with a single morning dose.

Keywords: oral iron supplementation, iron absorption, hepcidin

Conflict of Interest Disclosure: DWS and AJGM are employees of Radboud University and Medical Centre that offers high quality hepcidin measurements to the scientific, medical and pharmaceutical community, at a fee for service basis. The other authors do not have conflict of interest to disclose.

HARMONIZATION OF DIETARY INTAKE ASSESS-MENT IN BALKAN REGION USING DIET ASSESS & PLAN (DAP) PLATFORM

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Background and objectives: Initiatives in the Capacity Development in Nutrition Research in Balkan region in past decade have been toward creation of contemporary, harmonized Research Infrastructure (RI) compliant to European standards. One of the elements of this RI is an innovative tool, DIET ASSESS & PLAN (DAP), a platform for standardized food consumption collection, comprehensive dietary intake assessment and nutrition planning.

Methods: DAP, advanced dietary assessment application, compliant to EuroFIR(TM) standards, comprises computerized food consumption questionnaires (24-h dietary recalls (24HDR), Food Frequency Questionnaire (FFQ), Food Records (FR), Food Propensity Questionnaire (FPQ)), general and pre-screening information about subjects, anthropometric and biochemical parameters, blood pressure measurements, supplements intake and physical activity, and complementary Food photo atlas. It extracts nutrient data from compatible food composition database (FCDB) (30 national FCDBs from EuroFIR(TM) Food platform), and evaluates results based on sets of international nutrient recommenda-tions. Its structure is based on MySQL database (for FCDB) and Microsoft VisualFoxPro database engine.

Results: DAP enables dietary intake assessment on individual and/or population levels, dietary planning (for public institution procurements and personal dietary advice), foods design/reformulation, food labelling, and assessment of the Minimum Dietary Diversity-Women (MDD-W) as one of the priority indicators forPost-2015 Sustainable Development Goal (SDG) framework. It operates in bilingual options: English (default) and other language. DAP platform has EuroFIR(TM) thesaurus, LanguaL(TM) and EFSA FoodEX2 coding systems integrated in its structure, where food matching is possible on level of foods, recipes and dietary questionnaires. The software has been evaluated within EFSA project: "Dietary monitoring tools for risk assessment", 2014, and presents major platform for two new EFSA projects in Balkan region: National Dietary Surveys in Compliance with the EU Menu methodology (sixth support): "The adults' survey", including subjects from 10 to 74 years old, 2017-2021 (Serbia, Bosnia and Herzegovina and Montenegro) and "The children's survey", including subjects from three months up to 9 years old, 2017-2021 (Serbia and FYROM).

Conclusions: DAP platform with its standardized and harmonized tools for dietary assessment is RI that synchronizes nutrition surveillance in the Balkan region, and with is features could be employed on larger scale nutrition epidemiology studies.

Keywords: Dietary assessment tool, Research Infrastructure, Food consumption, Dietary survey, Balkan region

EFFECT OF DIFFERENT AMOUNTS OF ALCOHOL INTAKE ON GUT MICROBIOTA COMPOSITION OF HEALTHY ADULTS

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Background and objectives: Knowledge on the effects of alcohol consumption on the gut microbiota composition is scarce and mainly derived from animal studies or from studies on alcoholic subjects with alcohol-liver disease or cirrhosis. However, the effects are bound to be different depending of the amount of alcohol intake, as evidenced with other alcohol effects on health. The objective of the present work was to assess the effect of the amount of alcohol intake in the gut microbiota composition of healthy adults

Methods: A non-representative population sample of 261 healthy adults (25-45 y) of Madrid was studied (51% males, 49% females). Anthropometry was measured and socioeconomic, life-style and medical history data were obtained through a battery of

validated questionnaires. Gut microbiota composition was analyzed in fecal samples through 16S rRNA gene amplicon sequencing (V3+V4 gene regions. MiSeq 2x250 Illumina) and taxonomic analysis. Three groups of alcohol consumption were considered. 1) None-Low (N=124), average consumption <5g alcohol/day; 2) Moderate: ≥ 5 g/d and ≤20g/d (men) or ≤12 g/d (women) (N=99); 3) High: > 20 g/d (men) or > 12 g/d (women) (N=38). After post-processing OTUs data cleaning, general lineal model including alcohol group and sex as independent factors and non-parametric Kruskal-Wallis and Mann-Whitney tests were used for the statistical analysis of normal and non-normal distribution phyla encountered, respectively

Results: Differences between groups of subjects with different amount of alcohol intake were observed specially in the less abundant phyla while the predominant phyla were similar irrespective of alcohol consumption. A higher proportion of Spirochaetes was observed when alcohol consumption is high (Kruskal-Wallis test, P=0.001), and remains significant in a separate sex analysis. Other differences are observed in some minor phyla depending on amount of alcohol consumption but the findings are different in men and women.

Conclusions: Alcohol consumption above the recommended daily intake was associated with an increased proportion of Spirochaetes in gut microbiota of healthy adults compared to moderate, low or no-alcohol intake.

Keywords: Gut microbiota. Alcohol intake. 16S metagenomics. Healthy adults.

144/1648

DIETARY INTAKE AND SOURCES OF ADDED SUGAR AMONG BRAZILIAN POPULATION: RESULTS FROM ELANS/EBANS STUDY

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Background and objectives: Added sugar (AS) intake is highly associated with the epidemic of overweight and obesity. This study aimed to identify the dietary intake and sources of AS among Brazilian population.

Methods: Latin American Health and Nutrition Study (ELANS) is a multicenter study developed in urban areas of 8 Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. Data were obtained from 2,000 Brazilians (15-65 y.o) participating in EBANS (Brazilian Health and Nutrition Study). Two 24-hour recall were used to identify the intake of AS and the major food items accounting for AS, using the weighed-proportions formula developed by Block (1985) in which the relative contribution (RC) of a given food item/food group is defined as: RC=[(Total AS grams from a food item x 100)/Total AS grams from all food items]. Median intake and sources of AS were performed by age group, gender, socioeconomic level (SES) and nutritional status.

Results: Median AS and AS percentage of energy intake were 52.4g/day and 12.6%, respectively. More than 63% of the subjects had %energy from AS >10%. Comparison of median AS intake (g/day) between age groups, nutritional status and SES showed that the highest intake was found among male adolescents, obese male and high SES. Carbonated soft drinks accounted for the highest contribution of AS intake in the whole sample, providing from 26.8% to 40.1% of total AS intake. Infusions were the second main source, except for adolescents that had cookies and cakes as the second contributor of AS intake. Sugar-sweetened beverages (SSBs) represented 68% of total AS intake among Brazilians, based on gender it was 69.2% for male and 57.5% for female.

Conclusions: Brazilians are consuming AS above the level recommended by the World Health Organization (10%). The main source of AS was SSBs independent of gender, age group, SES and BMI status. These results reinforce the importance of reducing sugar content in manufactured foods. However product reformulation alone may not be enough, public health programs should also focus on strategies that reduce the quantity and frequency of others sources of AS, such as homemade drinks, cakes, cookies and desserts.

Keywords: Food source, Added sugar, Brazilian population, multicenter study.

Further collaborators: on behalf of the ELANS Study Group

144/1656

MONITORING AND EVALUATION OF DIET-RELATED NCD RISK FACTORS UNDER NUTRITION TRANSITION: A SECONDARY ANALYSES OF THE DATA OF NATIONAL FOOD CONSUMPTION SURVEY, LAO PDR

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Background and objectives: Recently, the countries where undernutrition and infectious diseases have been the significant public health problems are increasingly facing with the increased disease burden of non-communicable diseases (NCDs) like diabetes and cardiovascular diseases under nutrition transition, hence "double burden of malnutrition". Sustainable development goals (SDGs) were formulated in September 2015 as post-MDGs, thereby promoting global trend to focus on nutrition and NCDs. It is therefore important to develop a framework of policy planning to tackle "double burden of malnutrition" as well as evaluate the diet-related NCD risk factors in the countries undergoing nutrition transition. In our previous study, we developed the database on nutrition/NCDs monitoring systems and the relevant indicators (e.g. definition, criteria). The present study aims to develop a standardized tool (FFQ) for dietary assessment to evaluate the impact of intervention for "double burden of malnutrition" using the dataset of nationwide food consumption survey in Lao PDR.

Methods: National Food Consumption Survey is the first comprehensive nationwide survey on dietary intake in Lao PDR, which has been conducted by the National Institute of Public Health, Lao PDR (NIOPH) since 2014. This survey was undertaken by one day 24-hour recall method using food photo book developed by a pilot study, and INMUCAL-N was applied for calculation of nutrient intake. In addition, a questionnaire on the socio-demographic characteristics and the anthropometric data were collected. For the purpose of this study, the approval for secondary analyses is being sought to the NIOPH and the supporting bodies (e.g. FAO).

Results: Results of data analyses will be presented at the congress.

Conclusions: We expect to apply the newly-developed FFQ for monitoring and evaluation of diet-related NCD risk factors in the country, followed by the dietary surveys in Cambodia and Myanmar for standardization to monitor and evaluate diet-related NCD risk factors in each country.

Keywords: nutrition transition, food consumption data, dietary survey, 24-hour recall, FFQ

144/1673

EXPLORATORY STUDY ON FATTY ACID PROFILE FROM SEVERAL EDIBLE FISH SPECIES IN CHILE

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Background and objectives: Marine fish is one of the most important current dietary sources of eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA), two of the most recognized omega-3 long-chain polyunsaturated fatty acids (ω-3 LCPUFA) because of their beneficial effects and physiological roles in human health. In Chile there is a lack of information concerning EPA and DHA content in fish consumed by the population. In this work, we determined the fatty acid amount of seven fishes consumed in Chile with a focus on EPA and DHA, thus providing relevant information for consumers.

Methods: Specimens from seven fish species were collected for this study from local fishermen in Coquimbo (IV Region, Chile): Chilean hake (Merluccius gayi gayi), Peruvian morwong (Cheilodactylus gayi), Southern rays bream (Brama australis), Pacific sandperch (Prolatilus jugularis), Chilean jack mackerel (Trachurus murphyi), chub mackerel (Scomber japonicus) and Chilean flounder (Paralichthys adspersus). Fillets from 3 fishes of each species were put together and minced, and then the lipid fraction was extracted by the Folch method. Fatty acid profiles were obtained by gas chromatography coupled with flame ionization detection (GC-FID) using methyl tricosanoate as internal standard.

Results: Most analyzed fish fillets contained an EPA+DHA amount higher than 250 mg per serving size (100 g fillet), which is the minimum recommended daily intake of both ω-3 LCPUFA. The highest EPA+DHA amount was found in Peruvian morwong (440 mg/100 g fillet) whereas the lowest amount was found in Chilean flounder (202 mg/100 g fillet). It was observed that DHA amount was higher than EPA in all studied species: the highest and lowest DHA levels were found in Chilean jack mackerel (280 mg/100 g fillet) and Chilean hake (149 mg/100 g fillet) respectively, whereas the highest and lowest EPA levels were found in Peruvian morwong (144 mg/100 g fillet) and Southern rays bream (24 mg/100 g fillet) respectively.

Conclusions: This exploratory study provides valuable data to the very scarce literature regarding fatty acid composition of Chilean fishes. It did not include longitudinal data, but it can be used as starting point to design a larger study considering geographical, climate and seasonal conditions.

Keywords: Fish fillet, eicosapentaenoic acid, docosahexaenoic acid, fatty acid profile.

PROTEIN INTAKE, PROTEIN QUALITY, PROTEIN STATUS AND EARLY CHILDHOOD LINEAR GROWTH IN RURAL ETHIOPIA

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Background and objectives: Linear growth failure is a major public health concern in developing countries. Poor linear growth of children, manifested as stunting, is associated with higher child mortality and morbidity, poorer motor and cognitive development, and lower educational attainment and economic productivity in adulthood. Protein and essential amino acids play biological roles in bone elongation and necessary for linear growth. The quality of protein in foods consumed by low-income groups in developing countries is often limited, which reduces the availability of protein for use by the human body. However, so far limited evidence is available on the relationship between early childhood linear growth and protein intake, particularly in settings with a high prevalence of inflammation. we therefore examine the associations among protein intake, protein quality, protein status, and linear growth among young children in rural Ethiopia

Methods: We used a cross sectional data set (n=846) collected from July-September 2015 during baseline of an ongoing randomized controlled intervention trial of children aged 6-35 months in a rural area of Ethiopia. Protein intake was assessed using 24 h dietary recall, and protein quality was measured using the PDCAAS method. Determination of protein status (prealbumin), alpha-1-glycoprotein (AGP), and C-reactive protein (CRP) was conducted using immunoturbidimetry. Multivariable linear regression was used to evaluate the associations among protein intake, protein quality, protein status, and early linear growth.

Results: Prevalence of inflammation (elevated AGP > 1 g/L or CRP > 5 g/L) was about 37%. After adjustment for sex and socioeconomic status, we found protein status measured using prealbumin was correlated with height and weight of children. We found that among stunted children in the first one year, median protein intake was below the estimated average requirement (EAR) (P<0.05). After adjusting for potential confounders, we found total protein intake(β=0.32), and protein quality((β=0.45), and intake of the most limiting amino acids(β=0 .53) were positively associated with early childhood linear growth(P<0.005)

Conclusions: High linear growth failure in Ethiopian children likely affected by low protein intake. Nutrition programs that emphasize higher dietary protein intake as well as improving the quality of that protein might improve early child linear growth

Keywords: protein intake; protein status; linear growth; Ethiopia

Further collaborators:

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VALIDATION OF A MOBILE APPLICATION AS A TOOL TO ESTIMATE FOOD INTAKE IN ADULTS

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Background and objectives: Knowing the dietary patterns of the population includes nutritional assistance actions and can contribute to health care. However, traditional methods of dietary intake analysis have weaknesses that lead to measurement errors. The development of new tools can assist in information quality in dietary surveys while the use of digital technology with mobile devices facilitates recording and analysis of data, as already demonstrated. The objective of this investigation is to verify the validity of Nutrabem application -NApp, as a tool for recording food intake in adults. This study was conducted to determine the optimal sample size by considering dietetic variability.

Methods: A cross-sectional pretest study conducted with NApp users; food intake was also estimated by the application of a 24-hour recall; nutritional composition analysis was performed using Nutrabem Pro software. Student' t-test, Pearson's Correlation Coefficient and Bland Altman's chart will be applied to verify the agreement between methods.

Results: The sample of 40 subjects was composed of 33 women (82,5%); the average age of the respondents was 29.7 years (SD=8.96).

Conclusions: This study indicated that a sample of 280 individuals will able to produce results accurate enough to identify the significant differences in the variables of interest in this study with the power of 0.8.

Keywords: validation studies, dietary surveys, digital technology.

Further collaborators: Support: grant #2016/13978-7, São Paulo Research Foundation (FAPESP).

144/1707

MARKET ASSESSMENT OF OIL BRANDS TO ASSESS THEIR AVAILABILITY AND COMPLIANCE WITH VITAMIN A FORTIFICATION STANDARDS IN PAKISTAN

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Background and objectives: The mandatory fortification of oil with vitamin A has been identified as a key strategy to address prevalent deficiency in the Pakistan population. However, the potential efficacy of fortification can be compromised by sub optimal compliance to standards. Given the need to ascertain compliance, we sought to assess (1) availability of oil brands across provinces and (2) compliance of oil brands and producers with oil standards.

Methods: In Aug 2016, different retail outlets were visited in the 2-4 main urban market hubs (based on high population density) to record available brands in each of the 4 main provinces.

12 oil samples were collected from each oil brand available in Pakistan. Composite samples were prepared by brand and the average vitamin A content was quantified using HPLC. Unweighted averages by producer were calculated across brands.

Results: We were able to identify the number of brands available in Pakistan and the variety of available brands in the main provinces. Punjab province has the highest variety of available oil/ghee brands (70 brands), Sindh (45), KPK (44) and Baluchistan province the lowest (19).

The annual market volumes of the 50 producers included in the compliance assessment represents about 70% of the market volume. 70% of this volume is fortified (by 28 producers), but only 40% according to the national standard (by 11 producers).

The fortified oil is available in all the main 4 provinces.

Conclusions: The majority of the oil in Pakistan is fortified and fortified oil is available in all the main 4 provinces. Two-thirds of the oil is not fortified or does not meet the standard. Therefore, strengthening of the regulatory monitoring by key stakeholders (Regulatory bodies including Pakistan Standards and Quality Control Authority (PSQCA) /Food Authorities etc.) may be required to ensure inspections are carried out at the production sites of producers that do not fortify or do not meet the standard requirements, to understand the bottlenecks in collaboration with industry and to make sure that fortification of oil is initiated and quality assurance and control measures improved.

Market monitoring can identify non-compliant producers and prioritize follow-up for corrective action.

Keywords: market assessment, compliance, availability, food fortification, Pakistan

Further collaborators:
The market assessment was made possible through the support of the Pakistan Vanaspati Manufacturers Association (PVMA), stakeholders from the National and Provincial Governments, PSQCA, Pakistan Council for Scientific Research (PCSIR), Qarshi research Centre, Institute of Home and Food Science of the Government College of the Faisalabad University and GAIN, as well as the financial support from the USAID/GAIN Pakistan Regional Food Fortification Project.

144/1731

COMPREHENSIVE FOOD AND NUTRIENT DATABASE OF THE DIETSYS SYSTEM FOR DIET SURVEYS IN BRAZIL, ARGENTINA, AND THE UNITED STATES

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Background and objectives: The need for information on food composition that is up to date, accurate and reliable is critical to assess components of the diet aiming to promote health. The DietSys diet-data processing system allows using customized databases to calculate food components. We aimed to build a comprehensive food and nutrient database to be used in the DietSys system to assess dietary intake in epidemiological research in Brazil, Argentina, and the United States.

Methods: Three nutrient composition tables were unified: the Brazilian food composition table (TACO), the Argentinean food composition table (Argenfoods), and the U.S. Department of Agriculture, Agricultural Research Service (USDA) release 27. We created 21 food groups and used NOVA to classify food items into four food processing categories (FPC): unprocessed or minimally processed foods (UMP), processed culinary ingredients (PCI), processed foods (PF), and ultra-processed foods (UPF). For each FPC and food group, we calculated the number and proportion (%) of food items and the average density of energy (kcal/100 grams) and macronutrients (grams/100 grams).

Results: The DietSys database comprised 9386 food items: 6.1% from TACO, 4.7% from Argenfoods, and 89.2% from the USDA. Of food items classified as UMP, 53% were from Argenfoods and 23% from USDA. The USDA contained 78% of the UMP (N=1987), 83% of the PCI (N=318), 89% of the PF (N=2404), and 96% of the UPF (N=4203). Average density of energy, proteins, lipids, and carbohydrates from PCI was 23%, 4%, 26% and 42% lower in TACO and Argenfoods food items than the three tables' average. Some food groups included more than one FPC (e.g. in TACO, 16.0% of meats and derivatives were UMP, 34.6% were PF, and 3.7% were UPF; whereas in the USDA 39.9% of meats and derivatives were UMP, 50.4% were PF, and 1.1% were UPF).

Conclusions: This food and nutrient database will allow the DietSys user to calculate the intake of foods, food groups, FPCs, and nutrient content for Brazilian, Argentinean, and North-American populations, and to prioritize regional food items or to select alternative items. This dynamic database allows the addition of other foods and nutrients in the future.

Keywords: DietSys, DietSys database, food and nutrient database, international nutrient database, international food database.

Further collaborators:

Scientific initiation group.

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144/1742

SOMATOTIPO AND NUTRITIONAL STATUS OF SCHOOLCHILDREN OF ETNIA MAPUCHE OF THE COMMUNE OF PADRE LAS CASAS-CHILE

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Background and objectives: The Mapuche ethnic group, originally from southern Chile, is suffering from a migration from rural to urban, adapting to changes in current society, developing behaviors and lifestyles typical of urban and industrialized areas where it predominates excess of malnutrition. The objective of this research is to establish the impact of these social changes on the somatotype and nutritional status of Mapuche youth.

Methods: A descriptive, cross-sectional and quantitative study of 127 Mapuches schoolchildren of both sexes with their parents' consent was carried out in three rural schools in the community of Padre Las Casas, Chile. 74 men (58.3%) and 53 women (41 , 7%), between 10 and 14 years of age. Measurements were taken of: weight, height, skin folds and bones diameters; following the ISAK protocol. BMI and nutritional status were determined according to the Chilean standard and somatotype (endomorphy, mesomorphy and ectomorphy) using the anthropometric method described by Heath & Carter. Student's t test and Mann Whitney U test were used to analyze the results (p <0.05).

Results: Men presented a mesoendomorphic somatotype (4.1 - 4.7 - 1.6). Women are endomesomorphic (5.0 - 4.2 - 1.3). Nutritional status showed that 37.8% of the men were obese and 16.2% were overweight. In the ladies, 34.6% were obese and 22.1% were overweight. When comparing by gender, significant differences were found in Endomorphism in favor of women (p = 0.01), but not in Mesomorphy and Ectomorphism, with no differences.

Conclusions: It is evident that in schoolchildren of the Mapuche ethnic group of both sexes a nutritional state of excess predominates. In relation to the somatotype, the women showed a higher relative adiposity than the men. The Obesigenic environment, which highlights the modification of lifestyle, food, and the effect of sedentarism is affecting the Mapuche population as well as the rest of the school population.

Keywords: Somatotype, Nutritional Status, Mapuches Schoolchildren.

Further collaborators:

Address of rural schools in the commune of Padre las Casas - Chile.

144/1765

EFFECT OF DIETS RICH IN SATURATED FATTY ACIDS ON THYMUS OF GROWING RATS

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Background and objectives: The importance of diet in maintaining health is widely accepted and recognized. Dietary lipids play an important role in the regulation of the immune system. Thymus shows important functional changes in response to nutritional disorders.

The aim of this work is to analyze the effect of diets rich in saturated fatty acids in normal and high concentration on thymus' fatty acid profiles of growing rats.

Methods: Weanling Wistar rats were fed during 10 (10D) and 40 (40D) days with 15% and 42% (F%=Kcal lipids/100total Kcal) of dietary fat provided by butter (F15 y F42 groups). Control group received normocaloric diet (soy oil, F%=15) according to AIN´93. Thymus was removed. Thymus fatty acid profiles were determined by gas chromatography (GC). The statistical analysis used analysis of variance (ANOVA) and Dunnett´s post test (*p<0.01).

Results: Thymus fatty acid profile were (% area):

PALMITIC: F15-10D=27,05±5.01; F42-10D=25.75±3.63; CONTROL 10D=25.96±3.23;

F15-40D=29,73±2,34; F42-40D=24,60±2,99;
CONTROL 40D=27,79±3,73

OLEIC: F15-10D=19.00±5.35; F42-10D=22.01±5.37;
CONTROL 10D=18.22±3.23;
F15-40D=19,57±4,50; F42-40D=16,09±6,34;
CONTROL 40D=16,84±5,20;

LINOLEIC: F15-10D=3.69±0.48*; F42-10D=4.82±0.40*;
CONTROL 10D=10.26±1.37;
F15-40D=2,29±0,72*; F42-40D=3,73±0,65*;
CONTROL 40D=10,22±3,10

LINOLENIC: F15-10D=0,35±0.04*; F42-10D=0.34±0.04*;
CONTROL 10D=0.59±0.09;
F15-40D=0,37±0,16*; F42-40D=0,40±0,08*;
CONTROL 40D=0,75±0,11;

ARAQUIDONIC: F15-10D=9.84±3.31; F42-10D=7.33±1.94;
CONTROL 10D=10.46±2.60;
F15-40D=9,26±2,02; F42-40D=11,66±3,33;
CONTROL 40D=9,98±4,75

EPA: F15-10D=0.71±0.12; F42-10D=0.64±0.24;
CONTROL 10D=0.50±0.12;
F15-40D=0,62±0,26; F42-40D=0,24±0,11;
CONTROL 40D=0,15±0,07

DHA: F15-10D=0.61±0.14; F42-10D=0.60±0.17;
CONTROL 10D=0.52±0.16;
F15-40D=0,57±0,21; F42-40D=0,73±0,19;
CONTROL 40D=0,51±0,15.

Conclusions: All experimental groups showed decrease of linoleic and alfa linolenic acid.

The results observed on thymus lipid profile, demonstrate a decrease on the levels of essential fatty acids when a diet rich in saturated fatty acids is administered, independent of F%.

Thymus, characterized by a high rate of cellular turnover, is severely affected by nutritional imbalances and particularly by distortion in the proportion and type of fat.

Keywords: Thymus- essential fatty acids- diet- rat

144/1791

EVALUATION OF RISK FACTORS THAT PREDISPOSE TO METABOLIC SYNDROME THE WORKERS OF THE SÃO CAMILO UNIVERSITY CENTER PARTICIPANTS OF THE PROJECT "HEALTH FOR ALL" - SÃO PAULO - BRAZIL

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Background and objectives: Inserted in the context of obesity and related co-morbidities, the metabolic syndrome (SM) is a complex disorder that encompasses cardiovascular risk factors associated with abdominal obesity and insulin resistance. The metabolic syndrome has become the most frequently diagnosed, proving to be a trend for the next few years. According to the who, about 25% of adult Americans fit the profile that characterizes the syndrome. It is estimated that between 20-25% of the world population report SM.

The main objective of this study was to to evaluate the risk factors that predispose to metabolic syndrome of São Camilo University Center workers, participants of the "HEALTH FOR ALL" project.

Methods: This study was carried out with 107 workers of both genders, aged between 18 to 60 years, with a predominance of younger adults that voluntarily were involved at the research. Were measured height and weight for the calculation of body mass index (BMI), waist circumference (CC), hip circumference and neck circumference as well as percentage of body fat and blood pressure. Others tests carried out: glycated hemoglobin, triglycerides, total cholesterol and his fractions. This work is part of the project presented by the ethics and Research Committee under paragraph 61/2014.

Results: It was found that 64.4% presented excessive weight, being 45.8% overweight, 21.5% with different degrees of obesity and only 31.8% had weight adequate. Of individuals diagnosed with metabolic syndrome (17.8% of the population), they all showed levels of diabetes diagnosed, glycated hemoglobin, abdominal obesity appears in both sexes, prevalent in these individuals with metabolic syndrome, and strongly associated with increase cardiovascular morbidity and mortality. In this same group, found himself high percentage of body fat, total and HDL quite diminished. 19.6% of the studied population showed hypertension. 53.2% of the population were sedentary.

Conclusions: This is a population with numerous risk factors for cardiovascular diseases. The results presented in the study, suggest the need for specific actions that intervene in factors that determine the triggering of the metabolic syndrome and that can contribute to the promotion of health.

Keywords: Nutritional Assessment; Cardiovascular Diseases; Metabolic Syndrome

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144/1795

AN ASSESSMENT OF THE QUALITY OF DHS ANTHROPOMETRIC DATA, 2005-2014

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Background and objectives: Providing reliable estimates of anthropometric indicators among children is important for monitoring global progress toward the World Health Assembly targets, and also for short and long-term nutrition and health interventions. The collection of anthropometric data has been a key component of the Demographic and Health Surveys (DHS) since 1986.

To date, DHS has collected height and weight data for more than three million children and adults in 238 surveys in 77 countries. It is important to assess the quality of the nationally representative data for future improvements.

Methods: This analysis examines the quality of anthropometric data from 52 DHSs conducted between 2005 and 2014. The analysis includes height, weight, and age measurements of children under five years of age as well as three nutritional status indices—height-for-age (HAZ), weight-for-age (WAZ), and weight-for-height (WHZ)—that follow WHO guidelines. The data quality indicators used to investigate the measurements include: standard deviation of z-scores; heaping of measures of height, weight, and age; and the percentage of extreme cases flagged during data processing. In addition, linear regressions of the z-scores were conducted to examine the amount of heterogeneity in z-scores that can be explained by covariates, including cluster-level variation. The analyses identified surveys that have outperformed others in terms of anthropometric data quality along with surveys that have been deficient in data quality.

Results: The countries vary substantially in the data quality indicators examined. Some countries perform poorly on several of the data quality indicators, Albania and Benin, while other countries such as Colombia, Honduras, and Peru were identified as having high quality data. Of particular concern is the higher variability in the SD for children at younger ages, which may be due to the difficulty of measuring very young children lying down in contrast to measuring older children standing up.

Conclusions: Based on the results, the quality of anthropometric data can be improved in nationally representative surveys by including rigorous training on measurement of younger children. It is important to identifying new types of equipments to accurately measure the height/length of children, including digital and lightweight measuring boards.

Keywords: Anthropometry, stunting, nutritional status, z-score, DHS, data quality.

Further collaborators:

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144/1797

DESIGN OF CLINICAL TRIALS IN ADULTS WITH METABOLIC SYNDROME. SYSTEMATIC REVIEW

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Background and objectives: Background: Metabolic syndrome (MS) currently affects to more than 20% of the adult population.

Objective: evaluate the variation of the expressions of loss in the ME in ≥ 18 years, through dietary intervention and / or physical exercise.

Methods: Method: four databases, Pubmed, CINAHL, ProQuest and Web of Science were used. Selection criteria: ≥ 18 years; diagnosed with MS; weight loss intervention programs, which use diet and exercise as tools; Interest in loss should be manifested through parameters and units; clinical trials published between 2005 and 2015, in English and Spanish, in peer-reviewed scientific journals. The protocol of the PRISMA method was used to analyse the information.

Results: only 2% of clinical trials were selected (1805). The most frequent characteristics are: ATPIII and FID, as diagnostic criteria; number of patients ≤100; male sex; located in Europe, the United States and Oceania; duration of ≤6 months; waist circumference (cm), BMI (kg/m2), weight (kg and%) and multidisciplinary interventions showed the highest losses.

Conclusions: Discussion: the heterogeneity in the design of clinical trials makes difficult to identify the interventions with the highest losses in the parameter analysed and which techniques are the most advisable to achieve this goal.

Conclusion: there is a great diversity in the diagnoses of MS and disparity in the design of these clinical trials. Therefore, a series of recommendations are presented for the design of future clinical trials and, in addition, the most adequate techniques for loss with the Extrapolation of two clinical guidelines for overweight and obesity (ACE / AACE and European Guidelines).

Keywords: metabolic syndrome, weight loss, fat loss, diet, exercise and lifestyle.

Further collaborators: Pérez Albert Enrique: collaborated in the selection of included clinical trials; elaboration of the tables and the flow diagram.

Poveda González Marina: collaborated in the selection of included clinical trials; elaboration of the tables and the flow diagram.

Martínez-Espinosa Rosa María: selection of the information of interest in the tables; information analysis using the PRISMA methodology; writing, translation and revision of the manuscript.

Molina Vila Mariola D: selection of information of interest in the tables; Information analysis using the PRISMA methodology; Writing, translation and revision of the manuscript.

Reig García-Galbis Manuel: collaborated in the selection of the included clinical trials; elaboration and design of the tables; information analysis using the PRISMA methodology; Writing of the manuscript draft.

VARIATION OF THE EXPRESSIONS OF LOSS IN THE METABOLIC SYNDROME, IN CHILDREN AND ADOLESCENTS: DIETARY INTERVENTION AND PHYSICAL EXERCISE

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Background and objectives: Background: Metabolic syndrome (MS) affects ≥ 10% of the adolescent population worldwide.

Objective: evaluate the variation of the expressions of loss in the MS in ≤18 years, through dietary intervention and / or physical exercise.

Methods: Method: search date, between 2005 and 2015, in English and Spanish, in peer reviewed journals and following the PRISMA method. The selection criteria were: diagnostic for MS, overweight, obesity, type II diabetes, insulin resistance, hyperinsulinemia, hyperinsulinism, hyperglycemia, dyslipidemia, glucose intolerance and / or prediabetes; Randomized clinical trials, ≤18 years of age; Intervention programs that use diet and / or exercise as a tool, with or without metformin (interventions showing an interest in weight loss).

Results: only 1.3% of the clinical trials were selected (924) and the use of the diagnosis of MS was not observed. The most frequent characteristics of the clinical trial selected were: they were carried out in North America; the number of patients ranges from 25 to 120; female sex; duration of 6 months; weight loss (kg), BMI (kg/m2, percentile) and multidisciplinary intervention reported the highest losses.

Conclusions: the design of the clinical trials is heterogeneous and no trials diagnosed as MS have been found. A series of recommendations are presented for the design of future clinical trials; the most adequate techniques for loss with the extrapolation of two clinical guidelines for overweight and obesity (AND and ISCI) are indicated and it is recommended to investigate why the diagnosis of MS is not used.

Keywords: metabolic syndrome, children, teens, diet and exercise.

Further collaborators:

Pérez Albert Enrique: collaborated in the selection of included clinical trials; elaboration of the tables and the flow diagram.

Mateu Olivares Victoria: collaborated in the selection of included clinical trials; elaboration of the tables and the flow diagram.

Martínez-Espinosa Rosa María: selection of the information of interest in the tables; information analysis using the PRISMA methodology; writing, translation and revision of the manuscript.

Reig García-Galbis Manuel: collaborated in the selection of the included clinical trials; elaboration and design of the tables; information analysis using the PRISMA methodology; Writing of the manuscript draft.

BETTER MICRONUTRIENT INTAKE COULD BE RELATED TO PHYSICAL FITNESS IN OLDER ADULTS?

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Background and objectives: Diet and physical fitness (PF) have been described as major modifiable behaviours related to poor health. Indeed, diet and PF seem to be strong promoters of healthy ageing. Hence, the main aim of this study was to assess the association between micronutrient intake and PF in Spanish older adults.

Methods: 428 participants (43% males) aged over 55 years were recruited for the study. Dietary intake was assessed using two non-consecutive 24h dietary recalls. Energy intake (EI) and micronutrient intake were calculated through ALIMENTA software. Estimated average requirements (EAR) cut-off point method was applied to estimate the prevalence of nutrient intake adequacy/inadequacy. When EAR was not defined for a specific micronutrient, adequate intake (AI) was chosen. Energy expenditure (EE) was calculated using a validated physical activity questionnaire. Likewise, participants completed a battery of validated PF tests. The total score for each test ranged from 0 (worst) to 3 (best) points. The maximum score was 12 points. Scores of PF tests were added together and participants were divided into 3 groups (low, medium and high) using cluster statistical analyses. Data was analysed using generalized linear model.

Results: Inadequate intake for 11 and 8 micronutrients was observed in 9.8% and 11.4% of the subjects, respectively. More than 50% presented inadequate intakes for potassium, vitamin D, vitamin E, calcium, magnesium, vitamin B6, pantothenic acid and

folates. Only two participants were above EAR or AI for all micronutrients. Higher EI and EE was found in the high PF group compared to in the low PF group (all p<0.05). Subjects from the high PF group had significantly higher intakes for potassium, magnesium, phosphorus, calcium, selenium, zinc, vitamin B6, niacin, vitamin C and folates (p<0.05).

Conclusions: Subjects in the high PF group presented a better micronutrient intake profile than the others. Nevertheless, a considerable number of subjects presented micronutrient intake below the EAR. Therefore, there is a need to improve nutritional education and fitness among older adults and to consider supplementation for micronutrients at risk.

Keywords: nutritional status, macronutrients, micronutrients, older, physical fitness, diet

Further collaborators:

144/1831

ASSESSMENT OF THE ADEQUACY OF DIETARY INTAKE OF WORKERS FROM AN EDUCATIONAL INSTITUTION LOCATED IN THE CENTRAL REGION OF SÃO PAULO CITY-BRAZIL

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Background and objectives: Food and Nutrition Units, here called UAN, aims to manage the production of meals consumed outside the home adequate nutritionally and hygienic-sanitary proper. The Workers' Food Program (PAT), in Brazil aims to improve the quality of life of workers through adequate food, promoting greater physical capacity, greater resistance to fatigue, greater resistance to disease and lower risk of work accidents.

The objective was to assess the adequacy of dietary intake and the nutritional adequacy in energy and nutrients through the intention of food consumption of the workers of a school according to the recommendations of PAT and FAO/WHO (2003).

Methods: This is a study, developed in UAN that meet the workers of an educational institution. It was rated the average consumption of 95 staff of this school, in four different dates. It had been assessed for each participant, the amount of food served during the meal and the size of the portion that had been offered. It was also calculated the nutritional needs of each one of them, considering sex, age, occupation and their suitability in accordance with the recommendations.

Results: According of the energy of the food offered, found an average of 633, 75Kcal (dp 278.88Kcal), and 23% of the population has consumed a caloric value of proper diet. Noted an inadequate consumption of protein, (high in 54% of the population) and high

fat consumption in 25% of them. Significant reduction in the consumption of carbohydrates (95% of the population consumes below the needs). Low consumption of food sources of calcium and iron and proper consumption of fiber. The Brazilian Food Guide recommends adhering to public nutrition programs that promote the principles of healthy nutrition.

Conclusions: There are lags in the intake of macro and micronutrients by workers, stressing the necessity of implementing nutrition education for employees, so that your choices may be consistent with their needs. The nutritionist job is to worry about disease prevention and health promotion through the choice of food. In addition, it is important to provide proper food in UAN, whereas, for many employees, the food received in the company represents the main meal of the day.

Keywords: Food intake; Workers' Food Program; Nutrient intake

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144/1846

DIETARY INTAKE OF VITAMIN B6 AMONG INDIAN RURAL POPULATION

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Background and objectives: Vitamin B6 is one of the important water soluble B-vitamins essential for hemoglobin formation and energy metabolism. The Recommended Dietary Allowance (RDA) of vitamin B6 for a health human is 2.0 mg per day. Vitamin B6 is widely available in almost all foods including meat and plant foods. However there is no record on the intake of dietary B6 data in Indian rural population. Therefore this study was aimed to determine the intake of vitamin B6 through diet among Indian rural population.

Methods: The recently released Indian Food Composition Tables (IFCT2017) which contains completely analysed vitamin B6 data from nation-wide sampling plan was used for the calculation. Twenty four hours dietary recall method was used to access the dietary intake in rural population of 9 states which covers 11910 households and 50293 populations. The dietary intake of vitamin B6 was calculated independently for different groups of age, sex and physiological status.

Results: Vitamin B6 content was highest in fish followed by meat and plant foods. Average intake (per Consumption Unit) of vitamin B6 was 1.17 mg per day. Consumption of dietary B6 varied from 0.47 to 1.45 mg per day among different age or sex or physiological status of population. Vitamin B6 intake among children were <1.0 mg while, it was >1.2 mg in both adult male and female. Among the different physiological groups, the pregnant and lactating women intakes were <50% of the RDA.

Conclusions: The IFCT2017 shows that fish is the richest source for dietary B6. The dietary intake results suggest that, intake of vitamin B6 significantly varies among all age and sex groups. The dietary intake of vitamin B6 in the rural Indian population appears to be not adequate to meet the RDA across all age groups.

Keywords: Vitamin B6; Dietary intake; Indian rural population;, RDA; 24 hours dietary survey.

144/1850

ROLE OF A-TOCOPHEROL TRANSFER PROTEIN ON THE CELLULAR UPTAKE AND INTRACELLULAR LOCALIZATION OF A-TOCOPHEROL AND A-TOCOTRIENOL IN CULTURED LIVER CELLS

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Background and objectives: Since its discovery, vitamin E and its functions have been deeply studied. However, the mechanism underlying the intracellular localization and preferential retention of α-tocopherol (αT) in the body are still incompletely understood. The liver protein α-tocopherol transfer protein (α-TTP), located in the lysosomes is suggested to be involved in the preferential transport of αT in the liver. Despite the preferred affinity for αT, previous research shows a possible interaction of α-TTP with vitamin E metabolism that protects from metabolization other forms of vitamin E. The α-TTP role in the absorption and intracellular distribution of αT, but also the others forms need to be clarified. This research focuses on αT and it unsaturated isomer α-tocotrienol (αT3).

Methods: Time dependent absorption of αT and αT3 in HepG2, with and without αTTP expression, was investigated. Concentrations were measured inside and outside the cells by HPLC-FD over a time period of 72 hours. Maximum absorption times were selected for the intracellular distribution. This was ascertained using a density gradient centrifugation. Therefore HepG2 cells were separated into their cell compartments, identified by Western Blot, and αT and αT3 amounts were analyzed after 24 and 6 hours incubation with 50 μM of each compound.

Results: A continuous uptake of αT and αT3 in cells was determined, with no significant differences after 24 h. We observed a higher cellular uptake of αT3. αTTP did not reveal a significant enhance in the concentrations of each compound in cells. Intracellular distribution of αT and αT3 showed an accumulation in lysosomes, mitochondria and plasma membrane; being stronger in lysosomes at 6 h. No significant differences were detected for intracellular distribution between cells with and without αTTP expression.

Conclusions: Results suggest that αTTP is not essential for the uptake of the compounds in hepatocytes; its site of action is at a later step in the intracellular processing. The intracellular distribution might be because these organelles presumed to have higher levels of oxidative stress; or because is associated with the sites where αTTP is in the hepatocytes. However, with our results, an involvement of αTTP in specific transport inside cell compartments is still unclear.

Keywords: α -tocopherol. α -tocotrienol. α-tocopherol transfer protein. Intracellular distribution. Cultured liver cells.

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144/1871

MICRONUTRIENTS INTAKE, BODY COMPOSITION, AND LIPOPROTEIN-LIPID CONCENTRATIONS IN OBESE WOMEN

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Background and objectives: Obesity is associated with important metabolic disorders and enhances the comorbidity of related disorders such as type 2 diabetes, hypertension, and cardiovascular disease. Many micronutrients are involved in reducing the risk of such metabolic disorders. Thus, the aim of this study was to evaluate the intake of selected micronutrients and their relation to body composition and lipoprotein-lipid concentrations among obese women.

Methods: We enrolled 71 obese women recruited in the outpatient clinic of endocrinology from Clinics Hospital of São Paulo, Brazil. To evaluate the habitual consumption of micronutrients, diet assessment was accomplished by using a 3-day nonconsecutive dietary food record and entered into the NutriQuanti Online Computerized System (http://www.nutriquanti.com.br). The nutrients analyzed were calcium, iron, magnesium, zinc, copper,

manganese, potassium, and selenium. Fasting blood samples were collected for analysis of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-c), high-density lipoprotein cholesterol (HDL-c) and triacylglycerol levels (TG). Pearson's correlations were calculated between micronutrients intake and body composition variables [body mass index (BMI) and waist circumference(WC)] and plasma lipoprotein-lipid variables (including the atherogenic indexes TG/HDL-c, TC/HDL-c and LDL-c/HDL-c ratios, which are powerful predictors of cardiovascular disease).

Results: The women aged 40.5±9.0 years and had a BMI of 35.56±5.88 kg/m² and WC of 100.20±9.27 cm. Some minerals were inversely correlated with body composition and atherogenic indexes. Magnesium intake was inversely correlated with BMI (r = −0.35, P = 0.003), WC (r = −0.44, P < 0.001), TC/HDL-c ratio (r = −0.26, P = 0.026), and LDL-c/HDL-c ratio (r = −0.29, P = 0.013). On the other hand, this intake was positively correlated with HDL-c (r = 0.27, P = 0.023). Copper (r = −0.25, P = 0.041) and manganese intake (r = −0.30, P = 0.013) were inversely correlated with WC. Sodium intake was positively correlated with TG levels (r = 0.26, P = 0.030) and TG/HDL-c ratio (r = 0.25, P = 0.037).

Conclusions: These results highlight the importance of healthy eating in body composition and risk of cardiovascular diseases among obese women.

Keywords: Obesity; Nutritional Assessment; Micronutrients; Cardiovascular disease; Atherogenic indexes.

144/1882

ASSESSMENT OF CONSUMPTION AND CHALLENGE OF FOOD CLASSIFICATION IN GROUPS: EXPERTS' PANEL REPORT

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Background and objectives: The panel of experts is a research technique employed in social sciences that is also used in investigations that include multi-method conceptions. The proposal is to bring together experts to produce suggestions for solving the doubts and gaps existing in a certain subject. One of the great challenges of assessing food consumption has been the structuring of harmonized food databases. How and where to allocate food in groups requires the structuring of defined parameters, especially when comparing the results within and between studies. The present study reports the use of this technique as a strategy to aid the decision regarding the allocation of food in groups, aiming the structuring of a harmonized food database.

Methods: Six specialists working in the area of clinical/outpatient nutrition and researchers/teachers in the nutrition area participated in the meeting. The guests were previously given a script, containing objectives, justifications and methodology addressing information on the conduction of the "experts' panel" and harmonization of food database. The classification of food in groups proposed by the researcher, based on household food availability data between 2008-2009 Brazilian Household Budget Survey, was sent to the experts for prior appraisal. During the meeting, the questions of harmonization were raised, followed by discussion.

Results: The panel contributed to the reorganization of food groups. The 1121 foods previously distributed in 15 groups and 33 subgroups, now consist in 14 groups and 42 subgroups. Culinary preparations and foods with a higher degree of industrialization, such as tapioca, fruit juice/soft drink, mate tea, couscous and sweetener, were some of the items that presented the greatest difficulty in being classified into groups.

Conclusions: The panel of experts proved to be an adequate tool to find consistent answers taking into account the experience of other professionals/researchers in the field of nutrition. The specialists' participation allowed the articulation of different visions and reduction of possible tendencies coming from the exclusive look of the researcher.

Keywords: Expert's panel. Nutrition. Food classification.

144/1890

BRAZILIAN FOOD DATABASE HARMONIZATION: WHY FOOD GROUPING IS SO IMPORTANT?

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Background and objectives: Recent Brazilian population based studies analyzing food intake reports different food grouping, as shown by bibliographic research. This issue may affect the characterization of nutritional profile and restrict comparison between studies, even when they report results from the same dataset. Furthermore, the food identification through its group is almost mandatory when the goal is to develop food based approaches. As discussed by European Food Safety Authority (EFSA), "food classification and description system allow to improve the ability to capture all the useful details of food groups in exposure assessments", a crucial requirement for the risk assessment process for public health nutrition intervention. Additionally, in Brazil, we need to consider our food diversity, which may introduce misunderstandings in the food identification and group allocation, especially when the intention is to compare studies within and between countries.

Methods: This study proposes a standardized and harmonized food classification system using data from the 2008-2009 Brazilian Household Budget Survey. The discussion was based on the Data Food Networking (DAFNE) procedures.

Results: Harmonization procedures were based on food characteristics (nutritional/botanical), criteria used in previous studies, international and national food classification system (Codex Alimentarius and Anvisa food) and expert panel consultation. Therefore, were built 14 main food groups and 42 subgroups.

Conclusions: The proposed harmonization system allowed food grouping in accordance to pre defined criteria. Our results suggests that the use of this system may improve between and within studies (at national and international levels) comparison.

Keywords: Food classification. Nutrition. Food composition date.

144/1893

GREATER HEIGHT GROWTH AND OVERWEIGHT IN PRESCHOOL CHILDREN

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Background and objectives: Not unlike the world population, which experiences an important process of nutritional transition, an important increase in the diagnosis of overweight and obesity in childhood has been observed since the 1990s. Monitoring the nutritional status of children may help identifying patterns that may lead to the development of excess weight, since investigations have considered that differences in growth and body composition during childhood are determinants of nutritional status, in childhood and/or later. The purpose of the study was to verify if there is a relation between the greater growth in height and the excess of weight in children in preschool age.

Methods: An analytical cohort study of a representative sample of preschool children in a city in the countryside of São Paulo - Brazil. Weight and height of the children were collected in two moments: 2014 and 2016. Based on the anthropometric data and the age, the children were evaluated according to the anthropometric indices calculated in z-score with Anthro software v.3.2.215: height for age, and Body Mass Index (BMI) for age. The data analysis was performed using the Stata statistical package, version 9.2. The study was approved by the IRB of the School of Public Health/University of São Paulo.

Results: The final sample consisted of 359 children, 52.9% female, who had a mean age of 2.4 years on the first evaluation, and 4.8 years on the second evaluation. There was a positive and significant correlation (Pearson r = 0.28, 95%CI: 0.18 to 0.37, p<0.001)

between the differences in BMI z-score and in height z-score. Confirming this result, it was observed that children with the highest BMI in 2016 were those that presented the greatest difference in height between the two evaluations (Pearson r = 0.24, 95%CI: 0.14 to 0.34, p<0.001).

Conclusions: The results observed show that there is a correlation between the greater growth in height between 2 and 5 incomplete years of age and the risk of developing overweight.

Keywords: Growth, Body Height, Obesity, Overweight, Preschool.

Further collaborators:

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144/1902

THE POTENTIAL OF FOODBOOK24 TO COLLECT NATIONALLY REPRESENTATIVE NUTRIENT INTAKE DATA

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Background and objectives: National food consumption surveys are necessary to estimate dietary intakes of populations from specified regions for the purposes of: (i) evaluating compliance with dietary guidelines (ii) identification of deficiency or excess intakes of particular foods or nutrients and (iii) to investigate food safety risks such as contaminant exposures. However, there are many constraints to conducting large surveys including significant cost, time and participant burden. The aim of this study is to investigate the comparability of data collected from the Foodbook24 (a web based dietary assessment tool developed for the Irish adult population) Proof of Principle (PoP) study to the dietary intake data from most recent Irish national food consumption survey.

Methods: The Foodbook24 PoP study involved the web based, self-administered 24 hour recall tool being made freely available to the Irish adult population. The data collected as part of the PoP study was weighted to represent the population of participants that completed the National Adult and Nutrition Survey (NANS) (2008-2010). The comparison of weighted mean daily nutrient intake data collected from the Foodbook24 PoP study (n= 330 plausible reporters) and the mean daily nutrient intake data collected

from NANS (n=1051 plausible reporters) was conducted using the Wilcoxon-Mann–Whitney U-test in Creme Nutrition® software.

Results: Preliminary results highlight similar mean daily intakes for the majority of nutrients investigated. Percentage difference between mean daily intakes ranged from as little as 0.5% (potassium mg/day) to 35% (vitamin C mg/day). Despite weighting the PoP survey data, there were significant differences for some nutrient intakes however, for others e.g. energy (kcal/day), carbohydrate (g/day), iron (mg/day) and sodium (mg/day), there was no significant difference.

Conclusions: Foodbook24 (and similar validated web based dietary assessment methods) may offer a solution to the current constraints associated with the collection of data from large populations. Although further analysis is required, Foodbook24 has potential to assist in the collection of data in national nutrition surveys and also to facilitate the collection of rolling data intermittently between surveys.

Keywords: Foodbook24, web based, dietary assessment, consumption survey, comparison.

144/1904

NUTRITION STATUS AND RISK FACTORS ASSOCIATED IN OF HOSPITALIZED CHILDREN AND ADOLESCENTS IN THE PEDIATRIC SERVICE AT HOSPITAL SÃO JOÃO PORTO

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Background and objectives: Identifying malnourished children/adolescents at hospital admission is important for their clinical evolution and growth. It is fundamental to research the risk associated.

The aim is to assess the nutritional status of an inpatient paediatric population at the Paediatric Service/Hospital São João (PSHSJ) and identify the risk factors responsible for their nutrition status impairment.

Methods: We included 813 patients, between the ages of 0-18 years old, who were admitted to the PSHSJ, from 2/19/2016 to 3/30/2017. The Anthropometrics Measure (AM) include weight and length/stature and it was calculated the weight/length index (W/L) for children ≤2 years old, body mass index (BMI) for >2 years old according World Health Organization (WHO), and the

respective z-score. Based on Fenton intrauterine growth curves, the newborn was classified as intrauterine growth restriction (IUGR), adequate for gestational age (AGA) or large for gestational age (LGA). The results are present in the total sample and per age groups: [0-2] years;]2-5] years;]5-10] years and >10 years. Statistic analyses were performed with SPSS® and the protocol was approved by Ethic Committee of Hospital São João.

Results: Of the 813 patients, 54,5% were males and 44,6% females on average 5,7±5,5 years. It was found 17,5% of undernutrition and 23,6% of overweight/obese on the admission. The higher frequency of undernutrition was verified in the first two years of life (25%) but in the other hand 34,8% of overweight/obese was found in school age (]5-10] years) with significant statistically difference between the groups (p=<0,001).

The multivariate analysis for children risk factors associated with child malnutrition we observed that a lower risk of undernutrition in the children/ adolescents was associated with age (]2-5] years: OR =0,320 (p=0,016);]5-10] years: OR=0,140 (p=0,002); >10 years: OR=0,005 (p=0,194)), in comparison with a younger group ([0-2] years) and birth weight (AGA: OR=0,285 (p=0,011)), in comparison with IUGR.

Conclusions: The results seem to indicate a very high prevalence of undernutrition, particularity in the first two years old and overweight/obese among the oldest.

This reinforces the importance of adequate nutritional assessment of the inpatient children/adolescents to prevent this deterioration during the hospitalization stay.

Keywords: children/adolescents, nutrition status assessment, malnutrition, risk factors

144/1910

COMPARING THE EFFECTIVENESS AND COST-EFFECTIVENESS OF FACILITY- VERSUS COMMUNITY-BASED DISTRIBUTION OF MICRONUTRIENT POWDERS IN RURAL UGANDA

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Background and objectives: Micronutrient powders (MNP) are one of the few available nutrition interventions shown to reduce anemia and iron deficiency. While efficacy is well established, regular and sustained use of MNP in program settings has faced challenges. To better understand MNP delivery channels, we compared the effectiveness and cost-effectiveness of facility versus community-based distribution.

Methods: We conducted the randomized intervention study in Namutumba, Uganda. The six sub-counties in Namutumba were randomly allocated to either a health facility (HF) or voluntary health team members [(VHT) (i.e. community health worker)] distribution arm. Individual packets containing 30 MNP sachets, a two-month supply, were available to caregivers from February to November 2016. Cost data were continuously collected, and included total direct and indirect costs to NGO implementers, delivery channel providers, and beneficiaries. A cross-sectional survey was conducted at the end of the intervention to obtain data on the following program outcomes: coverage (consumed MNP in the previous 24 hours), intake adherence (received more than 2 packets of MNP), and appropriate use (no more than one sachet per day, MNP consumed with food, and minimum of 3 sachets consumed in the previous week). Unweighted and unadjusted data were analyzed based on intention to treat using chi-square tests.

Results: Data for analysis were available on 1060 children 8-23 months. Nearly all caregivers had heard of MNP (100% VHT versus 98% HF, p<0.006) and most caregivers had received MNP at least once (98% VHT versus 84% HF, p<0.001). Coverage (54% vs 33%, p<0.001), intake adherence (59% vs 15%, p<0.002), and appropriate use (39% vs 19 %, p<0.001) were higher in the VHT compared to the HF arm. Preliminary data on the incremental cost-effectiveness ratio (taking into account costs, program outcomes, and delivery channel) indicate the VHT arm was more cost-effective.

Conclusions: A community-based MNP delivery channel was more effective and more cost-effective at producing desired program outcomes compared to facility-based distribution. However, the difficulty in maintaining high levels of the desired program outcomes in both the facility and community-based delivery channels, as is often the case with other behavioral change interventions, may compromise sustainability.

Keywords: micronutrient powder. nutritional supplementation. infant and young child feeding. cost-effectiveness. delivery.

144/1929

ANEMIA, LOW CONSUMPTION OF IRON-CONTAINING FOODS AND ENHANCER OF IRON ABSORPTION IN PRESCHOOL CHILDREN OF THE EASTERN PROVINCES OF CUBA, 2016

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Background and objectives: Anemia is the main nutritional health problem in preschool children in Cuba in spite of the multiples fortified food and supplemental intervention. Iron deficiency is the principal cause of anemia; other causes are invoked such as deficiency of other micronutrients, infection and inflammation. Eastern provinces remain as the most vulnerable region of the country.

To evaluate the prevalence of anemia in preschool children in two provinces of eastern region of Cuba and the relation to food intake.

Methods: Children of 6 to 59 months living in provinces of Santiago de Cuba (Mella, La Maya and Santiago de Cuba municipalities) and Holguín (Frank País, Sagua de Tánamo, Antilla and Holguín municipalities). Hemoglobin (Hb) was measure by hematological cell counter ABX Micros 60 and anemia was defined as hemoglobin <110g/L in children. Food frequency questionnaire one month previous was used. The foods were classified as meat (red meat, poultry, fish and viscera), vegetables (lettuce, tomato, spinach, chard, carrot, okra, parsley and watercress), fruits (orange, tangerine, grape fruit, guava, papaya, mango, tamarind, banana, watermelon) and legumes (beans, pea, lentils, chickpea. Frequency intake was consider: "Frequently" (over 3 times a week or more), "Few Frequently" (intake below 3 times a week) and Never in this period.

Results: 450 children were included in the study. Anemia was found in 22.7% the children. The percentage of children who consume meat, eggs, vegetables and legumes Frequently were low (53,5%, 47,5%, 40,3% and 30,3% respectively). Fruits were consumed Frequently in the 68.8% of the children. Poultry and Tomato were the most food intake in the respective group (36.7% and 38,1%). Anemia was significantly associated with Low Frequently intake of fruit (OR=2.26 95%CI=1.41-3.62), vegetables (OR=2.24 95%CI=1.35-3.71), legumes (OR=1.85 95%CI=1.09-3.13) and eggs (OR=1.68 95%CI=1.05-2.68).

Conclusions: Anemia is a moderate health problem in eastern provinces of Cuba. Low intake of meat, vegetables, eggs and legumes were found. The Low Frequently intake of food enhancer of iron absorption is the principal factor associated to anemia in children studied.

Keywords: Anemia, preschool children, food intake, Cuba

144/1931

DIETARY IRON BIOAVAILABILITY: AGREEMENT BETWEEN ESTIMATION METHODS AND ITS ASSOCIATION WITH SERUM FERRITIN CONCENTRATIONS OF WOMEN AT CHILDBEARING AGE

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Background and objectives: Over the past 40 years, many iron bioavailability models have been developed aiming to re-

late diet and iron status. However, their precision and accuracy are questionable and studies that validate their practical use are scarce. Here, we estimated dietary iron bioavailability of women at childbearing age using a probabilistic approach and meal-based or complete diet-based algorithms. Also, we tested associations of these estimates to each other and to body iron stores, according to serum ferritin concentrations.

Methods: Diet was assessed by three non-consecutive computerized food records from 127 university students (18-42 years old) at apparently steady-state body iron. In a probabilistic model, simulated distributions of iron absorption values from individual diets (1-40%) were contrasted with distributions of iron physiological requirements among users and non-users of hormonal contraceptives, separately. An average iron bioavailability was assumed as that absorption of dietary iron matching with the prevalence of women whose iron requirements were not attended at the moment of evaluation (ferritin < 15 μg/L). Moreover, estimates of five different algorithms (two of them based on complete diets) were determined. The association between measurements and serum ferritin was tested by linear regression.

Results: Iron intake and inadequacy were 10,9 mg/d and 12,6%, respectively. Although correlated (P < 0.001), all algorithm estimates differed from unity. In particular, bioavailabilities from meal-based (11.6-12.8%) or complete diet-based algorithms (8.5-8.9%) differed (P < 0.001). Meanwhile, all these estimates diverged from that calculated by probabilistic approach (17.2%). No significant association was found between serum ferritin and bioavailabilities measured with Monsen et al. (1978), Reddy et al. (2000) or Armah et al. (2013) algorithms. Nevertheless, after adjusting for non-dietary variables, differences from 30 to 37% in means of serum ferritin were found between women classified according to the median or the extremes tertiles of bioavailable iron measured with Hallberg & Hulthén (2000) and Collings et al. (2013) algorithms.

Conclusions: Measures of dietary iron bioavailability disagree when estimated with algorithms or probabilistic model. The association between serum ferritin and estimates of two algorithms suggests good performance in ranking diets and/or meals according to bioavailable iron contents.

Keywords: Iron status; algorithm; probabilistic approach
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144/1942

TRACING DIETARY PATTERNS IN BANGLADESH FROM 1985 TO 2010

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Background and objectives: Factor analysis methods using individual dietary data are frequently employed to describe dietary patterns. However, there is a scarcity of data on individual diets while household consumption expenditure surveys (HCES) are available in many countries. So far, factor analysis methods have not been applied to household dietary data. We aim to use this data source to assess changes in diets over time.

Methods: We analyzed data from seven rounds of the Bangladesh Household [Income and] Expenditure Surveys (H[I]ES) from 1985 to 2010, and derived dietary patterns from 52,380 households using principal component analysis. We used logistic regression to assess associations between dietary patterns, survey years, and socioeconomic characteristics of households.

Results: Six dietary patterns were identified which explained 26% of the variance in dietary intake: Modern (6%); traditional fish (5%); traditional vegetables/fruits (4%); milk, snacks, and sweets (4%); and two starchy monotonous diets – one with potatoes and one with taro (3% each). All diets were present in all survey years, though a quarter of households were not associated with any identified dietary pattern. The proportion of households following the "traditional fish" and "milk, snacks, and sweets" dietary patterns declined between 1985 and 2010, while other patterns increased. All dietary patterns, except the starchy monotonous diet with taro, were associated with higher household per capita expenditure. Four diets were associated with rural locality: traditional vegetables/fruits (OR 1.4, p<0.01); milk, snacks, and sweets (OR 1.8, p<0.01); and the two starchy monotonous diets (OR 2.6, p<0.01; OR 4.0, p<0.01). Households with children had greater odds of consuming modern (OR 1.5, p<0.01); traditional vegetables/fruits (OR 1.1, p<0.01); and milk, snacks, and sweets (OR 1.8, p<0.01) diets. Two diets were associated with Hindu households: milk, snacks, and sweets (OR 1.5, p<0.01) and the starchy monotonous diet with taro (OR 1.3, p<0.01).

Conclusions: Dietary patterns can be identified from household consumption data and are similar to those obtained from individual data in number and amount of variance explained. In Bangladesh, dietary patterns have changed gradually over time, but change has been limited among the poorest.

Keywords: HCES; Dietary change; Expenditure; Bangladesh

144/1966

CHARACTERIZATION OF THE NUTRITIONAL STATUS, SUGAR AND TOTAL FAT CONSUMPTION AMONG PRESCHOOL AGE PANAMANIAN CHILDREN

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Background and objectives: The increased prevalence of infant obesity is a current public health concern in Panama. The present study aimed to determine the nutritional status, sugar and total fat consumption among preschool-age children in institutional kinder gardens in Panama.

Methods: A cross-sectional study with 100 preschool-age children in three institutional kinder gardens at Panama District (Pedregal, San Francisco and Parque Lefevre). Data was collected from January-March 2016. A semi-quantitative food frequency questioner was used to estimate sugar and total fat consumption and was sought from the Institute of Nutrition for Central America and Panama Food Composition Table. Anthropometric (weight and height) were using to calculate HAZ and BAZ according with WHO2008 growth standards.

Results: Mean age and standard deviation (SD) was 49.6±14.0 months (45%) female. The forty percent was classified as overweight, 62.5% reported a high and very high consumption of sugar. Sugar consumption geometrical mean and ±1SD was found higher in overweight 531 (293.2-961.2) g/week than in non-overweight 237 (132.1-426.2) g (ttest, p<0.05).

Conclusions: High prevalence of overweight was observed. The sugar and total fat consumption was very high taking into consideration the WHO recommendations. Nutrition policy should be put in place in order to regulate the consumption of ultra-processed and sugar drinks among preschool age children. Nutrition education could be used to promote healthy eating habit among overall school community (parents, teachers, principal and community).

Keywords: Infant Obesity, Nutrition, Dietary intake, Malnutrition.

144/1969

KNOWLEDGE AND PRACTICES OF PROTEIN SUPPLEMENTS CONSUMPTION AMONG PEOPLE WHO ATTEND GYMS IN PANAMA

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Background and objectives: The aim of this study was to describe the knowledge and practices of consumption of protein supplements in people who exercise in gyms in Panama City and the relationship between the protein supplementation and the knowledge that individuals have about it.

Methods: It was a cross-sectional descriptive study. A total of 163 subjects who exercise in five gyms of Panama City were part of this study. A survey of 24 questions was applied divided in three categories: demographic information, knowledge of protein and information on the protein consumption. The univariable statistical analysis was performed by means of the Chi2 test.

Results: Forty nine percent of the participants were using protein supplements. Of those who consumed protein 41.3% had adequate knowledge and 58.8% had inadequate knowledge. The main reason for the consumption of protein supplements was to increase muscle mass (36%). The most commonly used protein supplement was whey protein and the person who encouraged the consumption of these supplements was the trainer. No significant relationship was found in relating the knowledge of the participants regarding the previous knowledge of side effects at the p = 0.078. In assessing whether participants continue to use protein supplements despite knowing the risks associated with excessive intake, 60% said no, while 40% would continue use. The intake of protein supplements has become a common practice among people attending the gym.

Conclusions: The results show that the use and consumption pattern of protein supplements among those who attend gyms in Panama City, were found to be similar to those who exercise at gym around the world. It is needed more scientific evidence to know if they are actually working and not attributing the achievement to a placebo effect or some other external factor. As future research discovers additional problems with excessive supplementation, it will be important to educate people about the known risks and how they can obtain the right amount of protein through food and avoid consuming supplements.

Keywords: protein supplements, gym, knowledge, consumption of supplements, physical activity.

144/1970

DIETARY INTAKE OF TRANS FATTY ACIDS IN PARAGUAYAN UNIVERSITY STUDENTS. PRELIMINAR STUDY

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Background and objectives: The trans fatty acids (TFA) intake is related to the development of noncommunicable diseases (NCD). The consumption of foods with high fat content is popular in university students; however, consumption of trans fatty acids is not yet established in this population. The aim of the work was to estimate the intake of TFA in a selected sample of university students from Facultad de Ciencias Químicas (FCQ) of the Universidad Nacional de Asunción in 2017.

Methods: A qualitative and quantitative Food Consumption Frequency (FCF) survey was applied in university students (n=63), designed according to the availability of food in the country and the portions established in the Paraguayan Food Guidelines. In order to determine the AGT contribution by foods, 38 foods were analyzed by infrared spectrometry to determine the TFA content (AOAC. method), and we used tables of composition of TFA from references in foods (Griguol et al., 2007; Robledo de Dios et al., 2015; Moreno et al., 2014).

Results: The age average was 21.7±2.6 years, 88.9% were women. TFA intake mean was 7.43g/d (IC95%: 6.99-9.76), the 85.7% of the population studied exceeded the recommended limit of TFA intake (n=54). Considering a diet of 2000 kcal/d, the TFA intake caloric mean was 3.34% (IC95%: 3.15-4.39%). The TFA intake´s mean in women was 7.28g/d (IC95%: 6.86-9.76 g/d) and 7.43g/d for men (IC95%: 3.02-14.81) (p>0.05).

Conclusions: Foods that contribute the highest TFA intake was the typical foods, as Paraguayan soup, "chipa guazú", "milanesa" y " marinera". The TFA intake in the population studied exceeds the 1% of total energy per day, according to WHO recommendations.

Keywords: Trans fatty acids, intake, Food Consumption Frequency, university students.

144/1975

VALIDITY OF TWO BIOELECTRICAL IMPEDANCE ANALYSIS EQUATIONS IN THE ESTIMATION OF FAT AND FAT-FREE MASS IN CLASSICAL BALLET DANCERS

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Background and objectives: Body composition is part of the nutritional status and is recognized as a key factor determining athletic performance. Although bioelectrical impedance analysis (BIA) is considered an accessible and cheap method to partially measure body composition, few studies have addressed its validity for classical ballet dancers. This study aimed to test the validity of two BIA equations for fat (FM) and fat-free mass (FFM) estimation against dual-energy X-ray absorptiometry (DXA) in classical ballet dancers.

Methods: Thirteen female classical ballet dancers were evaluated. BIA was assessed using a RJL® tetrapolar device. FM and FFM were calculated using the manufacturer's and NHANES III equations. DXA was performed using DPXL/GE Lunar®, including pediatric and forearm software. One sample T test was used to evaluate mean differences between BIA and DXA estimates. Linear regression was used to observe how much BIA formulas predicted DXA. Bland-Altman analysis was performed when BIA estimates showed agreement in the previous tests.

Results: One sample T test showed that FM and FFM calculated by the NHANES III BIA formula had good agreement with DXA (p > 0.05). The manufacturer's BIA formula had good agreement with DXA only for FM (p > 0.05). Linear regression analysis was done for BIA measures with agreement to DXA. Correlations was found only in FM for both BIA equations (r2 = 0.4600, p = 0.0446 for the manufacturer's and r2 = 0.4539, p = 0.0466 for NHANES III). Bland-Altman test revealed that the manufacturer's equation underestimated FM by -2.20 ± 4.15%, whereas the NHANES III equation overestimated FM by 1.84 ± 3.95%.

Conclusions: Neither one of the two tested BIA equations was efficient in predicting FFM. Nevertheless, both equations presented good agreement with DXA for FM estimation. We conclude that BIA may be a feasible method to asses FM in ballet dancers when these equations are used.

Keywords: body composition, absorptiometry.

144/1980

URINARY SODIUM AND POTASSIUM EXCRETION IN ADULT POPULATION FROM QUITO

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Background and objectives: High sodium intake and potassium reduction in the diet are associated with the increase of blood pressure. Identifying sodium and potassium intake is important in order to estimate the risk of high blood pressure

Methods: Through a sectional study of 117 cases, 43.6% males (n = 51) and 56.4% (n = 66) females, aged between 25-64 years, we analyzed 24-hour urine samples using the automated Ion-selective electrodes (ISE) to measure urinary sodium and potassium levels. The participants, Quito residents, did not report diagnosis of hypertensive disease, heart disease, nephropathy or change in their eating habits three months before the study.

Results: The average consumption of sodium estimated by 24-hour urinary excretion is 169.2 mEq/L, being higher in males (187.8 mEq/L) than in females (154.7 mEq/L). Moreover, the indicated values far exceed the safety recommendations for normotensive populations (90 to 130 mEq/L). The average of salt intake reached was 9.7 g / day, higher in men than in women (10.8 g/d and 8.9 g/d, respectively). Moreover, 94.1% of the men exceed the safe levels of their consumption (<6 g/d), in the case of women reached 72.7%. On the other hand, potassium consumption reached 44.4 mEq/L, below the recommended minimum of the ion (50 mEq/L). Overall, we noticed a significant imbalance of the sodium: potassium relation that is 3.8: 1, well above of the tolerable optimal ratio (1.4: 1).

Conclusions: The adults from the study show high sodium intake and low potassium that would result in adverse effects to maintain blood pressure levels and increased risk of cardiovascular disease.

Keywords: sodium, potassium, intake dietary

Conflict of Interest Disclosure: The authors declare no conflict of interest. This study was funded by PUCE.

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144/1986

ENERGY AND MACRONUTRIENTS DIETARY INTAKE IN FEMALE SEMI-PROFESSIONAL CLASSICAL BALLET DANCERS

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Background and objectives: Classical female ballet dancers are dependent in aesthetic and weight for performance, which may increase the risk for energy intake imbalance. Nevertheless, little is known about eating behaviors of trained classical ballet dancers. This study aimed to investigate energy and macronutrient intake of semi-professional female classical ballet dancers.

Methods: Twelve female classical ballet dancers were evaluated for energy and macronutrients intake, comparing the results with sedentary women, matched by age (total mean age 26.05 ± 9.94 years). Three 24 h recall were done for each participant. Energy intake and requirements were estimated using the Institute of Medicine recommendations. Differences between dietary intakes and daily requirements were performed for data analysis. Shapiro-Wilk normality test was performed and results are shown as median – interquartile range. Wilcoxon test was used to compare differences in energy and macronutrients intake vs requirements in the same group. Mann-Whitney test was used to compare the two studied groups.

Results: Classical ballet dancers showed a high energetic imbalance when compared to sedentary controls (-857.71 – 1027.57 Kcal vs -126.61 – 891.56 Kcal, p = 0.034). Carbohydrate energy contribution in dietary intake was lower in classical ballet dancers when compared to sedentary controls (52.13 – 7.18% vs 56.03 – 8.12%, p = 0.047). Lipid and protein energy contribution in dietary intake were not different between groups, with medians of 29.01 – 9.55% and 17.40 – 6.41%, respectively. Nevertheless, classical ballet dancers consumed significantly more protein per body weight when compared to sedentary controls (1.64 – 1.24 g.Kg-1 vs 1.31 – 0.51 1.24 g.Kg-1, p = 0.025). Fiber intake was lower than recommended in both groups, and classical ballet dancers intake was -8.39 – 7.36 g less than recommended (p = 0.005).

Conclusions: We conclude that the evaluated semi-professional ballet dancers energy intake is significantly less than recommended and that macronutrient balance can be improved. Thus, energy and macronutrients intake are important aspects for further investigation and analysis in this group.

Keywords: food intake, fiber, carbohydrate, protein, lipids.

144/1999

DEVELOPMENT AND EVALUATION OF A RE-DUCED PROTOCOL FOR THE DEUTERIUM OXIDE DOSE-TO-MOTHER TECHNIQUE TO ASSESS EX-CLUSIVE BREASTFEEDING PRACTICES

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Background and objectives: Exclusive breastfeeding (EBF) practices can be assessed by quantifying infant water intake from sources other than human milk using a stable isotope deuterium oxide dose-to-the-mother (DTM) technique. While the DTM technique is non-invasive and relatively simple to perform, seven days of post-dose saliva sample collections from mother and infant over a 14-day study period makes it unsuitable for routine use in a public health setting. The purpose of this study was to determine if the DTM protocol could be reduced to a more practical design, which correctly classifies EBF practices with acceptable accuracy.

Methods: An existing DTM dataset collected using a stand-ardised protocol from 9 countries was available and consisted of 790 mother-infant pairs. For the purpose of development and evaluation of a reduced protocol, the data were randomly split into i) model building (565 pairs) and ii) evaluation (225 pairs). The model building dataset was considered the gold standard to assess the reduced protocol. For each potential reduced design, a previ-ously established model was fitted to the data, using a fully Bayes-ian framework, and mother-infant pairs were assigned to EBF or non-EBF categories based a non-milk water intake cut-off. The op-erating characteristics of the reduced protocol were assessed using sensitivity and specificity.

Results: One-day post-dose sample designs from days 3-9 were considered, however model fitting was unsuccessful in all cases. All combinations of two-day post-dose designs resulted in successful assignment of infants to a breastfeeding category and could be evaluated. The best EBF practice allocation characteris-tics were demonstrated (i.e., >95% sensitivity and specificity) for a single sample at any time between each of days 7-9 and days 13-14. Evaluation of this design provided acceptable agreement. In addi-tion, a number of two-day post-dose designs over a shorter period (days 5-9) were also considered satisfactory with >90% sensitivity and specificity.

Conclusions: A less time and resource intensive DTM two-day post-dose sampling design was found to be capable of separat-ing EBF from non-EBF practices in infants and was comparable to

the full sampling protocol. The design included sampling window periods to allow flexibility for field use.

Keywords: infants, exclusive breastfeeding, deuterium oxide dose-to-mother technique, human milk

Further collaborators:

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144/2016

ASSESSMENT OF NUTRIENT QUALITY OF SE-LECTED ASIAN DISHES USING THE HEALTHY RECIPE FRAMEWORK CRITERIA

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Background and objectives: The Healthy Recipe Frame-work (HRF) contains nutrition criteria to assess the nutrition quality of a dish, meal or food item as encouraging, good-for-you; or healthy-for-you. The criteria are based on international gener-ally accepted dietary recommendations as recommended by the Joint FAO/WHO/UNU Expert Consultation on Diet, Nutrition and Prevention of Chronic Disease. This study was conducted to assess the nutrient quality of selected 75 popular dishes from Chi-na, India, Indonesia, Philippines, Malaysia, Singapore, Thailand, and Vietnam using the HRF criteria.

Methods: The nutrient content analysis of each recipe was done using the recipe calculator specially developed by Unilever in Microsoft Excel for the HRF analysis. The recipe calculator compute the energy, nutrients and the following: percentage of the amount of recommended ingredient; total amount of vegetable per serving; percentage of energy content from protein, carbohy-drates, sugar, fats, saturated, and trans fatty acid; amount of fibre per 100 kcal energy content; amount of sodium per 100g of reci-pe; and amount of sodium per energy content. Most importantly it indicates if the recipe satisfies the encouraging; good-for-you; and healthy-for-you criteria and identify the component(s) why the recipe did not pass. The nutrient database was mostly from the United States Department of Agriculture Food Composition Table.

Results: Results showed that more than half(67%) of the rec-ipes are encouraging; but only 12 recipes(16%) and one(1%) dish were considered as good-for-you and healthy-for-you recipes, re-spectively. The common reason why 33% of the recipes did not pass any criteria was the use of meat with fat (48%) and refined

carbohydrate sources(36%). Almost three quarter(74%) of the encouraging recipes did not qualify to be good-for-you recipes primarily because of higher amount of sodium(76%) and saturated fats(25%) in the dishes. Only one recipe was considered healthy because the others have unmet requirements for vegetable(91%), carbohydrates(83%) and fibre(75%), among others.

Conclusions: Most of the Asian recipes analysed in this study conformed with the encouraging but only few(<15%) satisfied the good-for-you criteria. The HRF framework is useful for healthy recipe development and for improving recipes and meals to be healthier.

Keywords: Healthy recipe framework criteria, nutrition quality of recipe, nutrient content analysis, recipe calculator

Conflict of Interest Disclosure: The main author was commissioned by Unilever Philippines to undertake the study.

144/2020

SENSITIVITY OF THE DEVELOPMENT OF FOOD-BASED RECOMMENDATIONS USING LINEAR PROGRAMMING TO MODEL PARAMETER AND CONSTRAINT DECISIONS

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Background and objectives: Optifood is a tool to develop food-based recommendations (FBR) and identify problem nutrients by linear programming. Model parameters and constraints are derived from local dietary intake data and determine to a large extent the outcomes of the programming. However, the sensitivity of outcomes to decisions on dietary intake data to be used, is largely unknown.

Methods: Based on repeated 24-h recalls of 62 Kenyan children (4-6) Optifood was used to develop food-based recommendations and identify problem nutrients for scenarios using model parameters and constraints defined by one or two recalls and reported or estimated weekly frequencies of foods consumed. For all scenarios foods consumed by >3% of the children were selected and median daily servings were calculated. Minimum and maximum weekly frequencies for (sub)foodgroups and foods were defined as resp. 5th and 95th percentile of the intake distribution.

Results: Using two repeated recalls and reported weekly frequencies 37 non-condiment foods were selected for linear programming analyses. Draft FBR consisted of 21 daily servings of grains, 4 servings of legumes/nuts, 28 servings of vegetables, 7 servings of fruits, and 8, 7 and 7 servings of dairy, fish/eggs and added fats per week, respectively. Folate, vitamin A and zinc were identified as problem nutrients. Using estimated frequencies resulted in an increase of foods included in analyses (59) and increased minimum and maximum weekly frequencies of most (sub)foodgroups. This resulted in the addition of 3 servings of

starchy roots to the draft FBR and disappearance of folate as problem nutrient. Including only first recalls resulted in 7 additional foods selected and increased or reduced daily servings depending on the food compared to repeated recalls. This resulted only in a modest increase of maximum weekly frequencies. The same problem nutrients were identified.

Conclusions: The decision to use reported frequencies instead estimated frequencies influenced the draft FBR and problem nutrients to a larger extent than the decision to use one or two recalls. To improve feasibility of FBR it is recommended to include the recall of frequencies in the dietary assessment method.

Keywords: sensitivity, linear programming, 24-h recalls, frequencies, food-based recommendations

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144/2021

FAT MASS INDEX VERSUS BODY MASS INDEX TO ASSESS OBESITY IN MEXICAN CHILDREN

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Background and objectives: Body mass index (BMI, weight (kg)/height (m)2) is frequently used to classify a child as overweight or obese, but it cannot distinguish fat mass (FM) and lean body mass. The fat mass index (FMI, FM (kg)/height (m)2) can be derived using bioelectrical impedance. The aim of this study was to determine differences in estimation of childhood obesity using BMI Z-score or FMI in children.

Methods: Children had participated in the POSGRAD (Prenatal Omega-3 fatty acid Supplements, GRowth, And Development) study. At age 8-10 years, height and weight were measured according to standard protocols and body composition was assessed using a tetrapolar bioelectrical impedance analyzer (Impedimed DF50) with validated equations for Mexican children. FM calculated was then used for FMI final calculation, (FM (kg)/height (m)2). BMIZ was calculated using WHO reference and obesity was defined as BMIZ > 2 SD or FMI ≥ 6.6 kg/m2 in boys and ≥ 9.5 kg/m2 in girls, values previously used in literature.

Results: We included 281 boys and 255 girls. Mean body weight, percent body fat, BMIZ, and FMI were 32kg, 28.5%, 0.71,

and 5.3 and 31kg, 31.5%, 0.60, and 5.8, for boys and girls respectively. Using BMIZ, approximately 25% of boys and 16% of girls were classified as obese compared to 5% and 31%, respectively, using the FMI.

Conclusions: The use of BMIZ resulted in a higher estimate of obesity among boys and a lower estimate of obesity among girls compared to the FMI. These results are important as population studies and program evaluations using BMIZ may generate inaccurate estimates of childhood obesity. An important policy change could be to promote the use of relatively inexpensive body composition methods to improve estimates childhood obesity by using FMI instead of BMIZ.

Keywords: children, nutritional status, obesity, fat mass, BMI, FMI, %FM

Further collaborators:

144/2028

IS DRINKING MATE ASSOCIATED WITH POOR DIET QUALITY AND FOOD AND NUTRIENT INTAKES AMONG SOUTH AMERICAN ADULTS?

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Background and objectives: Mate, a beverage made from the leaves of Ilex paraguariensis, is widely consumed in South America. High intakes of mate, and the habit of adding sugar may affect diet by replacing meals and increasing total sugar intake. We assessed whether mate consumption is associated with diet quality and quantity among adults aged 35-74 years in four South American cities in Argentina (Bariloche and Marcos Paz), Chile (Temuco) and Uruguay (Canelones).

Methods: Cross-sectional analysis on data from baseline of CESCAS (Centro de Excelencia en Salud Cardiovascular del Cono Sur) I, a population-based prospective cohort study. We included participants with available socio-demographic and dietary data (n=5458). Diet was assessed using a validated 126-item food-frequency questionnaire. Diet quality was evaluated with the Alternate Healthy Eating Index (AHEI-2010), the Dietary Approaches to Stop Hypertension (DASH) and the Alternate Mediterranean Diet (AMeD) Scores, with higher scores indicating greater adherence to these patterns. Multivariable linear regression models were used to examine the associations of quartiles (Q) of mate consumption with energy-adjusted food and nutrient intakes and diet quality scores (converted to a 0-100 scale) adjusting for age, gender, education, and city. Subgroup analysis was conducted (participants that added sugar/ those that didn't.)

Results: 57% of participants drank mate daily; those who drank mate had an average intake of 1.3 liters per day and 34% of them added sugar to at least half of their mate beverage servings. Mate consumption was associated with more bread intake($p<0.001$). Among participants who didn't add sugar, diet quality and consumption of other foods were independent of mate consumption. However, participants in Q4 with the habit of adding sugar reported higher intakes of sweet and sugars, energy and carbohydrates, and lower intakes of dairy products, fiber, vitamins C, retinol, calcium, zinc and iron compared to participants in Q1($p<0.001$). In addition, in the same subgroup, differences between Q4vs.Q1 in diet quality scores were: AHEI-2010:-3.73 (95%CI -4.95;-2.50); DASH:-3.75(-5.81;-1.81) and AMeD:-8.77(-6.00;-11.56).

Conclusions: Higher consumption of mate was significantly associated with higher consumption of bread. When the habit of adding sugar was present, food and nutrient intakes as well as adherence to healthy diet patterns were negatively affected.

Keywords: Ilex paraguariensis, South America, mate, diet, diet quality

Further collaborators:

144/2032

SODIUM AND IODINE URINARY EXCRETION AND YOUR RELATION WITH BLOOD PRESSURE LEVELS AND NUTRITIONAL STATUS ON SCHOOLCHILDREN IN RIO DE JANEIRO

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Background and objectives: Excess consumption of iodine and sodium has been studied due to high consumption of ultraprocessed and processed foods and its relation with the development of diseases in early stages of life. The objective of this study was to describe the urinary excretion of sodium and iodine in schoolchildren related to pressure levels and anthropometric profile.

Methods: It was a cross-sectional study realized with schoolchildren aged 6–16y at Rio de Janeiro city. Anthropometric data, blood pressure levels, familial historic of arterial hypertension and spot urine samples was collected. The urine samples were analyzed by Flame Photometry to obtain sodium concentration and by Spectrophotometry by the Sandell-Kolthoff method for iodine. Descriptive (mean, SD, median, maximum and minimum) and inferential (Mann Whitney for mean comparison and Pearson and Spearman correlation) statistics were realized. The significance level was 0.05.

Results: The sample consisted in 109, which 52,4% were man and 78% adolescents. Overweight and obesity was present in 35,4%. There was 9.2% of changes in BP and 23.6% had parents with AH. The sons of hypertensive parents had an average of SBP higher than those whose parents weren´t hypertensive (P=0.012). The daily sodium intake was 2448.4±2186.8mg/day and 41.9% had ingestion above the UL. The daily salt intake was 6.2±5.6g/day and 48.4% was classified with higher intake. The iodine intake was 381.5±185,9μg/day, being classified as insufficient (3.2%), more than adequate (17.2%) and excessive (65.6%). The sodium intake prevalence ≥1500mg/day was about 55,9% and the iodine intake ≥200μg/day was about 82,8%.

Conclusions: Sodium and iodine intake weren't different by sex, anthropometric status and blood pressure classification. Schoolchildren which parents had hypertension showed sodium mean intake upper than that which parents hadn't. The sample showed excessive sodium intake like salt and iodine. This fact is a risk factor to chronic noncommunicable diseases, like AH, kidney, heart and thyroid diseases. Studies like that may increase the use of this measure as an indicator of the level of these minerals and can give directions to intervention strategies, in the field of health and education.

Keywords: Iodine – Sodium – Urine – Schoolchildren

144/2040

ANTHROPOMETRIC CHARACTERISTICS, DIET QUALITY AND DIFFERENCE IN FOOD INTAKE BETWEEN WOMEN WITH AND WITHOUT POLYCYSTIC OVARY SYNDROME

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Background and objectives: Scientific evidence indicates overweight/obesity in women with polycystic ovary syndrome (PCOS). Excess weight aggravates the syndrome through metabolic disorders. It is likely that one of the contributing factors to overweight in women with PCOS is inadequate food intake. The objective of this study was to evaluate the food intake and the nutritional status of patients with and without PCOS treated at School Hospital, Federal University of Uberlandia.

Methods: A case-control study was conducted with 67 women (34 cases). For anthropometric evaluation, the measurement of weight and height, used to calculate body mass index (BMI), and waist circumference (WC) were made. Both values obtained were evaluated by the classification of the World Health Organization. To evaluate body composition, especially to quantify lean mass and body fat, electric bioimpedance was performed. To evaluate the quality of food intake, a 24-hour food recall was made. Subsequently, the data was used to obtain the score using the Brazilian Healthy Eating Index (BHEI).

Results: There was no significant difference between the mean of the age (25.24±0.68 vs. 25.12±0.71; p=0.899), WC (88.0 vs. 79.0; p=0.158), BMI (25.8 vs. 22.9; p=0.221), percent lean tissue mass (68.4 vs. 70.5; p=0.175) and body fat (31.6 vs. 28.7; p=0.078) of the PCOS group and healthy women, respectively. In dietary analysis, the consumption of total energy (1425 vs. 1666; p=0.075), carbohydrate (627.3 vs. 735.4; p=0.137), protein (269.9 vs. 313.2; p=0.055), fat (407.6 vs. 554.6; p=0.208), cholesterol (150.7 vs. 188.2; p=0.060) and saturated fat (10.6 vs. 9.3; p=0.981) were similar between the groups. However, the PCOS group had lower consumption of fiber compared to the control group (8.8 vs. 11.6, respectively; p=0.018). Regarding the BHEI, in the PCOS group 72% (n=24) showed "needs improvement", 24% (n=8) showed "inadequate diet" and only one participant showed "good diet" while in the control group 76% (n=26) showed "needs improvement" and 24% (n=8) showed "inadequate diet".

Conclusions: Both groups showed no significant difference in anthropometric evaluation and dietary pattern. However, women with PCOS presented lower consumption of fiber compared to women without the syndrome. Therefore, women with and without PCOS need to improve eating habits to avoid overweight/obesity.

Keywords: Polycystic ovary syndrome. Nutritional status. Food intake. Diet quality.

144/2051

A LATERAL FLOW IMMUNOASSAY FOR QUANTIFICATION OF ALPHA-1-ACID GLYCOPROTEIN AS A DIAGNOSTIC TOOL FOR RAPID, MOBILE-BASED DETERMINATION OF INFLAMMATION

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Background and objectives: Alpha-1-acid glycoprotein (AGP) is an acute phase protein, and its measurement is recommended for adjustment of nutritional biomarkers for inflammation by the Biomarkers Reflecting Inflammation and Nutritional Determinants of Anemia (BRINDA) working group. Traditional AGP quantification is not widely available in resource limited settings and uses assays that require sample processing and shipment, laboratory and personnel resources, and hours to days to complete a test. We sought to develop an inexpensive, mobile-based, and rapid diagnostic test to quantify AGP.

Methods: We developed a lateral flow immunoassay (LFIA) designed to work in conjunction with the Cornell NutriPhone platform. In the LFIA, gold nanoparticles are conjugated to anti-AGP antibodies and generate a variable colorimetric signal based on the concentration of AGP in the sample. This can be quantified by the processing of an image captured by a mobile camera. We evaluated whether the LFIA could discriminate a range of concentrations of purified AGP in buffer and subsequently evaluated the assay's ability to quantify AGP and discriminate elevated concentrations (i.e. > 1 mg/mL) in diluted human serum (n=7) and serum spiked with purified AGP (to increase by 2 mg/mL, n=7) relative to an automated immunoturbidimetric assay.

Results: The first stage of the LFIA was able to distinguish purified AGP with a quantification range of 0.25 – 2.5 μg/mL (R^2=0.89). Mean ± SD unspiked serum AGP concentration by immunoturbidimetric assay was 0.36 ± 0.05 mg/mL (range 0.28 – 0.42 mg/mL). The LFIA results were significantly correlated with the immunoturbidimetric assay for all samples (y=0.76x + 0.37,

R^2=0.84). Initial sensitivity and specificity were compliant with World Health Organization specifications for a point of care diagnostic test.

Conclusions: The AGP LFIA demonstrated reasonable accuracy when compared to a commercial immunoturbidimetric assay and is inexpensive, portable, and can provide results within 15 minutes. This assay can be integrated into the NutriPhone platform to obtain multiple biomarkers of nutrition and inflammation in diverse and resource limited settings. Further development will focus on evaluating human serum with a wider range of endogenous AGP concentrations and ensuring the LFIA can distinguish elevated AGP concentrations closer to the suggested cutoff.

Keywords: AGP, biomarker, lateral flow assay, point-of-care

Conflict of Interest Disclosure: DE and SM have equity interest in a diagnostic start up focused on measurement of nutritional biomarkers at the point-of-care utilizing the results from their research.

144/2052

VITAMIN B12 INTAKE AND STATUS IN EARLY PREGNANCY IN WOMEN IN SOUTHERN INDIA

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Background and objectives: Vitamin B12 deficiency is common during pregnancy and is associated with adverse maternal and child health outcomes. The objective of this study was to examine dietary correlates of vitamin B12 status in a cohort study of pregnant women during the first trimester in Southern India.

Methods: Pregnant women (n=419) were enrolled before 12 weeks of gestation and monitored to assess dietary intake and vitamin B12 status during pregnancy. A validated food frequency questionnaire (FFQ) was used to evaluate dietary intake during the past three months. Plasma vitamin B12 concentrations were assessed via electrochemiluminescence in maternal samples at enrollment. Linear and binomial regression models were used to evaluate the associations between dietary intake of nutrients and food groups with vitamin B12 concentrations and deficiency (<150 pmol/L) during the first trimester.

Results: Median dietary intake of vitamin B12 was 1.73 g (IQR: 1.10-2.45) per day, and median maternal vitamin B12 concentrations were 126.9 (IQR: 89.6, 172.2) pmol/L at baseline. A total of 64% of women were vitamin B12 deficient (<150 pmol/L) at their first prenatal visit. Increased consumption of refined grains, fish, red meat, egg-based foods, organ meat, and total meat; and vitamin B12, methionine, iodine, cholesterol, saturated fat, and polyunsaturated fatty acids were associated with increased vitamin B12 concentrations (p<0.05). In analyses of vitamin B12 deficien-

cy, animal-source foods, including fish, egg-based foods, and organ meat were associated with lower risk of vitamin B12 deficiency (p<0.05). In nutrient analyses, increased intake of vitamin B12 (RR: 0.87, 95% CI: 0.80-0.93, p=0.0001), methionine (RR: 0.73, 95% CI: 0.54-0.98, p<0.05), selenium (RR: 0.99, 95% CI: 0.99-0.99, p<0.05), cholesterol (RR: 0.99, 95% CI: 0.99-0.99, p<0.001), and saturated, monosaturated, and omega-3 (linolenic acid, eicoasapentanoic acid, docosahexanoic acid) and omega-6 (docosapentanoic acid, arachidonic acid) polyunsaturated fatty acids (p<0.05) were associated with lower risk of vitamin B12 deficiency.

Conclusions: The prevalence of vitamin B12 deficiency was high early in pregnancy in this population. Inadequate dietary intake of animal-based foods and low consumption of vitamin B12, methionine, cholesterol, saturated fat, and polyunsaturated fatty acids predicted increased risk of vitamin B12 deficiency.

Keywords: Vitamin B12, dietary intake, pregnancy, India

144/2053

PERCENT BODY FAT PREDICTION USING BODY MASS, STATURE AND ABDOMINAL CIRCUMFERENCE IN ADULTS SEEN IN THE FAMILY DOCTOR PRIMARY CARE PROGRAM UNITS IN NITERÓI, RIO DE JANEIRO, BRASIL

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Background and objectives: Body mass (M), stature (S) and abdominal circumference (AC) are routinely measured in adults seen in Primary Health Care Units. Indicators are developed from these measures and used in nutritional and risk assessment for diseases. They could also be used to estimate percent body fat (%BF) if validated prediction equations (PE) are available for the specific population. To this end, the purpose of the present study was to validate a series of %BF in adults (≥45y) seen in the Family Doctor Primary Care Program (FD) units in Niterói, Rio de Janeiro, Brasil.

Methods: The tested %BF PE were developed in a probability sample of adults (≥20y) from Niterói and included BM, S and AC (R2 between 0.83 and 0.88). A sample of 518 subjects (329 women) seen in the FD units in Niterói participated in the study. BM, S and AC measures were obtained by trained researchers in the FD units. BMI (BM/S2) was used to assess the nutritional status. The subjects were invited to come to the research laboratory where %BF was obtained by DXA. The significance of the difference (bias) between predicted (%BFp) and measured (%BFm) %BF was determined by paired t-Student tests. The % bias [(%BFp -%BFm/%BFm)*100] was calculated. In addition, multiple regression models to predict %BF against the anthropometric measures were conducted with the data from the 518 subjects.

Results: Age of the 518 subjects varied from 45-92y (mean±SD, 59.6±9.7y). Mean %BFm was 41.8 (±5.7) and 28.3 (±6.8) for women and men, respectively. Overweight (25≥BMI<30kg/m²) was observed in 38.9% of the women and 39.8% were obese (BMI ≥30kg/m²). In men, these prevalences were 43.9 and 19.6%, respectively. Non-significant %BF biases were observed in 45-60y-old men (-0.5±5.4 representing -0.6±23.0%); 60-70y-old women (0.5±3.3 representing 1.5±8.3%); and ≥70y-old women (0.2±3.7 representing 1.3±10.1%). The developed %BF PE was [31.453-(350.294*1/BMI)-(12.558*Sex(Male=1;Female=0))+(0.242*AC)]; R2=0.82 and SEE=3.75.

Conclusions: The population specific %BF PE was not adequate for all segments of patients seen in the FD units. The developed PE includes BM, S and AC and might be an useful instrument to estimate the %BF using routine anthropometric measures obtained in adults seen in FD units.

Keywords: Nutrition Assessment, Anthropometry, Body Composition, Public Health

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144/2056

VALIDITY OF SKINFOLD PREDICTIVE EQUATIONS TO DETERMINE BODY COMPOSITION IN ADULTS FROM PRIMARY HEALTH CARE UNITS IN NITERÓI, RIO DE JANEIRO, BRASIL

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Background and objectives: Body composition (BC) information is important for nutritional assessment but its widespread use depends on accurate and feasible methods. The aim of the present study was to assess the validity of skinfold predictive equations to determine BC in adults (≥ 50 years) seen in Primary Health Care Units or enrolled in physical activity programs.

Methods: Two-hundred-eight-six adults (203 women) were recruited. Body mass, stature and skinfolds (triceps, TS; biceps, BS; and subscapular, SS) were measured. Nutritional status was determined by body mass index (BMI). Percent body fat (%BF) density was estimated using the prediction equations developed by Durnin & Womersley (DW_equations) for adults aged 50 to 72 years using one skinfold (TS or BS or SS) or a combination of skinfolds (TS+BS or TS+BS+SS). Fat mass (FM) and fat free mass (FFM) were calculated from the estimated %BF and the obtained

by DXA. Paired Student t-tests were used to determine the significance of the means.

Results: Mean (SD) measured %BF, FM and FFM was 41.4 (5.7) %, 27.7 (8.2) kg and 38.0 (5.6) kg for women and, 28.9 (7.2) %, 22.2 (9.6) kg e 52.0 (7.0) kg, for men, respectively. %BF and FM mean values were significantly underestimated by all equations in women (bias between 38 and 39.5% for %BF and 39.4 to 40.4 kg for FM), while FFM was overestimated. However, mean skinfold-estimated values of %BF, FM and FFM using BS or SS or BS+SS were not different from DXA in women aged 50 to 60 years or for those with BMI < 25 kg/m². The same occurred in women with BMI between 25-30 kg/m² for BC estimated using only SS. For all men, %BF, FM and FFM mean estimated values using TS, BS or TS+BS combination were not different from DXA. The same pattern was observed for the 50-70y age men and the ones with BMI < 25 or between 25-30 kg/m².

Conclusions: DW_equations can be used to estimate BC in groups of men and women depending on age and nutritional status but it is recommended that new equations be developed for this population.

Keywords: Nutrition Assessment, Anthropometry, Body Composition,Public Health.

144/2081

DEVELOPMENT OF A NON-MILK WATER INTAKE CUTOFF TO IDENTIFY EXCLUSIVE BREASTFED INFANTS USING THE DEUTERIUM OXIDE DOSE-TO-MOTHER TECHNIQUE

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Background and objectives: Assessing the rates of exclusive breastfeeding (EBF) until age six months is an important public health priority; however, feeding practices are based mostly on caregiver recall and often affected by self-reporting bias. The deuterium oxide dose-to-the-mother (DTM) technique can be used to distinguish EBF based on a cut-off (<25 g/d) of water intake from sources other than human milk. This value reflects the error (25±62 g/d) associated with the assumptions made in the calculation but has yet to be verified in mother-infant pairs known to be truly EBF. Thus, the aim of the present study was to estimate the apparent volume of non-milk water intake measured by deuterium dilution for infants known to be EBF.

Methods: Healthy, apparently EBF infants (n=121) aged 2.5-5.5 months were recruited from Sumedang, West Java, Indonesia. After administration of deuterium to the mothers, saliva was sampled from mother and infant pairs over a 14-d period. Validation of infant feeding practices was conducted via home observation over six non-consecutive days with recall of foods or liquids consumed by the infant during the respective previous 24 hours. A fully Bayesian approach was used to estimate the marginal posterior distribution of the population non-milk water intake over all mother-infant pairs.

Results: Of the 121 infants enrolled, 113 were reported as EBF during the study period, consisting of 1502 observations. Eight infants were administered medicines yet remained in the final sample as per the WHO EBF definition. Seven infants were identified as non-EBF: 3 swallowed bath water, 4 consumed other foods and/or liquids; and one infant was excluded due to physiologically implausible values. Using the 90th percentile of the distribution of the population non-milk water intake distribution, we estimated a cut-off value of 82.6 g/d, with a lower limit 95% CI of approximately 54 g/d.

Conclusions: The current study is the first to estimate the distribution region of deuterium exposure in mother-infant pairs using a known EBF infant cohort, with the classification of EBF defined as the proportion of the posterior distribution of non-milk water intake <82.6 g/d. This cut-off is substantially higher than previously recommended (<25 g/d).

Keywords: infants, exclusive breastfeeding, deuterium oxide dose-to-mother technique, human milk, feeding practices

144/2082

PREVIOUS STEP TO ANALYZE 24-H DIETARY RE-CALLS: STANDARDIZATION OF THE FOOD COMPOSITION DATABASE FOR THE "GROWTH AND OBESITY COHORT STUDY"

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Background and objectives: Analyzing 24-h dietary recalls is a enormous challenge when appropriate tools for dietary data collection are not available. Validated nutrition analysis software are often based on foreign database, data from literature sources and/or manufacturer´s data. These sources can differ from local food composition and therefore require a previous harmonization process.

Objective: To describe a protocol for adjusting the local food composition to nutritional analysis software database prior analyzing the 24-h dietary recalls applied to children from the "Growth and Obesity Cohort Study" (GOCS).

Methods: Nutrition Data System for Research (NDS-R) was used for harmonization process. This database includes over 18.000 foods and 165 nutrient and other food components, and it is updated annually to reflect marketplace changes and new analytic data. Dietitians identified food items reported in the 24-h dietary recalls collected during 2013-2014 and grouped them according to nutritional characteristics. Foods were matched in the NDS-R database through its general description (i.e., by name, type and mode of preparation). Recipes were added for commonly consumed processed foods that were not in the software database. Energy and macronutrient values available in Chilean food composition tables (TCA), local food industry composition tables and/or nutrition labels were compared to values described in the software. A concordance rate between 80 and 120% for each parameter analyzed was required to accept food harmonization.

Results: 766 foods, beverages and recipes were harmonized. Major obstacles were observed in local foods, for example, fish and seafood, processed foods, such as cookies, cakes, candies and fast food, among others. In addition, there were problems with the large variety of recipes and preparation of typical Chilean meals; however, NDS-R allows entering new recipes to its database.

Scarce information of new food and lack of updated TCA information constituted additional difficulties.

Conclusions: Software adaptation to analyze 24-h dietary recalls is an arduous task that must be performed by trained dietitians to minimize systematic and random errors in nutrient intake estimations. Local updated nutrient composition databases are key to enhance the quality of dietary assessment.

Keywords: Assessment dietary, 24-h dietary recall, Nutrition Data System for Research

Further collaborators:

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ASSESSMENT THE NUTRITIONAL STATUS AND FOOD INTAKE OF ATHLETES OF THE HANDBALL TEAM OF THE OF GUARULHOS CITY- SP

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Background and objectives: Handball is a collective, dynamic and fast-growing sport in Brazil. Because it is a high-performance sport and a great caloric expenditure, its practitioners undergo physical stress and great wear and tear, which must be compensated with adequate food consumption that promotes health, improves performance and recovery physical and muscular development of these individuals. The aim was to assess the nutritional status through anthropometric measures and adequate intake of food considering energy, macro and micronutrients of athletes of the handball team of the of Guarulhos City- SP

Methods: Cross-sectional study, approved by the committee of ethics in research. For this study, were evaluated Fifteen male handball athletes aged 18 to 26 years. For the determination of body fat, it has applied the sum of nine skin folds between them: subscapular, tricipital, bicipital, axillary, suprailiac, pectoral, abdominal, leg calf and thigh, determined by Heyward and Stolarczyk (1996) and Siri (1961), adapted by Lohman (1986). For the calculation of the caloric expenditure, the formula of Harrys & Benedict was applied, in addition of the calories of daily physical activities (NRC, 1989) and food-induced thermogenesis. For macronutrient suitability, the FAO/OMS recommendation (2003) was considered. For the assessment of the vitamins and minerals intake, it was applied the DRIs, - Dietary Reference Intakes (NRC, 2000).

Results: The percentage of fat body found in the majority of the athletes within the values considered adequate (80%). About the food intake showed that 73.33% of the group had a caloric intake below of recommended energetic requirements and 26.67% above of them. Other important point was that they have stayed long periods fasting, not doing an adequate fractionation of meals. It was found predominance of hyperlipidic and hyperprotein diets.

Considering the diversification of nutrients, the diets were considered monotonous with low intake of fruits and vegetables especially those that could influence directly in the performance of the Athlete during the training.

Conclusions: It was verified that there is a need to adapt the menu of the athletes, both energy and macro as well as micronutrients, so that healthy eating reflects on their income on the court.

Keywords: nutrition assessment, food consumption, body fat, athletes.

144/2096

BODY COMPOSITION IN MOROCCAN CHILDREN USING ISOTOPE DILUTION: DEVELOPMENT AND VALIDATION OF BIOELECTRICAL IMPEDANCE ANALYSIS EQUATIONS FOR PREDICTION TOTAL BODY WATER AND FAT-FREE MASS

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Background and objectives: Body composition is important as a marker of both current anf future health. Bioelectrical impedance analysis (BIA) is a simple and accurate method for estimating body composition, but requires population-specific prediction equations. The aim of the present study was to examine the validity of published BIA equations for assessing total body water (TBW) and fat-free mass (FFM) using deuterium oxide dilution (D2O) as the reference method and to develop new FFM-BIA and TBW-BIA equations in Moroccan children.

Methods: Data were collected from 250 healthy children aged 8-11 year-old. BIA variables were measured by a tetra-polar device. TBW and FFM were assessed by the D2O. The participants were sorted by gender and randomly split into development and validation subgroups. The validity of other published equations was also tested using Bland and Altman procedure, proportional bias and pure error.

Results: Prediction equations were generated, incorporating height, impedance index, weight, age and sex as predictors ($R^2 = 0.91$). The new equations provided non-significant proportional bias values, and better agreement than other tested equations. Bias and pure error values were -0.17 and 2.47 l for boys and -0.04 and 2.46 l for girls, for TBW equation. For FFM equation, bias values were 0.14 and -0.12 kg, and pure errors were 3.25 and 2.92 kg for boys and girls, respectively.

Conclusions: The new BIA prediction equations have high accuracy on Moroccan children and are recommended for use in these populations.

Keywords: body composition; bioelectrical impedance; prediction equation; Moroccan children.

144/2103

BLOOD PRESSURE IN RELATIONWITH BMI AND BODY FAT IN MOROCCAN SCHOOL CHILDREN: A CROSS SECTIONAL STUDY

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Background and objectives: Excess adiposity, which is well-recognized a risk factor for non communicable diseases such as hypertension, has become a major health problem in many developing countries, particularly among schoolchildren.

Therefore, the purpose of this study is to examine witch variables in the nutritional state are associated with blood pressure (BP).

Methods: A cross-sectional survey involving 250 children's (50.4% boys and 49.6% girls), were chosen randomly from 5 public schools in 2 cities of Morocco. Body composition was assessed using bioelectrical impedance analysis (BIA) and anthropometry.

Anthropometric data were taken using standardized equipment. Obesity was defined by the WHO reference body mass index (BMI)-for-age. Hypertension was defined as the occurrence of BP levels greater or equal to the 95th percentile of height- and sex-adjusted reference levels.

Results: Median age 9.58 (8.83–10.33) years; mean z-score BMI (-0.15±1.31) kg/m2. According to the BMI 13.3% of children was overweight and 7.2% was obese. The prevalence of hypertension was 11.1% and that of high percentage fat mass 26.6%.

All of the correlations of the systolic and diastolic blood pressure with variables in the nutritional state (BMI and fat mass) showed to be significant.

Significant correlation were found for fat mass (r = 0.16, p<0.005) (r = 0.15, p<0.005) with systolic and diastolic blood pressure respectively. Whereas BMI showed a stronger association with systolic blood pressure (r=0.21, p<0.001).

Conclusions: This study made it possible to notice that the anthropometric indicator that best is related to the existence of high BP is the BMI. This seems to be an easy method that is noninvasive and of low cost to detect the risk of high BP in schoolchildren.

Keywords: Blood pressure, hypertension, fat mass, body mass index, schoolchildren.

144/2126

ASSOCIATION BETWEEN DIETARY INTAKE AND DEMOGRAPHIC AND CLINICAL ASPECTS OF BRAZILIAN CANCER PATIENTS

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Background and objectives: Patients with cancer are also compromised by a variety of symptoms like nausea, vomiting, diarrhea, constipation, food aversions, fatigue, dyspnea, and pain, which may construct barriers that make dietary intake challenging. The cancer itself and added to the toxic effects of oncology treatment, it may increase the severity and persistence of symptoms and affect the dietary intake of patients. It is widely known that the tumor site, clinical stage, some symptoms and use of chemo/radiotherapy are factors that are associated with dietary intake. The objective was estimate the energy and macronutrient intakes of cancer patients and their relationship with the patients' demographic and clinical characteristics.

Methods: This is a cross-sectional study of 772 patients with cancer in treatment at Barretos Cancer Hospital. Demographic (personal interview) and clinical's information were collected (patient record). The study used the Food Frequency Questionnaire (FFQ). Univariate analysis of variance (ANOVA) followed by the Tukey post-hoc test determined whether the patients' energy and macronutrient intakes related to their demographic and clinical characteristics. The patients' energy and macronutrient intakes were compared with their nutritional requirements by point estimates and 95% confidence intervals (CI95%). The significance level was set at 5%.

Results: Most participants were females (63.1%) with a mean age of 53.2 (SD=12.7) years. Thirty-nine percent of the patients had stage III disease, 72.4% were undergoing chemotherapy, and 40.5% had metastases. Dietary intake differed significantly by employment status (p=0.009; p<0.001), socioeconomic class (p<0.001; p=0.002; p=0.004), cancer specialty area (p=0.008; p=0.003), type of treatment (p=0.023; p<0.001), and body mass index (BMI) (p=0.004). The mean of energy intake was 1346.5 (SD=332.0) (IC95%=1323.1-1370.0) kcal/day, the mean of protein intake was 57.0 (SD=20.0) (CI95%=55.6-58.5) g/day, the mean lipid intake was 27.3 (SD=10.0) (CI95%=26.6-28.0) g/day and 223.3 (SD=55.7) (IC95%=219.4-227.3) g/day of carbohydrates. The patients had inadequate energy and macronutrient intakes.

Conclusions: The patients' dietary intake was inadequate and differed significantly by employment status, socioeconomic class, cancer specialty area, type of treatment, and BMI.

Keywords: dietary intake, cancer, nutrients

144/2128

ANTHROPOMETRIC STUDY BY GENDER IN SEMI-URBAN SCHOOLCHILDREN IN KENITRA CITY-MOROCCO

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Background and objectives: The nutritional requirements of school-aged children vary from one age group to another and according to gender, because their energy expenditure is different . For this reason, it was chosen as a study objective to assess the nutritional status of schoolchildren and see if there is a significant difference between girls and boys in anthropometric indicators.

Methods: The anthropometric survey was carried out among 239 schoolchildren of average age (10.22 years ± 2.10),weight and height were measured according to the WHO (World Health Organization), Anthropometric indices which adopted are: weight-for-age, and height-for-age and body mass index (BMI), determined by the Z score calculated according to WHO growth references 2007 (5-19 years).

Results: Results of anthropometric studies revealed an underweight reach 4.3%: girls (5.6%), boys (6.3%) (10 years), stunting 6.3%: girls (6.1%), boys (5.6%), thinness 3.8%: girls (6.1%), boy (4.8%), low risk for overweight 4.3%: girls (11.3%), boy (10.5%), Obesity 0.9%: girls (3.5%), boys (2.4%). χ2 analysis did not show any significant differences between girls and boys regarding the various anthropometric indicators (P>0).

Conclusions: The population studied suffered from a slight malnutrition as well as a lack of influence of sex on the nutritional state of the school children.

Keywords: schoolchildren, semi-urban, nutritional status, gender

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DEVELOPMENT OF A NEW TOOL FOR DIETARY DATA COLLECTION: SER-24H, SOFTWARE FOR 24 HOURS RECALL

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Background and objectives: Analyzing 24-h dietary recalls involves several challenges such as standardized data collection, conversion of household measures, linkage of foods/beverages with nutrient content data, among others. There is no available Software for dietary data collection customized to Chilean needs.

Objective: To report the development of the software for dietary data collection "SER-24h" (Software de Encuestas Recordatorio 24 horas).

Methods: The software development started in 2015 and it was led by CEPOC at INTA, University of Chile. We build on the dietary data collected on 24-h dietary recalls since 2012. We identified foods, beverages and recipes to organize the food database. The recipes were disaggregated in ingredients. The National Nutrient Database Standard Reference of the United States Department of Agriculture (USDA) was used as nutrient content data. We linked our data to the USDA, assuming a concordance between 80 and 120% of energy and macronutrients, based on the nutrition facts of packaged foods and Chilean food composition data. A private company (CITEC®) provided technological support and generated the software.

Results: SER-24h includes a questionnaire designed for collecting interviewer 24-h dietary recalls using the "Automated Multiple-Pass Method". Foods/beverages are selected from a list of from 4682 options, with specific portion sizes for each one; the software allows to add new foods/beverages or portion sizes if needed. Recipes can be also selected from the ones available (n=838) or added if necessary. SER-24h provides reports with nutrient information at the food/beverage level, origin from the food or preparation, meal time, location and activities during the meals. The program was ready to collect data after 16 months of preparation and it can be executed online or offline from any operating system previously authorized by the webmaster.

Conclusions: The new software allows collecting standardized dietary information and it links it with nutrient content. As far as we know, SER-24h is the only Chilean dietary software which outputs provide dietary analyses discriminating different sources of nutrients (i.e. at the level of food groups, meals, time of the day, or others). The use of this tool should increase our scarce knowledge on local dietary patterns.

Keywords: dietary assessment, food intake, 24-h dietary recall, SER-24h.

WORKING ON ATYPICAL SCHEDULES AND ITS NEGATIVE IMPACT ON FOOD INTAKE IN BRAZILIAN SHIFT WORKERS

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Background and objectives: Although the shift worker is predisposed to nutritional disorders such as obesity, the association between atypical working hours and food intake patterns is poorly described in the literature. This study aimed to evaluate the associations between shift work and the dietary pattern in Brazilian shift workers.

Methods: A cross sectional study was conducted with 1.215 (461 early morning, 233 day, 146 evening and 375 night workers) shift workers. The food intake pattern was evaluated by a semi-quantitative Food Frequency Questionnaire (FFQ) validated for Brazilian adults. The prevalence of inadequate intake of eight food groups was calculated as a reference to the portions recommended using the "Food Pyramid Adapted for the Brazilian Population". Measurements were taken for weight, height, waist circumference, as well as calculations of the Body Mass Index (BMI). Binary logistic regression was performed and adjusted for potential confounding variables in order to verify the association between the shifts worked and inadequate food intake using the day shift as reference.

Results: An association was found between working in the early morning shift and inadequate food intake over various food groups, such as milk and dairy products (Adjusted odds ratio [AOR]: 2.49; 95% CI 1.29, 4.81; $p < 0.01$), meat and eggs (AOR: 1.61; 95%CI 1.07, 2.42; $p < 0.05$) cereals and pasta (AOR: 1.44; 95% CI 1.01, 2.05; $p < 0.05$) and fruit and fruit juices (AOR: 2.04; 95% CI 1.06, 3.93; $p < 0.05$). The night shift present 2.25 times (AOR: 2.25; 95% CI 1.19, 4.25; $p < 0.05$) greater odds of inadequacy for milk and dairy products, meat and eggs (AOR: 1.62; 95% CI 1.07, 2.45; $p < 0,05$) and cereals and pasta (AOR: 1.56; 95% CI 1.09, 2.24; $p < 0,05$).

Conclusions: The food intake pattern of all other food groups were not associated with the work shifts. Early morning and night shift workers are more vulnerable to inadequate intake from various food groups. These results demonstrate the need to develop food intervention programs concerning food patterns in workers that work atypical schedules.

Keywords: Food intake. Shift workers. Work schedule. Unhealthy eating habits. Poor diet.

NUTRITIONAL STATUS OF RURAL YOUTH IN THE PROVINCE OF TUCUMÁN, ARGENTINA

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Background and objectives: Tucumán has twice the rural population than the national average. A third are young people between 10 and 24 years old and 28% have some basic unmet need. This indicates that they live in conditions of vulnerability, which can have an impact on their health. Nutritional status is the result of the balance between nutrient intake and the requirements of an individual. The imbalance in some of these aspects, due to the deficit or excess, can generate malnutrition. The objective was to evaluate the nutritional status of young people attending rural schools in the province of Tucumán

Methods: The cross-sectional study included 383 cases, ranging from 9 to 15 years old, from seven rural schools in the province of Tucumán, Argentina. Four schools belonging to the department of Rio Chico, two to Tafí Viejo and one to Lules. The selection was for convenience. The exact age was determined from the data in the school records. Anthropometric measurements were performed according to standardized protocols. Portable digital balance (precision of 100g) and vertical anthropometer (precision 0.1cm) were used. The Who Anthro Plus software was used to process the data.

Results: With respect to the nutritional deficit, it was found 3.9% of stunting and 1% of wasting. At the departmental level, the following prevalences were observed, respectively: Lules 5.9% and 2.9%; Tafí Viejo 4.3% and 1.1% and Rio Chico 3.5% and 0.8%.As for overweight, we found 22.2% and 17% of obesity. The analysis by departments indicated the following prevalences of overweight and obesity: Lules 26.5% and 5.9%; Tafí Viejo 27.2% and 19.6% and Río Chico 21% and 17.5%.

Conclusions: The presence of malnutrition in rural areas, predominantly due to excess, accounts for the magnitude of the existing nutritional problems. The prevalence of overweight is high and similar in all areas. In contrast, obesity manifests itself in a heterogeneous form and reaches its maximum value, as well as being overweight, in the department of Tafí Viejo. Regarding the presence of stunting and wasting, they are presented differently by area, however, they show their greater value of both indicators, in the department of Lules.

Keywords: Nutritional status - youth - rural - Tucumán

CREATING THE NEW LEXICON FOR THE NEXT GENERATION OF DIETARY ASSESSMENT METHODS

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Background and objectives: Quantifying how much people eat and drink remains an open research question. Mobile technology development has created a new era for assessment of dietary intake. These new methods show promise with regard to improved cooperation from study participants or patients and translation to more accurate results of energy and nutrient intakes. Benefits of these methods also include the additional detail about food and contextual information surrounding eating occasions. However, the reporting and the repeatability of these methods are hampered by the lack of standardized terminology associated with these new mobile methods. Therefore, the objective of this presentation is to outline a framework for identifying these new promising dietary assessment methods.

Methods: Efforts to standardize the language of this transition from traditional to mobile methods are needed

Results: Images taken with handheld devices or wearable cameras have been used to assist traditional dietary assessment methods (image-assisted methods). Image-assisted approaches can supplement dietary records or 24-hr dietary recalls. In recent years, image-based approaches using mobile devices or wearable sensors with embedded cameras have been developed (image-based methods). Image-based approaches capture all eating occasions with images as the primary record of dietary intake. The challenges of implementation of these new methods, their benefits, interoperability, and standardization will be covered.

Conclusions: Guidance in communicating these new methodologies will enhance their adoption and progression. The recommendations presented will improve reporting and the ability of

researchers and practitioners to identify best use method based on goals, study design, and sample characteristics.

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PREVALENCE OF OVERWEIGHT AND OBESITY AND ITS ASSOCIATION WITH SOCIODEMOGRAPHIC FACTORS AMONG A NATIONAL REPRESENTATIVE SAMPLE OF ECUADORIAN CHILDREN AND ADOLESCENTS

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Background and objectives: Overweight and obesity during childhood are important risk factors for noncommunicable diseases. We aim to assess the prevalence of overweight and obesity among children and adolescents and its associations with sociodemographic factors in a National representative sample from a middle-income country.

Methods: A national representative sample of 2-18 years old children and adolescents from the 2012 Ecuadorian National Health Survey (ENSANUT-ECU) was analyzed. Overweight, and obesity were defined applying the IOTF cut offs. Logistic regression models were set to identify sociodemographic factors (i.e. sex, rurality, geographic region, ethnicity, household income quintile and age) associated with overweight/obesity. The models were adjusted for the cluster design applying the svy command in Stata version 13.0.

Results: In total, 24,224 children and adolescents (8.2±5.1 years old) from the four geographic regions in Ecuador (Pacific-Coast, Andean-Region, Amazon-Rainforest and the Galápagos Islands) were included in the analysis. Overweight, obesity and morbid obesity affected 14.5% (95% CI, 13.2-16.4), 3.5% (95% CI, 2.7-4.6), and 2.2 % (95% CI, 1.8-2.8) of the studied population. Urban participants were 1.2 times (P=0.001; 95% CI, 1.1-1.3) more likely to be either overweight or obese in comparison with their rural pairs. Similarly, children and adolescents living in households in the higher income quintiles (P<0.001; OR: 1.7; 95% CI, 1.4-2.0) and adolescents (P=0.045; OR: 1.4; 95% CI, 1.0-1.8) were more likely to be either overweight or obese in comparison participants in the lower income quintiles and children respectively. No significant associations were found between overweight and obesity with either sex or geographic region.

Conclusions: The reported overweight/obesity prevalence are in line with those reported in the Latin American region. This

health problem seems to affect the whole country and to be predominant among urban and wealthier populations as well as when the population reaches adolescence. Although some actions have been already taken such as such the implementation of traffic light food labels and health promotion programs, more actions are still needed.

144/2210

NUTRITIONAL STATUS EVALUATION BY ANTHROPOMETRIC ASSESSMENT OF A GROUP OF WORKERS IN SÃO PAULO CITY, BRASIL

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Background and objectives: Since the 1970s, Brazil has undergone a reduction of malnutrition associated with an increase in obesity, a process called nutritional transition. The aim of the study was to evaluate the nutritional status of adult workers (19-59 years) of a shopping mall in the city of São Paulo, comparing the anthropometric evaluation data between those with sedentary (S) and non-sedentary (NS) work.

Methods: This was a descriptive cross-sectional study with primary data collection of 107 volunteers (64 females; 43 males), who met the inclusion criteria and had signed the informed consent. Data included: Weight; height; arm, waist (WC), wrist and hip circumferences; triceps (TSF), bicipital, subscapular and supraeiliac skinfolds, arm muscle circumference (AMC), sum of 4 skinfolds (S4SF) and the indexes BMI, central obesity (CO), waist to hip (WHR) and conicity index (CI). The S4SF was used to estimate the percentage of body fat and the results were compared to the BMI. Nutritional status and cardiovascular risk (CVR) was determined.

Results: BMI and WC showed a positive correlation with age in both sexes; 62,8% of men of all ages were overweight (46,5%) or obese versus only 34,4% women (29,7% overweight) irrespective of age differences between sex groups. AMC, TSF and S4SF does not correlate with BMI for neither sexes. For women, WC and WHR identified 18% and 3% of CVR respectively. The CI showed positive correlation with age in both sexes and a good correlation and precocity in the identification of CVR, especially for men. Of women at NS (n=38) and S (n=26) type of work, 68,4% and 57,7% presented with normal BMI respectively, even though in both groups a higher than average fat percentage (HPFM) was observed (NS=81,6%; S=92,3%). Similar results were observed for men (NS=9; S=34), with 66,6% of NS and 94,1% of S presenting HPFM.

Conclusions: BMI is an easy method to evaluate nutritional status of populations, but should be associated to other variables chosen in accordance to the ethnic group studied. The type of work might play an important role in the nutritional status and percentage of fat mass, but the present work fail to show it.

Keywords: Anthropometric evaluation. Nutritional Status. Cardiovascular risk.

Further collaborators:

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144/2212

ENERGY EXPENDITURE OF SELECTED DAILY ACTIVITIES IN ADULTS FROM NITERÓI, RIO DE JANEIRO, BRASIL

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Background and objectives: The assessment of the energy expenditure (EE) plays an important role in the assessment of the nutritional status and the treatment strategies of the population. The purpose of the present study was to measure the EE of selected daily activities and to compare the values with the code MET values of the Compendium of Physical Activities (CPA). The activities were: typing, organization of shelves, climb up and down 8 flights of stairs and walk on the treadmill at two self-selected speeds (pleasure, PV and exercise, EV) and PV-0.8.

Methods: This is a preliminary analysis of data of 33 adult (≥20y) subjects (25 women) recruited to participate in a larger study aimed to assess total daily EE by various methods. Resting EE (METm) was assessed with the subject sitting during 12'. The EE of each of the selected activities were measured for six minutes and expressed as multiple of METm (MMETm) or estimated MET (METe=3.5mLO2/kg/min). Body mass (BM) and stature (S) were also obtained. Body mass index (BMI) was calculated as BM/S2. Percent body fat (%BF) was measured by DXA.

Results: Mean (SD) age and BMI were 26.2 (6.6) and 23.7 (3.7) kg/m². Mean %BF was 32.7 (5.0) and 25.0 (9.3) for women and men, respectively. EE (kcal/min) of organizing shelves, climbing up and down the stairs was 3.0 (1.1), 7.0 (1.5) and 3.7 (1.0), respectively. MMETm was higher than MMETe by approximately 9% for all activities. Organizing shelves and PV-0.8 were classified as moderate activities (≥3 METs) only when METm was used. MMETm was 3.1 (0.6), 3.5 (0.6) and 4.8 (0.9) for PV-0.8 (3.8±0.5), PV (4.6±0.6) and EV (6.1±0.6km/h) and equal to the CPA codes for the last two. However, EE calculated by METe and the CPA codes was significantly greater that measured (mean difference of 0.51±0.69 and 0.65±0.9kcal/min, respectively). Climbing up stairs was the only activity classified as heavy (MMETm=6.9±0.8).

Conclusions: It is concluded that walking at PV can be considered as a moderate activity. Even though the CPA code MET values for walking at PV and EV were correct, their use will significantly overestimate the EE.

Keywords: Energy expenditure. Physical activity. Daily activities. Nutrition assessment.

144/2219

REFERENCE INTERVAL FOR METHYLMALONIC ACID IN DRIED BLOOD SPOTS OF YOUNG, ADULT WOMEN TO FACILITATE SCREENING OF VITAMIN B-12 DEFICIENCY IN FIELD SETTINGS

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Background and objectives: Maternal vitamin B-12 (B-12) status in early pregnancy has been inversely associated with impaired fetal development, including neural tube defects, and positively with infant B-12 status. Periconceptional B-12 adequacy is thus critical. Dried blood spots (DBSs) allow for convenient and cost-effective collection of biological samples in field settings. We have developed a method to quantify methylmalonic acid (MMA), the most specific functional B-12 biomarker, in DBSs. The objective was to calculate a reference value of DBS MMA in young adult women suggestive of functional B-12 deficiency.

Methods: In a convenience sample of 208 healthy women (19-35 years) living in Vancouver, Canada, DBSs were collected after pricking either middle or index finger. DBS MMA was quantified from an 8-mm spot by liquid chromatography-tandem mass spectrometry; plasma MMA and serum total B-12 and holotranscobalamin concentrations were determined. Dietary B-12 intake was assessed by food frequency questionnaire, and dosage of supplemental B-12 recorded. A reference value was computed from a reference population (mean ± SD age: 26.7±4.2 y), i.e. a subset of women with plasma MMA concentrations <370 nmol/L (92% of study population) and DBS MMA data (n=174), following clinical guidelines (CLSI EP28-A3c).

Results: The upper limit (90% CI) of the central 95% reference interval, computed after Box-Cox transformation and removal of 5 outliers (Tukey's test), was 8.9 (8.2-9.6) pmol/8-mm spot. The reference population had a median (IQR) DBS MMA concentration of 5.2 (4.2-6.3) pmol/8-mm spot. DBS MMA concentration was correlated with plasma MMA (ρ=0.65; P<0.0001) and serum total B-12 (ρ=-0.17; P=0.02) and holotranscobalamin (ρ=-0.22; P=0.004) concentrations. The median (IQR) plasma MMA and serum total B-12 and holotranscobalamin concentration of the reference population was 148 (114-185) nmol/L, 278 (200-373) pmol/L, and 66.5 (51.4-87.7) pmol/L respectively; the median (IQR) dietary and total (dietary and supplementary; 30%

supplement user) B-12 intake was 2.7 (1.9-4.0) µg/d and 3.7 (2.4-7.6) µg/d, respectively.

Conclusions: This is the first study to present a reference value for elevated DBS MMA computed from a healthy reference population of young adult women. Analysis of DBS MMA has the potential to be a convenient and field-applicable method that facilitates B-12 deficiency screening in reproductive-aged women.

Keywords: vitamin B-12 deficiency, methylmalonic acid, dried blood spots, reference interval, periconceptional

REDUCTIONS IN DIET QUALITY WITH TIME IN SINCE BENEFITS IN LOW INCOME WOMEN PARTICIPATING IN THE SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM IN THE UNITED STATES

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Background and objectives: The Supplemental Nutrition Assistance Program (SNAP) is the largest food assistance program in the United States, serving approximately 46 million individuals with program benefits. It transfers financial benefits once a month via an electronic card that can be utilized to purchase foods. Within the first 3 days of the month, a spike in food expenditure is noted, followed by redemption of 80% of the benefits within 2 weeks. The objective is to investigate changes in dietary quality in 151 women that occurred in response to fewer financial resources toward the end of the monthly cycle of SNAP benefits.

Methods: Subjects were recruited from low-income housing sites and neighborhood centers, informed consent was obtained, and a demographic survey was administered. At 1 week intervals, four more visits were conducted in which the participants completed a food frequency questionnaire (FFQ). It was validated for a reference period of 1 week and consisted of 95 food items, with varying frequency and serving size options. The initial administration of the FFQ was based on timing of the initiation of the monthly program benefit. The indicator of diet quality was the Healthy Eating Index-2010. Scores ranged from 0-100, based on 12 dietary subgroups, with nine adequacy and three moderation components. A mixed linear model was conducted with time as the independent variable, and diet quality and foods as the dependent variables. When significant main effects were detected, Bonferroni adjustments were conducted.

Results: Diet quality scores significantly declined as the month progressed, from 57.4 + 0.9 at week 1 to 45.6 + 1.0 at week 4. This was accompanied by a decrease in intakes of fruits, vegetables and dairy, and a higher consumption of whole grains. Total protein foods remained unchanged. Also, fewer home-prepared meals and increased eating outside the home were reported towards the end of the month.

Conclusions: The decline in dietary quality with time over the month from receipt of SNAP benefits might be mitigated by their allocations on a bimonthly basis. A more frequent distribution could provide a more even food supply and alleviate inconsistencies over time.

Keywords: diet quality, food assistance

EXCESS BODY FAT IN EUTROPHIC ADOLESCENTS AND RISK OF BLOOD PRESSURE CHANGE

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Background and objectives: The current adolescents lifestyle has collaborated for the body fat accumulation and chronic diseases development, such as hypertension. It is widely known that, in overweight individuals, there is a greater risk of blood pressure change. However, this risk is directly associated with excess body fat, which can occur in eutrophic individuals as well. The main objective of this study is to evaluate eutrophic adolescents body fat and the relation with the risk of development of blood pressure change.

Methods: A cross-sectional study that assessed adolescents aged 10 to 17 years old. The collected variables were weight (kg), height (cm) to calculate BMI (kg/m2), and were considered eutrophic adolescents ranked between -1 and +2 z-score of BMI according to the World Health Organization, 2007. To assessment of body fat, were used triceps and subscapular skinfold thickness, according to standard techniques, and body fat percent calculated according to the equations of Slaughter and classified by Lohman. To measurement of blood pressure Measurement protocol was followed, according to the V Brazilian Guidelines on Hypertension. The values of blood pressure were classified according to American Academy of Pediatrics recommendations - The fourth report on the diagnosis, evaluation, and treatment of high blood pressure in children and adolescents. Crude analysis between excess body fat and the independent variables were performed by univariated logistic regression. The binary regression analysis was used to estimate the values of chance (odds ratio–OR).

Results: Among 1774 adolescents assessed, 1123 eutrophic adolescents were selected, and 55.8% (n = 627) were female. The prevalence of excess body fat in eutrophic adolescents, boys and girls, were, respectively, 64.3% e 71.4%. It was verified that the risk of these eutrophic adolescents presenting a change in Sistolic Blood Pressure was 1.43 higher in relation to adolescents who did not present excess body fat (OR: 1.43 (0.98-2.09)), and for Diastolic Blood Pressure, this risk was 2.70 higher [(OR: 2.70 (1.78-4.10)].

Conclusions: It is concluded that there is elevated risk of eutrophic adolescents with excess body fat present alterations in

blood pressure, and this outcome is higher for diastolic blood pressure.

Keywords: Body fat. Nutricional Status. Eutrophy. Adolescent. Blood Pressure

Further collaborators:

Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text; Isa de Pádua Cintra helped to implement the study and to write thetext; Maria Aparecida Zanetti Passos helped the data collection, helped implement the study, and helped to write the textt; Mauro Fisberg was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

144/2257

NUTRI-CAMPECHADA 2016: NUTRIMETRY APPLICATION TO HIGH-SCHOOL ADOLESCENTS

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Background and objectives: Mexico is world first place in childhood overweight and obesity, four out of ten Mexican adolescents are overweight or obese and the trend is increasing, that's why Mexico is strongly committed to contributing any element that helps curb this epidemic. The objective of the study was to establish the use of Nutrimetry as an instrument for clinical and epidemiological surveillance of malnutrition as the first part of a program called "Nutri-Campechada" in a sample of high-school adolescents.

Methods: Nutrimetry is a tool that combines BMI/age with height/age and generates nutricodes that identify groups of nutritional risk allowing a timely malnutrition prevention. According to WHO z-scores values were assigned, for height/age: $z \leq -2 = 1$, $z \geq 2 = 5$, or 3 to the rest, and for BMI/age: $z \leq -1 = 0$, $1 \leq z < 2 = 6$, $z \geq 2 = 12$ or 3 to the rest, values were crossed and 12 codes that combine short, normal and high height with underweight, normal-weight, overweight and obesity were obtained.

Results: Data of 822 students of the "Instituto Campechano" between 15 and 18 years of age were evaluated. Weight and height were measured, BMI/age and height/age were calculated, and applying Nutrimetry, risk groups were classified in odd (1/3/5: underweight, 7/9/11: overweight and 13/15/17: obese) and even (4/6/8: normal weight) numbers. Prevalence were: 1 (n=6) 0.73%, 3 (n=29) 3.53%, 5 (n=0) 0.00%, 4 (n=46) 5.60%, 6 (n=292) 35.52%, 8 (n=0) 0.00%, 7 (n=44) 5.35%, 9 (n=222) 27.01%, 11 (n=0) 0.00%, 13 (n=22) 2.68%, 15 (n=161) 19.59%, and 17 (n=0) 0.00%.

Conclusions: Prevalence of overweight and obesity in the studied population (54.62%) is higher than the national average (36.3%). The problem of overweight and obesity is higher in males (57.36%) than in females (52.88%).

High height is very uncommon since no student was reported with this condition, also low height affects 14.36% of this sample, but only 0.73% of them were underweight and 8.03% overweight and obese.

Based on the results, Nutri-Campechada requires a permanent training intervention in the Mediterranean diet and physical activation addressed to the students to improve their nutritional condition.

Keywords: Nutrimetry, overweight, obesity, adolescents, nutrition assessment

144/2286

DEVELOPMENT OF AN INTERACTIVE TECHNOLOGICAL TOOL THAT USE THE LEAP MOTION CONTROLLER, AS A TOOL TO ESTIMATE FOOD PORTION SIZE: A VIABILITY PILOT STUDY

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Background and objectives: Estimation of food portion sizes has been a big challenge in dietary assessment. The aim of this work was to design and develop an interactive technological tool for the estimation of food portions through a virtual reality based on the Leap Motion® controller.

Methods: The interactive technological tool development was carried out in three phases: 1) Creation of food portions and photographs. We include 121 food portions sizes (fruits, vegetables, cereals, legumes, animal foods and fats). The food was cooked, weighed and in some cases measured before taking photographs. 2) 3D modeling food. In this phase the food portion sizes were 3D modeling with the next software: MAYA Autodesk 2016, Autodesk Mudbox 2016 and Adobe Photoshop. 3) Software development. To create the functional prototype of the Virtual Reality based in the Leap Motion® controller, we used the Unity software that is used for the creation of videogames.

Results: We designed and developed an interactive technological tool for estimation of food portion size based on the Leap Motion controller. Anyone can model with his/her bare hands a food portion size and the software could predict the portion size in grams. The first validation tests showed small differences between the food portion size estimated by the software and the real food portion size (weighed) for some food (watermelon, beans, cottage cheese, shredded coconut, read meat and chicken). The average differences was 8.4 g (SD 12.7 g) for the food mentioned before.

Conclusions: The interactive technological software that use the Leap Motion controller developed here, is a promising tool for a better food portion sizes estimation. Further work and investigation is needed in order to improve our development.

Keywords: Portion size estimation, dietary assessment, leap motion.

144/2300

IODINE NUTRITIONAL STATUS IN FERTILE AGE WOMEN IN THE PROVINCE OF JUJUY, ARGENTINA

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Background and objectives: INTRODUCTION: An iodine deficient diet is cause of hypothyroidism, mental retardation and IDD (iodine deficiency disorders). During pregnancy, iodine requirements increases. Adequate iodine supply must be achieved in preconception. Previous survey reported that pregnant population in Jujuy was iodine deficient.

OBJECTIVE: To establish iodine nutritional status in women of childbearing age in the province of Jujuy measuring urinary iodine concentration (UIC) and salt for consumption iodization levels

Methods: MATHERIAL AND METHODS: We randomly selected 98 healthy women between 14 and 40 years, living in Jujuy (without thyroid disease, pregnancy or taking iodine containing supplements). After informed consent, urinary casual sample and a household salt sample were obtained. The UIC was quantified by Persulfate method and iodine in salt by qualitative kit. A subsample (n = 77) by titration with thiosulfate. Median and percentiles of UIC were calculated and percentage of salts with adequate low or absent iodine content. We compared UIC of women taking salts of national and regional salts. We considered indicators of sustained IDD elimination if UIC median was between 100 to 199 UImg/l and > 90% of household salt iodine ≥15ppm. Statistic SPSS

Results: RESULTS: UIC median: 119 µg/L, range: 12-365 µg/L, distribution: 41.2% < 100ug/L, 52.6% between 100-199 µg/L, 4.1% between 200-299 µg/L and 2.1% > 300 µg/L; percentile 20: 54.4 µg/L, percentile 80: 165 µg/L.

Regional salts were consumed by 71.3%. The Kit detected 84.5% positive iodine and 15.5% without iodine (only detected in regional salts). Iodine content: 22.4 ± 15.39 ppm; 0.0-95.2 ppm range, >15 ppm the 74.0% between 20-40 ppm 61% and 17% without iodine measurable. UIC median was significantly higher in women consuming salt of national origin compared to regional salts (123 ug/L vs 117 ug/L respectively, p = 0.001).

Conclusions: CONCLUSIONS: Median urine iodine concentration in this study indicate iodine sufficiency. But iodine levels are under the recommended levels in 42% of the women. The goal of 90% of salt containing iodine ≥15ppm at household levels was not achieved. A preventive official plan must be implemented

Keywords: micronutrients, deficiency iodine, urine iodine, iodized salt.

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144/2316

NEW DIETARY ASSESSMENT TECHNOLOGY FOR INDIVIDUAL-LEVEL DIETARY DATA COLLECTION IN LOW-INCOME COUNTRIES: THE DEVELOPMENT PROCESS OF INDDEX24

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Background and objectives: Large-scale individual-level dietary surveys are infrequently conducted in low-income countries (LICs). Barriers include high resource requirements and limited research infrastructure for dietary assessment. As part of a multi-year effort to scale-up dietary assessment in LICs, the International Dietary Data Expansion (INDDEX) Project is investing in INDDEX24, a novel dietary assessment platform modeled on a multiple pass 24-hour dietary recall (24HR) and targeted to users in LICs. This study presents the systematic process used to identify INDDEX24's technical specifications and the results of preliminary testing carried out Bangladesh and Burkina Faso.

Methods: A multi-pronged approach was used to draft the INDDEX24 technical specifications. First, an initial list of technical specifications was drafted by a dietary assessment expert with in-depth knowledge and experience conducting 24HR surveys in LICs. Second, a literature review and qualitative research on existing 24HR platforms were conducted. Third, the INDDEX Project's Technical Advisory Group (TAG) and external technology experts evaluated the feasibility and validity of the technical specifications in terms of their appropriateness in the context of LICs.

Results: The INDDEX24 platform consists of a mobile application (app) for data collection and an integrated database website app for housing context-specific information required for processing 24HR data. It contains an interviewer-administered format, offline data collection capability, and is designed to be easily adapted to new contexts. INDDEX24 will also facilitate dietary

data processing by enabling researchers to link their food list to a contextually appropriate food composition database. A beta-version of INDDEX24 was developed and then evaluated by members of the INDDEX Project and TAG. Following revisions to the beta-version, the performance and user experience of a beta version of INDDEX24 was assessed in Bangladesh and Burkina Faso. Researchers in these countries suggested modifications to improve the usability of the platform. Additional in-depth feedback from cognitive debriefing with both survey respondents and enumerators was incorporated.

Conclusions: INDDEX24 has been developed by integrating feedback from a broad range of stakeholders and through extensive testing in a range of contexts. The efforts will help ensure INDDEX24 is a high quality, evidence-based tool for dietary assessment researchers in LICs.

Keywords: Dietary assessment. Food consumption data. 24-hour dietary recall. Low-income countries.

144/2328

BIG DATA METHODS AND PUPILLARY RESPONSE: CRACKING THE CODE OF DARK ADAPTOMETRY FOR VITAMIN A DEFICIENCY

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Background and objectives: The World Health Organization estimates that 9.7 million pregnant women exhibit night blindness, a severe form of dark adaptation, due to vitamin A deficiency (VAD). We have developed an innovative digital, quantitative field method leveraging pupillary responsiveness to structured light stimuli to assess functional VAD. Breakthroughs in image analysis and pattern recognition have revealed details of pupillary dynamics of up to 3000 consecutive data points on each subject's pupillary response over a 90 second window among pregnant women in rural Bangladesh.

Methods: We conducted an individually randomized, controlled trial among 488 women in late pregnancy in Gaibandha, Bangladesh from April 2015 to May 2016, supplementing half the women with a daily dose of 5,000 IU of vitamin A for 15 days. A blood sample was collected and women were assessed pre-and post-supplementation using a portable field dark adaptometer to record pupillary response to varying light stimuli (-2.9 to 0.1 c/m2). We present results of both conventional statistical analysis and machine learning and image analysis approaches to identify characteristic pupillary dynamic signatures associated with VAD and possibly, specific serum Vitamin A levels.

Results: 241 control and 247 supplemented women participated in the trial. Gestational age (28 weeks) and plasma retinol ($0.34 \pm 0.1 \mu g/mL$) levels did not differ between groups at baseline, though we see an intervention effect of increased plasma retinol levels among the supplemented group (difference of $+0.03 \pm 0.08$ versus -0.01 ± 0.08, p=0.002). Pupillary responsiveness was similar across groups at baseline and is being analyzed at follow-up. We have captured 1800-3000 pupillary response diameters on women with an example of early data on an individual participant included at this link (https://tinyurl.com/pupildata) to illustrate the heretofore uncaptured granularity and precision of pupillary dynamics captured in a rural, remote population.

Conclusions: We hope to demonstrate the practicality of digital field dark adaptometry as a method for point-of-population vitamin A status determination using the dynamics of pupillary responsiveness. Breakthroughs in mobile computing capacity and analytics continue to improve the feasibility of the method.

Keywords: Vitamin A deficiency, dark adaptometry, pupillary response, night blindness,

Further collaborators:

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IODIZATION OF SALT AS SUCCESSFUL STRATEGY, COMBATING IODINE DEFICIENCY DISORDERS (IDD) IN AFGHANISTAN

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Background and objectives: Iodine Deficiency Disorder (IDD) is serious public health problem among Afghan school aged children and reproductive age women. The Universal Salt Iodization (USI) program as main strategy combating IDD started in 2003 by operating of the first salt iodization factory and became a great success in Afghanistan, currently there are 31 salt iodization factories functioning in 14 out of 34 provinces with the capacity of 5-8 Metric Ton /hour each. The iodization of salt for edible consumption becomes mandatory in 2011 after enactment of national regulation by the government. The objective of this study is to present the success effect of salt iodization program on reduction of iodine deficiency in Afghanistan.

Methods: Reviewing the results of two National Nutrition Surveys (NNS) conducted in 2004 and 2013, to assess the impact of USI program, over the reduction of iodine deficiency in the country.

Results: According to the NNS 2013 reports, up to 66% of the households all over the country have access to and are using adequately iodized salt (>15 ppm) in the diet, and a significant improvement from 28% reported by the NNS 2004, the report also indicated that the prevalence of iodine deficiency among children 7-11 years and reproductive age women decreased to 29.5 % and 40.7% respectively, remarkable progress from 72% and 75% respectively among the same age groups. The comparisons of two data showing a remarkable iodine deficiency reduction of 35 percentage points (55%), as a result of 10 years successful salt iodization program implementation, furthermore, it will contribute to saving the brine damage and preventing the reduction of 10-15 IQ points of almost 395,000 out of 94, 2000(72% of total live births/year) afghan new-born children each year, causing as iodine deficiency.

Conclusions: since there is no any national program influencing the reduction of iodine deficiency, the salt iodization has been a successful strategy combating IDD in Afghanistan.

Keywords: Iodine Deficiency Disorder ,Brain damage ,10-15 IQ points ,salt iodization

DIET, ANTHROPOMETRY AND GUT PERMEABILITY IN MEXICAN CHILDREN WITH AUTISM SPECTRUM DISORDERS

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Background and objectives: Autistic Spectrum Disorders (ASD) comprise a group of developmental disorders, characterized by deficits in social interaction, communication, and behavioral patterns. Children with ASD may present nutritional challenges, specially as a result of their restrictive behaviors such as selective food intake, increased sensory sensitivity leading to rejection of food, disruptive behavior to specific foods and refusal to accept new foods. Aditionally, nutritional status can be affected by gastrointestinal problems that may be related to a leaky gut. The aim of the study was to evaluate diet, anthropometry and intestinal permeability of ASD children and teenagers.

Methods: A cross-sectional study was crried out in 22 ASD children and adolescents aged 4 to 18 years from the cities of Aguascalientes and Querétaro, México. Diet was evaluated by means of three 24-hour recalls a food frequency questionnaire. Weight and height were measured by duplicate and BMI was stimated and compared with WHO z score. Intestinal permeability was evaluated by a lactulose/mannitol test and its subsequent measurement in urine by HPLC.

Results: At the end of the study it was observed a high prevalence of malnutrition, 18.2% of the participants have low weight for height and 50% have overweight or obesity; the diet was unbalanced with a high content of fat and refined sugar, and a poor consumption of fiber (13.0g ± 5.2), vitamin E, vitamin D, potassium, calcium and zinc. Intestinal permeability was in average 0.01 ± 0.02 and it was adequate in 80% of the sampe.

Conclusions: In this study it was found that participants have deficient consumption of some vitamins and minerals, but high ingestión of fat and sugar, and a hight percentage of participants have overweight or obesity, its advisable to developt food counseling strategies for children with ASD. In contrast with previous studies, intestinal permeability was adecuate in Mexican children with ASD.

Keywords: Autism spectrum disorders, anthropometry, diet, gut permeability.

ASSOCIATION BETWEEN INDIAN DIABETES RISK SCORE (IDRS) AND NON IDRS COMPONENTS AMONG INDIAN ADULTS

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Background and objectives: Prevalence of Type 2 diabetes is increasing at an alarming rate globally. It is a major risk factor for death and other non-fetal complications. WHO reports that one fifth (19%) of the total diabetics, reside in India (35 million). It is projected that it will increase to 80 million 2030. Indian Diabetes Risk Score is a simple, cost effective tool devised by MDRF to determine high risk individuals at an early stage. There is a need to assess a correlation between the risk score and other modifiable non-IDRS components which can be further focused on to reduce the risk of Diabetes and CHDs in future. Thus, a study with an aim to derive an association between IDRS and Non-IDRS components in urban population of Pune was developed.

Methods: A cross-sectional study involved N=185 healthy individuals aged between 20 and 50 years, randomly selected from a free living setting in Pune city. Other than IDRS components (Age, Waist Circumference, physical activity and family history), non IDRS components like anthropometric measurements, dietary data, random blood sugar level (BSL), blood pressure (BP) and lipid profile were also assessed.

Results: The findings revealed that 24.9% of the population had high risk of diabetes; where as 33% had moderate risk of diabetes. IDRS showed a significant positive association (p<0.01) with BMI, carbohydrate intake, blood pressure, random BSL, change in appetite and FRS. However, a negative association (p<0.05) was found between IDRS and protein and fat intake, flax seed consumption and nature of physical activity.

Conclusions: IDRS and non-IDRS components are strongly associated, which indicates an increased risk of Diabetes, if not modified with due attention. To reduce ever increasing burden of diabetes in the community, it is essential to undertake mass screening program. So that appropriate interventions can be delivered to prolong occurrence of Type 2 diabetes in productive population.

Keywords: IDRS, Body Mass Index, Waist Hip ratio, Framingham Risk Score

SELENIUM PATHWAY GENOTYPES ARE ASSOCIATED WITH COLORECTAL CANCER RISK AND MODIFIED BY SELENIUM STATUS

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Background and objectives: Suboptimal intakes of the essential micronutrient selenium (Se) and selenoprotein genetic variation may contribute to colorectal cancer (CRC). Here, we examined the associations of single nucleotide polymorphisms (SNPs) in the Se pathway and their Se status interactions with CRC risk in the European Prospective Investigation into Cancer and Nutrition (EPIC) study.

Methods: Using an Illumina Goldengate assay, we simultaneously genotyped all SNPs in 164 Se pathway genes (comprising all 25 selenoprotein genes, selenoprotein biosynthesis / transport genes, and metabolic pathway genes) using 1264 candidate functional and common tagging SNPs. From these assays, 1040 variants in 154 genes were successfully assayed in DNA samples from 1478 CRC case-control pairs matched within EPIC. Multivariate logistic regression was used to determine the association of SNPs in the Se pathway with CRC risk. Pathway and gene based analyses were also performed using the PIGE package Adaptive Rank Truncated test.

Results: Genotypes for 144 SNPs in 63 genes were associated with an altered CRC risk However, none of the associations in the selenoprotein genes remained significant after Benjamini-Hochberg multiple-testing correction, although the Thioredoxin Reductase 1 (TXNRD1) rs11111979 SNP retained significance with gene-wide PACT (P values adjusted for correlated tests) considerations. SNP genotypes in cell-signaling pathway genes (FRZB, SMAD3, and SMAD7) known to be affected by Se intake were also significantly associated with CRC risk after multiple testing adjustments. Additionally, genetic variations were shown to interact with biomarkers of Se status (as assessed by serum Se and Selenoprotein P concentration) to alter CRC risk. Pathway analyses also suggest that SNP only and SNP X Se interactions in selenoprotein, antioxidant, apoptosis and TGF-beta signaling pathways may alter CRC susceptibility risk.

Conclusions: Detailed investigation of Se intake levels and metabolism is needed to further explore relevance for CRC

etio-pathogenesis, especially for individuals of particular Se pathway genotypes and/or those with suboptimal Se status.

Keywords: selenium, selenoproteins, colorectal cancer, single nucleotide polymorphisms, prospective cohort

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SORGHUM COOKIES ENRICHED WITH CAROTENOIDS FROM SWEET POTATO KEEP HIGH IRON BIOAVAILABILITY IN WISTAR RATS

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Background and objectives: Iron deficiency anemia is the most common nutritional disorder worldwide and reaches over 30% of the world's population. Sorghum is a cereal which contain many phenolic compounds and vitamin E, but has low iron levels. Evidences indicated which the carotenoids can increase the iron diet absorption, the mobilization in the liver storage and the erythropoietic process. So the Embrapa is producing in its experimental fields the sweet potato Beauregard biofortified with carotenoids since the sweet potato is a popular root rich in carbohydrates with low glycemic index. The aim of this study was to evaluate the iron bioavailability of the cookies development with sorghum and sweet potato biofortified with carotenoids.

Methods: In the first phase of the experiment, 21 rats were fed with depletion diet Fe-free during three weeks. Following, the rats were divided in three groups: a control ferrous sulphate (AIN-93G) and two tests with the cookies enriched with carotenoids (D-ECD, dry enriched cookie diet; and E-ECD, extruded enriched cookie diet) for two weeks. Were analyzed the biometry, iron bioavailability, total antioxidant capacity (TAC) and genes expression of the duodenum and liver.

Results: The body weight did not differed among the experimental groups, although the weight gain was lower in the group fed with dry enriched cookie diet. In addition, the group fed with D-ECD also had lower food intake but the feed efficiency ratio did not differed among the three groups. Although the difference in iron intake, all bioavailability parameters, hemoglobin, hemoglobin gain, hemoglobin regeneration efficiency, and its relative biologic value were similar to the three experimental groups. TAC in plasma was similar between the groups fed with D-ECD and E-ECD and higher when compared with the AIN-93G due the antioxidant compounds intake. In addition, the expression of the enzymes related with iron metabolic pathways, ferroportin, hephaestin, divalent metal transporter-1 and duodenal cytochrome B,

investigated in the duodenum increased and ferritin investigated in the liver decreased.

Conclusions: Therefore, the addition of sweet potato biofortified with carotenoids increased nutritional value of the sorghum cookies and became potential functional food to prevent or control iron deficiency anemia.

Keywords: acceptability; sweet potato; iron deficiency anemia; total antioxidant capacity; genes expressionacceptability; sweet potato; iron deficiency anemia; total antioxidant capacity; genes expression

Further collaborators:

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PREVALENCE OF HOSPITAL MALNUTRITION IN CHILDREN UNDER FIVE YEARS OF AGE IN A HOSPITAL OF REFERENCE

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Background and objectives: Malnutrition in hospitalized pediatric patients remains a common finding and a frequent cause of increased morbidity and mortality in children and adolescents. The percentage of intra-hospital infant malnutrition ranges from 6% to 35% and in Latin American hospitals on average 11%. The main objective was to determine the prevalence of hospital malnutrition among children under five years of age admitted to the Pediatric Service of the Clinic Hospital, FCM-UNA.

Methods: Prospective descriptive, longitudinal, observational study included patients of both sexes older than 1 month and under 5 years admitted to the Pediatric Service of the de Clinic Hospital, FCM-UNA during the period from January 1, 2016 to June 30, 2016, whose hospital stay was greater than 48 hours. Sampling: Non-probabilistic of consecutive cases, for convenience. Variables: age, sex, origin, birth weight, gestational age, weight at admission and discharge, height, breastfeeding, beginning of complementary feeding, maternal schooling, maternal occupation, diagnosis of admission, complications, hospitalization days, enteral feeding and / or parenteral, fasting, evolution. Sample size: 361 patients less than five years of age. The nutritional status was evaluated by z Weight/Age, z Weight/Size, z Size/Age) (WHO 2006, ANTHRO). Statistics: parametric and non-parametric measurements. T Student. Significance: p <0.05.

Results: Of a total of 1,183 hospitalized patients, 607 (51.4%) were younger than 5 years, 361 met the inclusion criteria. 51.5% Male; 56% were younger infants, 21% were older infants and 23%

were preschoolers; Age range 1-59 months (average 15.2 m). $\overline{X}$ Days of hospitalization: 7.1 days (2-47 days) At admission, the prevalence of global malnutrition was 25.8%, acute malnutrition 22.4% and chronic malnutrition 28.8%; Hospital malnutrition: 8.2%. Children with malnutrition were characterized by: low birth weight, breastfeeding of less than five months, parents with a monthly family income of a minimum wage, who consulted for a basic pathology. The association of enteral nutrition use and weight gain was significant (p = 0.02). No child presented kwashiorkor. No deaths were recorded.

Conclusions: The prevalence of hospital malnutrition in children under five years of age is 8.2% in a referral hospital. It is higher in the infants group.

Keywords: hospital malnutrition, nutritional status, Infants

144/2397

NUTRITION AND HEALTH MONITORING SYSTEM DEVELOPMENT IN THE US AFFILIATED PACIFIC: THE CHILDREN'S HEALTHY LIVING NETWORK

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Background and objectives: The US Affiliated Pacific Islands are underserved by the US national health and nutrition monitoring system. The importance of having reliable anthropometric data was highlighted with the recent Zika virus outbreak in the region, with critical sequelae identified with infant head circumference measurements (microcephaly), and for monitoring obesity in a region with the highest rates of obesity and non-communicable disease in the world. The Children's Healthy Living (CHL) Network has expanded its partnership beyond Colleges and Headstart programs to include Departments of Health, in partnership with the Pacific Island Health Officers Association (PIHOA)(CHL USDA/AFRI Grant#: 2011-68001-30335, Novotny R, PI; PIHOA CDC/NACDD Cooperative Agreement # 1412016, Techur-Pedro

A, PI). The CHL Network aims to develop and maintain a regional anthropometric monitoring system through partnerships of land grant colleges and health departments to provide data for decision-making.

Methods: Training, standardization and coordination of research and health program personnel in anthropometric measures were done in 11 jurisdictions, according to protocols developed by CHL and later expanded to 3 age groups: 0-1 y (length, weight, head circumference), 2-10 y (height, weight, waist circumference at the umbilicus), 11+ y (height, weight, waist circumference at the iliac crest)(Li et al. 2015).

Results: Each US affiliated Pacific jurisdiction now has at least 1 standardized anthropometric measurer in at least 1 age group. With a core of regional anthropometric measurers in the 2-10 y range (145 height, 154 weight, 109 waist), measurers are now being trained in infant (24 length, 24 weight, 24 head circumference) and adult measures (52 height, 50 weight, 1 waist circumference). Increasing the number of standardized measurers and developing a sustainable anthropometric monitoring system that includes quality assurance is in process for the region.

Conclusions: College and health leaders in the US affiliated Pacific region have formed a network to provide on-going training and skill development in order to gather and maintain standardized anthropometric information useful for decision making related to non-communicable and communicable diseases critical to the region.

Keywords: Pacific, anthropometry, height, weight, circumferences

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144/2407

THE IMPACT OF TASTE PREFERENCES ON MACRONUTRIENT INTAKE

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Background and objectives: Recent evidence has suggested that there are multiple links between taste preferences and food choices and the amount of food consumed. In this study, we aimed to investigate whether there is an impact of taste preference on macronutrient consumption in healthy adults.

Methods: This study compromised 46 adults aged between 18-40. Socio-demographic characteristics and anthropometric measurements of the individuals were taken by dietitians. Participants' 24 hour food recall was also taken for determining the nutrient intakes by specialized dietitians. The results were evaluated by the statistical program SPSS.

Results: The great majority of participants reported that they like sweet taste (93.5%). Participants 69.6 % like soury taste and 60.9 % salt taste. Because umami taste is a new taste for consumers, it was found that 50.0% of the participants did not have an idea

about the taste of umami and 28.3% disliked it. The mean energy intake of the participants was 2038.4 ± 678.34 kkal. According to the participants' 24-hour food recalls, the average percentage of energy from carbohydrate, fat and protein intake were 47.9 ± 9.31%, 37.2 ± 8.66% and 14.9 ± 3.50% respectively. The fat intake of the participants who like sweet taste (37.%) was higher than non-likers of the sweet taste (26.3%) (p=0.02). Also participants who like bitter taste fat intake were higher than non-likers of bitter taste (p>0.05). Fat intake levels were lower who likes mostly soury and salty taste when compared to sweet and bitter taste likers. Daily protein intake of the salty (p>0.05) and soury taste (p<0.05) likers were higher than the sweet and bitter taste likers. The participants like salty taste daily protein intake were 5 g higher than the non-likers salty taste (p>0.05).

Conclusions: There was a relation between fat, protein intake of the participants with taste preferences. There are evidence on oral and pharyngeal recognition of the nutrients is proposed as a mechanism for regulating nutrient intake. Further experimental studies need to investigate the taste preference and its affect on nutrient intake .

Keywords: taste, nutrient intake, food choice

144/2426

USE OF COMPUTER VISION TECHNIQUES FOR AUTOMATIC FOOD CLASSIFICATION BY SIZE

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Background and objectives: Computer vision (VC) techniques are a novel tool for the food and nutrition area. The classification of foods according to size using VC techniques would allow the estimation of portion sizes and grams, optimize the evaluators time and reduce subjectivity, but research in this area is still incipient. Therefore, we set out to develop an automatic and reproducible method of food classification by size.

Methods: To evaluate the method we used oranges, which are much consumed and are available in the local market. We measured the dimensions (greater diameter) of the oranges with a caliber and weighed each one of them, later we classified them in: small, medium and large. We created a closed environment to obtain high quality images, and developed a program that takes the obtained images as input data and we applied VC techniques which includes image processing, segmentation, extraction of characteristics and classification using the algorithm KNN. Finally we estimated the sensitivity and specificity of the results obtained through the program.

Results: We obtained photographs of 207 oranges (124 used for training of the program (60%) and 83 for the corresponding tests of the same (40%)), the average greater diameter according to the measurements of the expert was 69.1 ± 4.4 millimeters and the obtained from the program was 68.9 ± 4.1. The Pearson correlation showed r = 0.68 (p <0.001). The average difference between the expert and the program measurements was 0.20 ± 3.4 (p> 0.05). After 100 training with random assignment of oranges in the ratio of 60% to 40%, the program had a sensitivity and specificity equal to 1.0.

Conclusions: The proposed method could provide assistance to nutrition professionals in the process of estimating the size of foods and consequently portions and grams. The database of images and physical measurements generated would enable more studies in the area.

Keywords: Computer vision, Food, food classifications

144/2428

IDENTIFYING DIETARY STRATEGIES TO IMPROVE NUTRIENT ADEQUACY AMONG ETHIOPIAN INFANTS AND YOUNG CHILDREN USING LINEAR MODELLING

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Background and objectives: Optimal Infant and Young Child Feeding practices are crucial for child survival but lack guidance from local food-based dietary guidelines, that incorporate fortified products, to ensure nutrient adequacy in Ethiopia.

Methods: Based on data from the Ethiopian National Food Consumption Survey, linear programming (LP, Optifood) was used to identify nutrients lacking in local diets of young children (6-8, 9-11 and 12-23 months) and to formulate realistic Food Based Dietary Recommendations (FBDR) for improved nutrient adequacy in four regions by comparing alternative approaches of local complementary foods, micronutrient powders (MNPs), Small quantity Lipid based Nutrient Supplement (Sq-LNS) and combinations of these.

Results: Optimised local diets provided inadequate zinc in all regions and age groups, inadequate iron for infants < 1 year of age

in all regions, and inadequate calcium, niacin, thiamin, folate, vitamin B12 and B6 in some regions and age-groups, but not in all. The set of regional FBDRs were significantly different for the four regions thus development of one general national FBDRs will be a challenge. Promoting a more diverse diet such as increasing vegetables, legumes and animal source food consumption improves nutrient profile of the diet to a certain extent. Nevertheless even after the FBDRs; some nutrient intakes remain suboptimal.

Conclusions: The best nutritional option to solve the nutrient gaps identified is a combination of regional FBDRs with MNP supplementation. It is important to emphasize that MNP should not replace the feeding recommendations, but should be promoted in addition to these FBDRs together with breast-feeding on demand during the first two years of age.

Keywords: Complementary food, Optifood analysis, food based dietary recommendations, problem nutrients, young children.

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NUTRITIONAL STATUS BY GENDER, AGE RANGE, SEL AND REGION AMONG ARGENTINE POPULATION. RESULTS OF ELANS STUDY

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Background and objectives: Obesity's comorbidities are the major cause of morbidity and less quality of life in adult population all over the world. The aim of this study was to evaluate the prevalence of overweight (OW), obesity (OB) and underweight (UW) in a representative sample population of Argentina.

Methods: Data were obtained from 1266 Argentines participating in The Latin American Health and Nutrition Study (ELANS), a multicenter study of a nationally representative randomized sample of urban population of 8 LA countries between November 2014 and July 2015. The sample had a multistage design stratified by geographical location (6 regions), age (15-65 y), gender and Socio Economic Level (SEL). A standard study protocol was designed to evaluate 6 anthropometric measurements including weight and height. A questionnaire to classify SEL was administered. Sample expansion factors were calculated and descriptive statistical data analysis was performed with SPSS Statistics 20.

Results: Overall OW, OB and UW prevalence were 32.2%, 23.2% and 4.9% respectively. Analyzing by gender, up to 20 years of age, the prevalence of OW including OB was higher for men, but OB prevalence was higher for woman between 35 and 49 y (32.1% vs. 23.3%). On the other hand, the prevalence of UW, up to 20 years old, was higher for women (12.4% for 20-34 y). Comparing by SEL (high, medium and low) OW including OB prevalence was 61.8%, 57.4% and 52.7% respectively, while the highest prevalence of UW (5.7%) was observed on low SEL population. Analyzing by region the prevalence of OW including OB was higher for men in Buenos Aires Metropolitan Area, Cuyo and South regions (65.2%, 72.8%, 65.2%), while for women was higher in Pampeana, Northwest and Northeast regions (58.5%, 56.8%, 55.7%). South region had the highest prevalence of OW including OB (63.1%) while Pampeana region had the highest prevalence of UW (8.1%).

Conclusions: More than 50% of the Argentine population is above the BMI considered healthy. Minimal differences were found between genders and regions but a special public health consideration should be centered in the trans-generational tracking of adiposity in woman.

Keywords: Nutritional Status, Argentine population, multicenter study

Further collaborators:
on behalf of the ELANS Study Group

REPORTED DIETARY INTAKE: ANALYSIS OF CAL-CIUM USUAL INTAKE AMONG ARGENTINE POP-ULATION. RESULTS FROM ELANS STUDY

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Background and objectives: The consumption of calcium is associated both with the prevention of many diseases and also with quality of life (1). This study aimed to identify the adequacy of calcium intake among Argentine population.

(1) Mueller, N. T., & Appel, L. J. (2017). Attributing Death to Diet: Precision Counts. Jama, 317(9), 908-909.

Methods: Data were obtained from 1266 Argentines participating in Latin American Health and Nutrition Study (ELANS), a multicenter study of a nationally representative randomized sample of urban population of 8 LA countries, developed between November 2014 and July 2015. The sample by country had a multistage design stratified by region, age (15-65 y), gender and SEL. A standard study protocol was designed to evaluate nutritional intake assessed by two 24-hour recalls, analyzed with the Nutrition Data System for Research (NDS-R) from Minnesota University, after a standardization process between local food and NDS-R database. Calcium usual intake was estimated with the Multiple Source Method (MSM) statistic package (https://nugo.dife.de/msm) and adequacy estimated in comparisons with Recommended Dietary Allowances (RDA) (IOM standards). Sample expansion factors were calculated and descriptive statistical data analysis was performed with SPSS Statistics 20.

Results: Median of usual consumption of the whole sample was 777 and 689 mg/day in men and women respectively. Both female adolescents and women above 50 consume a median of 50% of RDAs: 646.1 and 655,4 mg/day respectively, adding that 99% and 98,5% of the population of those groups of ages were below recommendations. Although the RDA decreases at 20-49 y, the prevalence of inadequate usual intake was 90.9%-86.9%. Younger males (15-19) and older ones (50-65) consume more calcium than women of same ages (855.7 mg/day and 746,7 respectively) but, the prevalence of inadequate usual intake was 94.4% and 90.3% respectively, for equal RDAs.

Conclusions: The prevalence of inadequate usual intake of calcium for Argentine population, at every age range and gender is very high. These results reinforce the importance of public health programs focused on increasing calcium consumption and implementing micronutrients fortification specially in women.

Keywords: Calcium, inadequate usual intake, Argentinian population, multicenter study.

CHARACTERISTICS OF THE DIET IN THE ARGENTINE POPULATION. RESULTS OF ELANS STUDY

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Background and objectives: The diet is determinant in the development of chronic diseases. The aim of this study was to assess energy intake (EI) and macronutrients intake (MI) and distribution (MD) of the Argentine population

Methods: Data from 1266 Argentine people (15-65 y) participating in the Latin American Health and Nutrition Study (ELANS), a multicenter study developed in urban areas of 8 LA countries. Intake was assessed by two face to face 24-hour recalls (November 2014-July 2015), and processed by the software Nutritional Data System for Research (NDS-R). Daily intake was analyzed by age, gender, socioeconomic level (SEL) and region (Buenos Aires Metropolitan Area, Cuyo, Pampeana, Northwest,

Northeast and South). The median values of EI and MI and percentages of MD were calculated. Sample expansion factors were calculated and descriptive statistical data analysis was performed with SPSS 20.

Results: The median of EI was 2154 kcal/day (2434 kcal/day in men and 1911 kcal/day in women). The MI was 271 g/day of carbohydrates, 85 g/day of protein and 78 g /day of fat (51%, 16% and 33% of EI respectively). Saturated fats accounted for 11.5%, monounsaturated fat 10.3% and polyunsaturated fat 7.7% of EI. The cholesterol intake was 375 mg/day. The added sugar was 15% of the EI. It was observed that EI decreased inversely with age (2667 kcal/day in men aged 15 to 19 years and 1712 kcal/day in women between 50 and 65 years)., EI values showed no differences by SEL. In men, differences were found in MD: high SEL men increased proportion of fats and proteins (35% and 17% respectively) in comparison with low SEL men (32 and 15%). EI was not different due to a compensation effect of CHO. By region, EI ranged from 1994 kcal/day in the Pampeana region to 2307 kcal/day in the Northwest. No significant differences were found in MD by age.

Conclusions: In Argentina, population diet showed high levels of critical nutrients as saturated fats, cholesterol, and added sugars, all related to cardiovascular disease and metabolic syndrome. Differences by region and by SEL were found and should be taken into account by public health stakeholders.

Keywords: Energy intake, macronutrients, Argentine population, multicenter study.

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Further collaborators: on behalf of the ELANS Study Group

fat distribution. In this regard, a new index, called the Lipid Accumulation Product (LAP), has been proposed. The aim of this study was to compare LAP and BMI measurements and to determine cutoff point values for LAP and BMI in apparently healthy Brazilian adults men.

Methods: A cross-sectional study was conducted with 130 apparently healthy Brazilian adults men (20-59 years). Anthropometric data, including weight, height and waist circumference, were determined. Triglycerides were determined by enzymatic colorimetric method. The lipid accumulation product was calculated as (waist circumference [cm] − 65) × (triglycerides concentration [mM]). Percentage of body fat mass was obtained by Tetrapolar Bioelectrical Impedance Analysis. It was considered as cutoff point for elevated percentage of body fat mass values ≥ 25%. The statistical analysis consisted in construction of ROC curves (Receiver Operating Characteristic Curve) and was carried out using Medcalc version 12.7.

Results: A strong correlation was found between BMI and percentage of body fat mass (r=0.71; p<0.001). BMI and LAP also showed a strong correlation (r=0.67; p<0,001), as well as, LAP and percentage of body fat mass (r=0.69; p<0,001). According to these results, the ROC curve analysis showed accuracy for BMI (AUC=0.886±0.057) and for LAP (AUC=0.823±0.068) regarding the discriminatory ability for detect elevated percentage of body fat mass. The cutoff point value of 39.3 cm.mmol/L for LAP provided a sensitivity of 73.3% (95% CI: 44.9-92.0%) and specificity of 81.7% (95% CI: 73.4-88.3). Whereas, the cutoff point value of 27.1 kg/m2 for BMI provided a sensitivity of 86.7% (95% CI: 59.5-98.0) and specificity was 88.7% (95% CI: 81.4-93.8%).

Conclusions: The LAP may be an alternative to measure adiposity; however, the BMI is a simple, inexpensive and reliable tool that showed great ability in discriminating elevated values of percentage of body fat mass in apparently healthy Brazilian adults men.

Keywords: Adiposity. Body Mass Index. Lipid accumulation product. Obesity.

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LIPID ACCUMULATION PRODUCT UTILIZATION IN BRAZILIAN ADULTS MEN: COMPARISON WITH THE BODY MASS INDEX

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Background and objectives: Obesity (defined as an excess accumulation of body fat) is a complex multifactorial condition that has reached epidemic proportions. The Body Mass Index (BMI) is the most commonly used indicator to assess obesity. This indicator evaluates generalized obesity, but does not measure body

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ANTHROPOMETRY AND THE MEAL PATTERNS AMONG UNIVERSITY STUDENTS IN KENITRA CITY, MOROCCO

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Background and objectives: Morocco, in full economic, social and cultural transition, experiencing urbanization increasingly greater causing changes in lifestyle and dietary habits. The objective of this study was to evaluate nutritional status by Anthropometry and determines the meal patterns of university students in Kenitra city, Morocco.

Methods: The anthropometric survey was conducted on 150 university students with average age (24.15years ± 4.6). Body Mass Index (BMI) was adopted to evaluate nutritional status by Anthropometry. A self-administered questionnaire was used to collect data about sociodemographic features of the students and their families, as well as meal habits of students.

Results: The finding showed an average Height of subject (1,64m ± 0,1 cm), the mean weight was (60.9 kg ± 10.7 kg); the mean of IMC (22.36+3.5); stunting (10%), thinness (9.3%), a risk of overweight (16%) and obesity (1.3%). About 73.7% of students eat three meals per day (70,7% for breakfast, 87,7% for lunch and 62,7% for diner). Snacks were eaten daily by 60 % of students. The majority drinks at breakfast tea (39.3%), coffee (13.3%) and eat Bread, cheese and olive oil (53. 3%).At the lunch, students eat bread (84%) with Tajine of meat (39%) and fruits (71.3%). At the dinner, most students eat bread)66.7%(and the pasta or tajine with meat (48%). 68.7% hydrate daily (1.7L per day),62% consume daily fruits and vegetable.

Conclusions: Students practice meals based on cereals. Interventions are needed to promote healthy eating habits among students.

Keywords: Anthropometry, nutritional status, meal patterns, university students, Morocco

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NECK CIRCUMFERENCE TO IDENTIFY EXCESS ADIPOSITY IN HOSPITALIZED PATIENTS

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Background and objectives: Obesity has a great impact on health, due to its complications. Anthropometric measures are able to identify the upper-body subcutaneous fat accumulation, such as neck circumference (NC), which presents a strong correlation with adiposity. The objectives of this study was to evaluate the prevalence of adult and elderly patients hospitalized with excess adiposity through NC, and verify the correlation of NC with BMI (Body Mass Index) in these patients.

Methods: A cross-sectional study, with secondary data from a hospital in the city of Taubate, Sao Paulo, which evaluated hospitalized adults and elderly, among February 2015 and May 2016. The variables analyzed were weight, height, BMI, NC, sex and age . For classification of nutritional status, the cutoff points proposed by the World Health Organization (1995), for adults and Lipschitz for the elderly (1994), were used. The cutoff points for elevated NC were 37 and 34 cm, for men and women, respectively. Data analysis was performed using descriptive statistics. Pearson's correlation test was performed to verify the correlation between NC and BMI.

Results: Among 628 patients selected, 579 were the final sample, of which 53.88% (n = 312) were female. The mean age, for the female and male sex was 66.2 ± 15.78 and 63.48 ± 13.88, respectively. It was verified that 76% of the female patients and 67.4% of the male patients presented elevated NC. Considering the groups of patients with and without overweight by BMI, 65.82% and 34.17% of the women, 64.44% and 35.55% of the men presented elevated NC, respectively. There was a strong correlation between NC and BMI for males (r = 0.85) and female (r = 0.90).

Conclusions: It was concluded that there was high correlation between NC and BMI for both sexes, and higher prevalence of overweight women who presented elevated NC. In relation to the non-overweight patients, there was a higher prevalence of males for this outcome.

Keywords: Neck Circumference, Anthropometry, Excess Adiposity, Hospitalized Patients.

Further collaborators:

Adriana Aparecida da Silva Alvarenga helped to implement the study and to write the text; Adriana Lisboa Mendes Roman helped the data collection, helped implement the study, and helped to write the text; Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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UNDERREPORTING OF ENERGY INTAKE IN A PROBABILITY SAMPLE OF THE BRAZILIAN ADULT POPULATION

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Background and objectives: Energy intake (EI) is an important measure in detailed nutritional assessment in clinical and re-

search settings. However, there has been recent strong criticism on the self-reported methods used to obtain EI in populations, which yield low, unexplained, and sometimes unusable, values primarily in women and obese. The EI/basal metabolic rate (BMR) ratio has been suggested to provide clues on who underreports EI. In 2008, EI was obtained in a probability sample of the Brazilian 10y+ population by a 24h dietary recall (24HDR). This study reports the relationship between EI and BMR of the sub-sample of Brazilian adults (≥20y) in an attempt to quantify the level of EI underreporting.

Methods: Data from 25949 subjects (14052 women) aged 20-104y were used in the analysis. BMR was estimated by two set of equations: 1) the Schofield equations using body mass and stature (SCHO) suggested to be used internationally by FAO/WHO and 2) equations developed in a probability sample of the adult population of Niterói, a urban area in the Metropolitan area of Rio de Janeiro, Brazil (BRA). The latter equations have been validated in adults from the same town. EI/BMR of 1.53 was used as the cutoff to identify underreporting. The values were weighted to represent the Brazilian adult population.

Results: Overall mean (95%CI) EI was 1728.6 (1719.3;1737.9) kcal/day, being higher in men (1941.4, 1926.4;1956.5) than in women (1521.6, 1510.9;1532.2) kcal/day. Estimated BMR by the SCHO equations (1523.6, 1520.6;1526.5kcal/day) was significantly higher than the BRA equations (1259.5, 1257.0;1262.0kcal/day). Mean EI/BMR ratio varied from 1.06 to 1.21 depending on age and sex when the SCHO equations were used and between 1.26 and 1.48 with the BRA equations. EI underreporting varied from 78 to 88% when using the SCHO equations and 59 to 74% when the BRA equations were used. Using the latter equations, underreporting was 64% and 69% in all men and women, respectively.

Conclusions: EI assessed by a 24hDR is underestimated by more than 60% of the Brazilian adult population. Caution is warranted when using 24hDR to estimate EI in adults in Brazil.

Keywords: Nutrition Assessment, Basal metabolism, Adults, Diet.

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ger, satiety and binge eating scale scores on caloric estimation in healthy subjects.

Methods: This study was conducted with 46 healthy volunteers in Ankara, Turkey. Anthropometric measurements, body compositions were examined. Binge eating scale was evaluated on participants to identify the risk of binge eating disorder. Moreover, 24-hour recall food records were taken from subjects. To determine the effect of hunger and satiety situations on caloric estimations of some specific foods, a protocol was developed. Participants were asked to estimate the energy content of the foods in hunger and satiety status.

Results: The mean age of subjects was 22,9±4,4, and mean BMI was 22,5±2,6 kg/m2. According to Binge Eating Scale, 84,8% of participants' binge eating scores were low. Non-binging subjects estimated calorie content of CHO-based foods eg. green beans, chocolate, potato chips, and fried potatoes lower when they were hungry (p<0,05). Subjects who had moderate binge eating scores estimated calorie content of apple higher when they are satiated (p<0,05) when compared with hunger situation. According to data obtained from food records, 60,9% of subjects consumed higher energy from CHO. Estimations on calorie contents of CHO content foods apple, bread, and fried potatoes of these subjects were statistically different in hunger and satiety conditions (p<0,05).

Conclusions: This study shows that there is a significant association between hunger status and caloric estimations. Especially carbohydrate consumption affects predictions about foods that contain more carbohydrate. Further studies are required to investigate the relation between binge eating, carbohydrate consumption and caloric estimations.

Keywords: hunger, satiety, binge eating, caloric estimation

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HUNGER, SATIETY AND BINGE EATING ; IS THERE A DIFFERENCE ON CALORIC ESTIMATION OF CHO-BASED FOODS?

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Background and objectives: Estimation of calories in foods is crucial in the maintenance of body weight and energy regulation. Binge eating is defined as eating an unusually large amount of food in a short period and experiencing a loss-of-control over eating. In this study, we aimed to investigate the effects of hun-

ACCURACY AND RELIABILITY OF A LOW-COST, HANDHELD 3D IMAGING SYSTEM FOR CHILD ANTHROPOMETRY

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Background and objectives: Body measurement, or anthropometry, is used to assess child growth and body composition. Anthropometry is used in clinical settings to identify and manage malnutrition, and in national surveys to guide nutrition programs. The usefulness of anthropometry however is undermined by poor measurement quality, which has led to calls for improved quality and/or new approaches. We evaluated the potential of a three-dimensional (3D) imaging system to replace the current gold standard of non-digital, manual measurements for child stature (length or height), head circumference (HC) and mid-upper arm circumference (MUAC).

Methods: Five trained anthropometrists measured 474 apparently healthy children 0-5 years of age in Atlanta, USA from September 2016 to February 2017. For manual measurements, we followed training and measurement techniques used to develop the 2006 WHO Growth Standards. Anthropometrists took 3D scans of children using an iPad Air® with Occipital Structure Sensor and custom software developed by Body Surface Translations. We analyzed the quality of manual measurements using the 2006 WHO Growth Standards to calculate z-scores and define biological plausibility. We evaluated the accuracy of scan-derived measurements against manual measurements using average bias and Bland-Altman Plots; for reliability, we calculated intra- and inter-observer Technical Error of Measurement (TEM) and Coefficient of Reliability.

Results: 99.8% of manual measurements were biologically plausible, and the z-score standard deviations (SD) were close to 1.0 for all anthropometric indices, ranging from 0.92 for weight-for-height to 1.07 for height-for-age. Z-score variances among children under 2 years did not differ from those 2 or more based on Levene's Test. Inter- and intra-observer TEM was below 0.35 cm for all manual measurements. We are still analyzing the accuracy and reliability of scan-derived measurements.

Conclusions: We collected high quality manual anthropometry. If accurate and reliable, 3D imaging could help to improve the efficiency, precision and accuracy of child anthropometry. Expensive 3D imaging systems are already used in the garment industry for adult anthropometry. The 3D scanner and associated software we used in this study are low-cost, mobile and can handle movement; possibly extending the use of 3D imaging for diagnostic purposes.

Keywords: anthropometry; 3D; imaging; accuracy; reliability

THE PILOT KOREAN KEY FOODS BASED ON DIET CONSUMPTION

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Background and objectives: This study was performed to develop the Key Foods approach to select foods for nutrient analysis of up-to-date National Food Nutrient Composition Database. The primary objective of nutrient composition database in Korea is to provide the information to represent the nutrients consumed by Korean population, especially the nutrient profile for each food identified as important in the food consumption. The Key Food approach assists database system to prioritize foods that contribute significant amounts of nutrients of public health interest to the diet.

Methods: The Key Foods approach used 16 nutrients and energy (Key Nutrients) of public health significance identified in the intake data from Korea National Health and Nutrition Examination Survey(KNHANES) 2013-2014. The recipe file from KNHANES containing the list of ingredients and their amounts was used to identify the Key Foods. At first, foods list that contributed to the intake of each nutrient was selected using recipe code from raw data of KNHANES. Then, we determined foods that contributed the most to intake across all key nutrients. After selecting foods list, Key Foods were identified as those food components that contribute up to 85% of any one nutrient of Key Nutrients.

Results: From this procedure, 570 primary Key Foods were aggregated, which account for approximately 90.5% of the contribution of the nutrient consumption for the Korean diet. 456 Key foods were identified after further refinement procedure to insure that we have a representative list of what Korean eat by considering some foods that are not widely consumed by the Korean population.

Conclusions: This Key Foods list will be used for updating and revising the National Food Nutrient Composition Database from 2017 and concentrating resources for food composition analysis in Korea. We expect the updating database will give representative data for researchers, etc.

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BRAZILIAN NUT INTAKE HAS NO INFLUENCE ON BODY COMPOSITION IN OBESE WOMEN

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Background and objectives: Nuts are considered to have an optimal energy density and a good source of lipids, especially unsaturated fatty acids. One Brazilian nut provides approximately 35,3kcal and 3,24g of total lipids, mainly monounsaturated fatty acids. The daily consumption of this food has been associated with the improvement of lipid profile and risk reduction of cardiovascular diseases. However, there is a concern about the possible effects of the daily intake of nuts on weight gain. Thus, the aim of this study was to investigate the effects of Brazilian nuts (Bertholletia excelsa H.B.K.) intake on body composition of obese women.

Methods: We enrolled 72 obese women recruited in the outpatient clinic of endocrinology from Clinics Hospital of São Paulo, Brazil. They were randomly assigned to either ingestion of Brazil nuts (BN) group or control (CO) group and they were followed up for 2 months. Participants of the treatment group consumed one Brazilian nut daily and the control group avoided the intake of any food containing the nut for the same period of time. On baseline and after two months of follow-up were assessed weight and height for the calculation of body mass index (BMI), waist circumference (WC) and percentage of body fat (%BF). Repeated measures ANOVA analyses were performed using SPSS 18.0 software to evaluate the effect of supplementation time with Brazilian nuts on the variables mentioned above.

Results: Twenty-nine participants of the treated group (BN) and twenty-six of the control group (CO) completed the trial. The mean age of BN and CO group was 40,3±9,0 and 39,4±9,5 (P=0,714) respectively. For BN and CO groups, no significant differences were observed for weight (ΔAfter-Before= -0,50) (ΔAfter-Before= 0,20) (P=0,723), BMI (ΔAfter-Before= -0,10) (ΔAfter-Before=0,10) (P=0,784), WC (ΔAfter-Before= -1,10) (ΔAfter-Before= 2,50) (P=0,111) and %BF (ΔAfter-Before= 0,30) (ΔAfter-Before= -0,10) (P=0,587).

Conclusions: The data show that Brazilian nut consumption for two months has no effect on the body composition of obese women.

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A MODEL FOR DIGITALIZATION OF THE NUTRITION JOURNEY – CASE INSIGHTS FROM THE NUTRIDIA APP DEVELOPMENT FOR CANCER PATIENT COUNSELLING

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Background and objectives: Shared decision making is relevant to nutrition counselling for patients who have diminished food intake, and suffer from cancer and therapy related riskfactors. Shared decision making however requires the patient to be well informed, and the professional to have access to updated information on the patients foodintake and riskfactors as nausea, mouthproblems i.e. So far nutritional apps seem to have been inspired more by experience economy than by nutrition science. The objective of NutriDia was to digitalize the nutrition counselling in a transparent and beneficial manner for the client while at the same time making the most of the expert knowledge of nutritionists and app developers, in order to enhance shared decision making for the individualised nutrition plan.

Methods: Development was set in the University Hospital Nutrition Centre with a professional app developer as partner and with university scientific team as evaluators. Evaluation performed observation and interviews with patients and professionals in consecutive app intermezzo's. The "sprint" concept from Agile software development was adopted. It defines principles for software development under which user requirements are specified and solutions are returned through efforts of a multidisciplinary team. It is adaptive and aims at early delivery and continuous improvement to secure flexible and rapid response to user wishes. Two versions were developed – one for the counsellors and one for patients supporting the dialogue in the presence of both patient and counselor.

Results: Patients took high interest in the patient APP that ended up user friendly to a large group of cancer patients, regardless of age and diagnose. Professionals were in general in agreement that the professional future will be "app'tized" and patient focused. For both groups early and instructed introduction was viewed as important. For both groups the visual appearance and straightforwardness of the app was found essential to user loyalty. Professionals however found it difficult that the software under the development did not "speak" with other clinical software, and has to be opened separately.

Conclusions: The sprinted mode of working involving clients, practitioners and developers in an evidence based environment is a useful method for future nutrition app'tisation.

Keywords: Digitalization, Nutrition Counselling, Nutridia, Cancer Patients

Further collaborators:

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MAN OR MACHINE – A REVIEW OF SMART ICT ASSISTED REALTIME DIETARY ASSESSMENT TECHNOLOGIES (RDAT) FOR AUTOMATED DIETARY DATA ASSESSMENT

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Background and objectives: Data collection in dietary intake studies using traditional methods is costly and time consuming. As a result ICT assisted measurement of dietary behavior has attracted interest from the nutrition research community and a number of groups across the world has through different trajectories tried to reduce the workload related to determining food intake. The aim of the study it to present an overview of smart ICT assisted devices for automated dietary data assessment – here referred to as Realtime Dietary Assessment Technologies (RDAT

Methods: A literature search was conducted using the key words ICT assisted, app, devices, technology assisted automated, dietary data, food intake, assessment collection. In order to exclude ICT based solutions only replacing paper based methods with screen based ones, the study used as inclusion criteria was that methods should be based on < 1 hardware component. In addition, a network search was carried out based on snowballing technique in which known authors, research groups and technology acronyms was used as search terms. Only technologies that was reported scientifically was included. The search identified 8 technologies that was analyzed further

Results: The literature search identified the following Realtime Dietary Assessment Technologies (RDAT): eButton, Dietary intake Monitoring System (DIMS), Splendid, Smart Meal, Mandometer Technology and Technology Assisted Dietary Assesment (TADA). The review showed that the following specialized hardware based components was used in order to automatize the recognition of types and amounts of food: scales, jawbone motion, fork motion, imaging, picture recognition, spectrophotometry, Near InfraRed (NIR) technology and Near Field Communication (NFC).

Conclusions: The technologies identified all minimizes human involvement and involve novel combinations of various technology-solutions. All technologies are based on combinations of "intake signals" and uses a mix of different intake proxies. They include measuring jawbone and or fork movement as proxies, measuring chewing noise, measuring weight of plated food, math-based algorithms for automated or semi automated pictures recognition and artificial intelligence based recognition. The technologies are currently undergoing validation and feasibility studies. We conclude that more interdisciplinary research involving both nutritionists and digital media scientists is needed as well as more cooperation and knowledge sharing between involved research groups.

Keywords: Nutritional Assessment, Realtime Dietary Assessment Technologies, RDAT, automated dietary data assessment, ICT assisted food intake dietary data collection

Further collaborators: The author wish to acknowledge the dVices4food and the Richfields program

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NUTRITIONAL PROFILE OF JIU JITSU FIGHTERS AND ANALYSIS OF ITS KNOWLEDGE REGARDING DIET GRACIE

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Background and objectives: The Gracie Diet, created by Carlos Gracie (precursors of Brazilian jiu-jitsu), has as main objective to maintain a slightly alkaline blood pH through food combinations divided into groups in order to prevent chemical reactions harmful to the organism. Thus, the objective was to analyze body composition and diet under the principles of the Gracie Diet in jiu-jitsu fighters.

Methods: A cross-sectional field study with a descriptive analysis and a quantitative approach involving jiu-jitsu fighters, only men between 18 and 29 years of age, enrolled in a state competition, excluding those classified as obese by BMI (WHO, 1997). Data collection was based on individual interview about personal details, food and knowledge of the Gracie Diet. The anthropometric assessment was carried out by GC% arising from Guedes protocol (2010) with Fleck classification (1983) and Wilmore (1983) and BMI (WHO, 1997).

Results: Information of 69 fighters were collected, and 84% had excess body fat and 51% overweight and 80% did not conform to the recommendations of the Food Guide for the Brazilian Population (BRAZIL, 2005). As for the Gracie Diet, 67% claimed to know it, but only one fighter followed. Most followed principles as washing hands before meals (88%), at bedtime drink water (59%), not to consume alcohol (56%) and 10% non-mixed grains and / or starches together. The dietary maneuvers were used by 30% of the fighters, and supplements by 46%, of which, 44% under nutritionist prescription.

Conclusions: In view of these results, it was concluded that the majority of the study participants did not present a body composition comparable to the established standards for the sports modality and did not conform to the recommendations of the Brazilian Population Food Guide. A greater number of connoisseurs and followers of the Gracie Diet was expected, as this is widely known in the midst of martial arts. Therefore, it is believed that there is a disinterest of the fighters or lack of knowledge related to diet, and an urgent need to raise awareness about the role of nutritional guidance in sports performance, so that there is performance allied to health.

Keywords: Jiu jitsu, nutrition, body composition, anthropometry, Gracie Diet.

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COMPARISON OF SOCIODEMOGRAPHIC AND NUTRITIONAL CHARACTERISTICS BETWEEN VEGETARIANS, VEGANS AND MEAT EATERS FROM THE NUTRINET-SANTÉ STUDY

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Background and objectives: Vegetarian and vegan diets are a growing trend in many western countries. Epidemiological evidence suggesting that such diets may help in maintaining a good health is rising. However, dietary and sociodemographic characteristics of vegetarian and vegan consumers are not well known. The aim of this cross-sectional study was to describe sociodemographic and nutritional characteristics of vegetarians and vegans adults, compared to meat-eaters, from the French NutriNet-Santé study.

Methods: Participants were classified into 3 diet groups based on self-reported information: 90,664 meat eaters, 2,370 vegetarians and 789 vegans. Dietary data were collected using repeated 24 h dietary records. Multivariable polytomic logistic regression models were perfomed to assess the association between the sociodemographic characteristics and type of diet. The prevalence of nutrient intake inadequacy was estimated, by sex, age and type of diet categories.

Results: Compared with meat eaters, vegetarians were more likely to be highly educated, and unlike vegans had lower education level. Vegetarians and vegans substituted animal protein dense products by higher consumption of plant protein dense products (e.g.: soy based products such as tofu or legumes). Vegans had

the most balanced diets in terms of macronutrients. Vegetarians exhibited lower estimated prevalence of inadequacies for micronutrient such as antioxidant vitamins (e.g.: for vitamin E, 28.9% for vegetarian women <55y vs. 41.6 in meat eaters) while vegan exhibited higher estimated prevalence of inadequacies for some nutrients in particular vitamin B12 (69.9% in men and 83.4% in women <55y), compared to meat eaters.

Conclusions: Our study highlighted that vegetarian and vegan diets may overall allow reaching nutritional recommendations. Although such diets may be culturally difficult to accept, at least in some subgroups, well-planned vegetarian dietary patterns could be considered as sustainable diets including potential health benefits and a lower environmental impact.

Keywords: vegetarians, vegans, diet, sociodemographic characteristics, dietary nutrient inadequacy

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VITAMIN D VALUES IN SERUM IN RELATION TO THE NUTRITIONAL STATUS AND LIFE HABITS IN A GROUP OF HEALTHY VOLUNTEERS FROM MEDELLÍN, COLOMBIA

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Background and objectives: Vitamin D serum values depend mainly of its synthesis after solar light exposition and alternatively, from the ingestion of food rich in this vitamin. Factors such as age, skin pigmentation, use of anti sun-protecting agents, lenght of light exposition also influence its synthesis.

To determine Vitamin D serum values and explore their relation wiht the nutritional status and life habits in a group of healthy volunteers from the city of Medellín, Colombia

Methods: A cross sectional study was carried out in a group of 53 healthy volunteers. Data pertaining sociodemographic, anthropometric and life habits were collected. Vitamin D serum values were determined by means of the High Efficiency Liquid Chromatography (HPLC) technique with ultraviolet detection. To quantify Vitamin D intake we used frequency of ingesta, evaluated the nutritional status, took athropometric mesasurements and determined the skin phototype by means of the Fitzpatrick and Von Luschan scales. In order to explore the relationship among the nutritional status, the life habits and certain socio-demographic conditions such as vitamin D serum classification, the Chi square test was used. Correlations among vitamin D serum values and certain quantitative variables were measured by the Spearman r test.

Results: Women predominated in this study, 79,2%, with 41,5% of them belonging to social strata 3. Median age was 32

years, the predominating skin phototype was IV (49,1%), the most subjects (72,2%) used sun blockers once a day. The mean vitamin D ingesta was 191,7±142,0 UI day and mean lenght of light exposition was 36±28 minutes/day. According to the Body Mass Index (BMI), 39,6% were either overweight or obese. Deficient or insufficient vitamin D serum values were found in 67,9%. Age was found to be the only variable that showed an inverse correlation with Vitamin D defficient or insufficient values (r=-0,279; p=0,43).

Conclusions: The proportion of healthy volunteers that showed deficient or insufficient vitamin D values was very high. Vitamin D intake was lower than recommended. No relationship was found among the nutritional status and life habits with these values. Age was found to be the only factor that showed a negative correlation.

Keywords: Vitamin D, serum values, nutritional status, intake

144/2598

INTRA-INDIVIDUAL DIFFERENCES IN PLASMA FERRITIN CONCENTRATION IN RELATION TO INFLAMMATION OBSERVED DURING A SHORT-TERM LONGITUDINAL STUDY ARE SIMILAR TO CROSS-SECTIONAL INTER-INDIVIDUAL DIFFERENCES

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Background and objectives: Cross-sectional (CS) surveys indicate that individuals with acute inflammation have higher plasma ferritin (pF) concentrations than those without, possibly due to either inflammation-induced increases in pF or a heightened risk of inflammation among individuals with higher iron status. To determine the validity of adjusting pF for inflammation using CS data, we assessed the effects of short-term changes in inflammation status on pF, based on the assumption that body iron stores were unlikely to change during the study period.

Methods: Two blood samples were obtained 21d apart from 451 asymptomatic 6-23mo Burkinabé children; plasma was ana-

lyzed for ferritin, C-reactive protein (CRP) and alpha-1-acid glycoprotein (AGP). Inflammation was defined as CRP>5mg/L and/or AGP>1g/L. Additionally, a regression correction (RC) approach was used to adjust pF to a presumably healthy reference point within the study population (10th percentile CRP/AGP concentrations). Cross-sectional RCs were estimated from a naïve regression model which treated observations from the same children as independent. Longitudinal RCs, to estimate effects of intra-individual changes in CRP/AGP were estimated from structural equation models, accounting for repeated measures.

Results: pF was significantly greater in children with inflammation (44.9±2.9µg/L) than those without (13.6±1.0µg/L; P<0.0001). Similarly, pF differed intra-individually in longitudinal models, based on changes in inflammation status (with inflammation: 37.0±3.2µg/L vs. without: 15.3±1.2µg/L; P<0.0001). The RC approach from CS models over-adjusted slightly for the effects of inflammation on pF compared to longitudinal models (P<0.001); adjusted pF were 9.5±0.3µg/L and 10.5±0.4µg/L, respectively, vs. unadjusted 25.0±1.0µg/L. The estimated prevalence of iron deficiency (pF<12µg/L) was comparable between CS and longitudinal models (61.0% and 56.5%, respectively vs. unadjusted, 27.7%).

Conclusions: In this population, pF changed intra-individually in relation to inflammation. Cross-sectional RC models tended to over-adjust for the effects of inflammation on pF compared to longitudinal models, suggesting that pre-illness iron status was slightly higher in those with inflammation than those without, or that adjustments did not capture the full effect of inflammation. However, estimated mean pF and prevalence of iron deficiency were similar, especially when compared to unadjusted values, suggesting that CS adjustments are valid for survey data collection and programmatic decisions in comparable populations.

Keywords: ferritin, regression correction, iron deficiency, inflammation

144/2609

IRON AND VITAMIN C INTAKE IN SCHOOL-AGE CHILDREN IN POLAND

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Background and objectives: Iron is required for oxygen transport, electron transfer, oxidase activities and energy metabolism. The main components of the body that contain iron are erythrocyte haemoglobin and muscle myoglobin, liver ferritin, and haem and non-haem enzymes.

One of the main factors that increase the absorption of non-heme iron is vitamin C. Vitamin C has also a number of biochemical and physiological functions in the body. There is still ongoing problem of not sufficient iron and vitamin C intake in Poland. The aim of the study was to assess the iron and vitamin C content in daily diets of Polish school-age children.

Methods: The study was carried out between 2006 and 2011 among 981 girls and boys aged 9-13 years with the use of one-day

dietary recall method. The data on iron and vitamin C content in food products were based on the National Food Composition Database. The results of iron and vitamin C intake were compared to the Estimated Average Requirements (EAR).

Results: The median total daily iron intake in the group of pupils was 7.7 mg and ranged from 7.3 mg (girls) to 7.9 mg (boys). The comparison of individual iron intake to EAR values showed that 38.6% diets were below EAR. The main sources of iron in pupils' diets were cereal products (31.4%), vegetables and fruits (21.1%) and meat and meat products (11.1%). The median total daily vitamin C intake in the group of studied pupils was 46.0 mg and ranged from 43.7 mg (boys) to 48.8 mg (girls). In comparison to EAR, the 46.9% of diets were below EAR. The main sources of vitamin C in pupils' diets were juices (27.1%), vegetables and pulses (25.6%) and potatoes and their products (23.3%).

Conclusions: The study showed that many diets of school children aged 9-13 years in Poland were low in iron and vitamin C in relation to the requirements.

Keywords: iron, vitamin C, intake, girls, boys

cholesterol, HDL-cholesterol level, albumin and hemoglobin significantly lower (all p less than 0.05). Forns index value, aspartat-aminotransferase, alaninaminotransferase, and gamma-glutamyl transpeptidase were statistically significantly higher in patients with denutrition (all p less than 0.05). The average concentrations of pro-inflammatory cytokines (TNF-α, IL-6) were higher in patients with denutrition. Multivariate analysis identified two independent risk factors for denutrition: mean duration of CHC (odds ratio [OR] = 1.3; 95% confidence interval [CI] = 1.03-2.4), and Forns index (OR = 1.2; 95% CI = 1.02-2.5).

Conclusions: The results of this study demonstrated that patients with chronic hepatitis C associated denutrition in a high percentage. Nutritional screening using both clinical and especially biochemical methods is necessary in this population.

Keywords: chronic hepatitis C, denutrition, nutritional risk index, instant nutritional assessment score

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144/2610

NUTRITIONAL STATUS IN PATIENTS WITH CHRONIC HEPATITIS C

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Background and objectives: The objective of the study was to assess nutritional status in patients with chronic hepatitis C (CHC) by different methods and to evaluate the risk factors for denutrition in this population.

Methods: This observational study, held in three medical centers from Bucharest, Romania, included 173 patients. We followed anthropometric indices and biochemical parameters for each patient. Clinical and biological assessment of nutritional status was performed using body mass index (BMI), nutritional risk index (NRI) and instant nutritional assessment score (INA). Each patient completed Mini Nutritional Assessment (MNA). We also recorded a denutrition combined score. We considered patients to be malnourished according to the combined score if any score indicated denutrition. Hepatic fibrosis was assessed using Forns index.

Results: The mean average age was 54.14±9.1 years. The mean duration of CHC was 7.21±3.23 years. Using the combined score, denutrition was present in 17 patients (9.8%). Patients with denutrition had weight, body mass index, waist circumference, total

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144/2642

PREVALENCE OF MALNUTRITION IN PATIENTS WITH INFLAMMATORY BOWEL DISEASE

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Background and objectives: Inflammatory bowel disease (IBD) including ulcerative colitis (UC), Crohn's disease (CD) and inclasificable colitis(IC). Patients with IBD are at risk of malnutrition (MN), the nutritional assessment plays a crucial role in the practice of care of patients with IBD. The aim was to determine prevalence of MN in patients with IBD

Methods: Analyzed data from a cohort of patients with clinical and histopathological diagnosis of IBD treated at the Division of Gastroenterology, with a multidisciplinary care model, from January 2013 to March 2017. Nutritional assessment were calculated in each ,consisted of anthropometric measurements of body mass index (BMI) and Subjective Global Assessment (SGA) as a systematic method of integrating nutritional history data, gastrointestinal symptoms and physical examination,3 diagnoses were obtained: A. eunutrids, B. at risk or moderate malnutrition and C. severe malnutrition. To determine the clinical activity of CD, the Harvey-Bradshaw index was used and for the UC the modified Truelove-Witts index

Results: 151 patients with IBD were included: median age was 44, 32 (±16, 9) year, 56, 4% female, 30.2% had CD, 66, 9% UC and 2, 9% IC, year diagnosis median 6 year (1- 43).

Parameters nutritional with SGA were not statiscally significantly different in UC, CD well nourished (p=0.67), patients moderately and severely malnourished (p=0.67) and with BMI overweight or obese CD 27, 26%, UC 40, 77% (p=0.17). Patients with ±10 years evolution between CD and UC(P=0.34). The disease situation had a high percentage in the Remission stage, for UC (71.8%), CD (90.9%) and the rest in broad stage for UC (28.2%) and CD (9.1%)

Conclusions: In this population we found an adequate nutritional status between the two populations CD and UC. The optimization of the nutritional status can improve the results in patients with IBD, for which it is necessary to detect and treat MN, for which an interdisciplinary team is needed.

Keywords: Inflammatory bowel disease. Assessment nutritional. Malnutrition

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ANALYSIS OF THE USAGE AND CHARACTERISTICS OF DIETARY SUPPLEMENT CONSUMERS OF URBAN COSTA RICAN POPULATION. RESULTS FROM ELANS STUDY

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Background and objectives: Previous studies reveal that dietary supplement (DS) consumption has increased in the Western world in all ages groups and is influenced by gender, age, educational level, socioeconomic status and other factors. In Costa Rica there is no information regarding DS use in the general population. The present study was focused on assessing the prevalence of use and determining the socio-demographic, anthropometric and nutritional characteristics of urban Costa Rican DS consumers, and to explore the reasons for their consumption.

Methods: Data were obtained from Latin American Nutrition and Health Study (ELANS), is a cross-sectional study including a representative sample of urban population from eight LA countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela). In Costa Rica 798 participants were asked about DS use, and six months after the first contact a second questionnaire was applied by telephone to subjects who had previously reported DS use, in order to delve on the characteristics and perceptions involved in DS consumption. Chi-square test was used to compare observed and expected frequencies.

Results: Approximately 6% (n=48) of the population surveyed reported the use of DS, mainly in the form of multivitamins. No significant differences for sex, age, socioeconomic status (SES), educational level and body mass index (BMI) were found for DS intake. DS consumers reflected significantly higher intakes of dietary calcium in both sexes, and dietary vitamins C and vitamin E

in women, compared to nonusers. Reasons for consumption of DS focused on health benefits, prevention of illness, improved immunity, and energy boost. Although perceived as beneficial for 58% of the cases, the use was discontinued after six months.

Conclusions: The prevalence of DS usage was lower than reported by other studies in the field. A pattern similar to that described in the literature (BMI <25 kg/m2, physically active, healthy lifestyles and favorable socio-demographic backgrounds) was not found in this study.

Keywords: dietary supplements; consumers; perceptions; Costa Rica

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ACCURACY OF ACCELEROMETER FOR PREDICTION OF ENERGY EXPENDITURE AND ACTIVITY INTENSITY IN ATHLETIC ELEMENTARY SCHOOL CHILDREN DURING SELECTED ACTIVITIES

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Background and objectives: Athletic children may have higher risk of energy deficiency in comparison to their non-athlete counterparts, due to their higher energy expenditure. In this context, accurate assessment of energy expenditure is important for estimation of requirements. The objective of this study was to evaluate the accuracy of accelerometer for prediction of energy expenditure and activity intensity in athletic elementary school children, during selected activities.

Methods: The present study involved 31 elementary school children (16 boys and 15 girls), aged 9-12 years. During the measurements, children performed 8 selected activities while simultaneously wearing the accelerometer and carrying the portable indirect calorimeter. Five equations were assessed for prediction of energy expenditure from accelerometer counts (Freedson / Trost,

Treuth, Pate, Puyau, Mattocks), while Evenson equation was added for prediction of activity intensity, making 6 equations in total. The accuracy of accelerometer energy prediction was assessed by comparing measured and predicted values, using the paired t-test. Based on their METs, activities were classified as sedentary, light, moderate or vigorous. The intensity classification accuracy was evaluated with κ statistics and ROC-Curve.

Results: For activities of lying down, watching TV and reading, Freedson / Trost and Treuth equations were accurate in predicting energy expenditure. Regarding Pate equation, it was accurate for vacuuming and slow treadmill walking energy prediction. Puyau predictive equation was inaccurate in all activities, while Mattocks' equation was accurate in all treadmill walking activities. Concerning activity intensity classification accuracy, Pate equation had the best performance across the 4 intensities (κ = 0.72), while the remaining equations had low accuracy (κ = 0.14~0.37). In case of the sedentary activities, all equations had a good prediction accuracy (ROC-AUC = 0.83-0.89), while in light activities, Pate equation had an excellent accuracy (ROC-AUC = 0.91). For moderate activities, all equations showed a poor performance whereas in vigorous activities, Pate equation had an excellent prediction accuracy (ROC-AUC = 0.94).

Conclusions: In conclusion, no equation was accurate in predicting energy expenditure across all assessed activities in children athletes. For activity intensity classification, Pate equation had the best prediction accuracy.

Keywords: Energy expenditure, accelerometer, Children, Athlete.

144/2681

BODY MASS INDEX OF PATIENTS WITH DENTO-FACIAL DEFORMITIES BEFORE AND AFTER MONO AND BIMAXILLARY ORTHOGNATHIC SURGERY

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Background and objectives: Orthognathic surgery is a treatment for patients with dentofacial deformity. After surgical procedure, diet restriction is recommended and, consequently, weight loss is common. The objective was to compare Body Mass Index (BMI) of patients with dentofacial deformities before and after mono and bimaxillary orthognathic surgery.

Methods: Prospective clinical study with 69 adults with dentofacial deformity submitted to mono or bimaxillary orthog-

nathic surgery (December 2013 to March 2016). Data collection was performed a week before surgery and 10, 40, and 90 days post operatory (PO). BMI (kg/m2) was estimated with the equation: weight (kg)/height (m)2, and classified in: < 18.5, underweight; 18.5–24.9, eutrophic; 25.0–29.9, overweight; and >30.0, obesity. Statistical analysis was performed with Chi-Square test and Student t-test for independent samples, with a confidence interval of 95%.

Results: Mean age was 29.42±8.72 years, 56.5% (n=39) of the patients were women, and 56.5% (n=39) were monomaxillary surgeries. In the preoperative period, 51.30% (n=20) and 43.30% (n=13) of the patients submitted to mono and bimaxillary, respectively, were eutrophics, and 90 days PO 61.50% (n=24) and 46.70% (n=14) of the patients submitted to mono or bimaxillary, respectively, were eutrophics. There were no difference between BMI classification in mono and bimaxillary before (p=0.551) and after surgery (p>0.05). BMI before monomaxillary was similar to bimaxillary surgery (24.84±4.23 and 26.11±4.52, respectively, p=0.237,). At 10, 40 and 90 days PO, BMI were also similar to mono and bimaxillary surgery (PO10: 23.94±4.16 and 24.97±4.41, respectively; PO40: 23.86±3.96 and 24.65±4.37, respectively; PO90: 24.34±4.00 and 24.85±4.19, respectively; p>0.05).

Conclusions: BMI are similar to mono and bimaxillar in pre and postoperative periods. BMI alone is not enough to predict body composition, and BMI classification is unable to verify fast and small weight variations.

Keywords: Orthognathic surgery. Nutritional status. Nutrition assessment. Body Mass Index.

144/2693

DIETARY INTAKE AND SOURCES OF ADDED SUGAR AMONG BRAZILIAN POPULATION: RESULTS FROM ELANS/EBANS STUDY

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Background and objectives: Added sugar (AS) intake is highly associated with the epidemic of overweight and obesity. This study aimed to identify the dietary intake and sources of AS among Brazilian population.

Methods: Latin American Health and Nutrition Study (ELANS) is a multicenter study developed in urban areas of 8 Latin American countries: Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. Data were obtained from 2,000 Brazilians (15-65 y.o) participating in EBANS (Brazilian Health and Nutrition Study). Two 24-hour recall were used to identify the intake of AS and the major food items accounting for AS, using the weighed-proportions formula developed by Block (1985) in which the relative contribution (RC) of a given food item/food group is defined as: RC=[(Total AS grams from a food item x 100)/Total AS grams from all food items]. Median intake and sources of AS were performed by age group, gender, socioeconomic level (SES) and nutritional status.

Results: Median AS and AS percentage of energy intake were 52.4g/day and 12.6%, respectively. More than 63% of the subjects had %energy from AS >10%. Comparison of median AS intake (g/day) between age groups, nutritional status and SES showed that the highest intake was found among male adolescents, obese male and high SES. Carbonated soft drinks accounted for the highest contribution of AS intake in whole sample, providing from 26.8% to 40.1% of total AS intake. Infusions were the second main source, except for adolescents that had cookies and cakes as the second contributor of AS intake. Sugar-sweetened beverages (SSBs) represented 68% of total AS intake among Brazilians, based on gender it was 69.2% for male and 57.5% for female.

Conclusions: Brazilians are consuming AS above the level recommended by the World Health Organization (10%). The main source of AS was SSBs independent of gender, age group, SES and BMI status. This results reinforce the importance of reducing sugar content in manufactured foods. However product reformulation alone may not be enough, public health programs should also focus on strategies that reduce the quantity and frequency of others sources of AS, such as homemade drinks, cakes, cookies and desserts.

Keywords: Food source, Added sugar, Brazilian population, multicenter study.

Conflict of Interest Disclosure: The ELANS is supported by a scientific grant from the Coca Cola Company and support from the Instituto Pensi / Hospital Infantil Sabara, International Life Science Institute of Argentina, Universidad de Costa Rica, Pontificia Universidad Católica de Chile,Pontificia Universidad Javeriana, Universidad Central de Venezuela (CENDES-UCV)/ Fundación Bengoa, Universidad San Francisco de Quito, and Instituto de Investigación Nutricional de Peru. The funders had no role in study design, data collection and analysis, the decision to publish, or the preparation of this manuscript.

Further collaborators: On behalf of ELANS Study Group

ASSOCIATION BETWEEN DIETARY CALCIUM INTAKE AND NUTRITIONAL STATUS AND WAIST CIRCUMFERENCE IN URBAN COSTA RICAN POPULATION: RESULTS FROM THE LATIN AMERICAN STUDY OF NUTRITION AND HEALTH (ELANS)

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Background and objectives: Several cross-sectional studies have shown an inverse relationship between dietary calcium intake and both body mass index (BMI) and waist circumference. Possible mechanisms for such associations include increased fecal fat excretion, changes in adipocyte metabolism and increased thermogenesis. The aim of this study was to investigate the association between total dietary calcium, body mass index and waist circumference in Costa Rican population living in urban areas during the period between 2014-2015 as part of the Latin American Study of Nutrition and Heath (ELANS).

Methods: Data were obtained from 798 subjects from urban Costa Rican population, between the ages of 15 and 65 participating in ELANS, a multicentric study developed in urban areas of Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela. Food intake assessment included two 24-hour recall (Multiple Pass Method), from non-consecutives days and processed by the software Nutritional Data System for Research (NDS-R). Calcium usual intake was estimated with the Multiple Source Method (MSM) statistic package (https://nugo.dife.de/msm). Anthropometric measurements were obtained and BMI and BMI-for-age percentiles were calculated. Population was divided into tertiles according to dietary calcium consumption, and association with nutritional status were analyzed. Logistic regression was use to calculate the probability of having excess weight or waist circumference above recommendation.

Results: The probability of having excess weight (≥24.9 kg/m2) was 39% less for those in the second tertile of calcium intake, and 55% less for those in the highest tertile of calcium intake. The risk of having a waist circumference above the recommendation (men ≥102 cm; woman ≥ 88 cm) was 34% less for the second tertile and 42% less for the higher tertile of calcium intake.

Conclusions: Evidence suggests that a low dietary calcium intake increase the probability to have excess weight and waist circumference above recommendations in urban Costa Rican population.

Keywords: calcium intake; excess weight; waist circumference; Costa Rica

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Further collaborators: on behalf of ELANS Study Group

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ENERGY, MACRO AND MICRONUTRIENTS ADEQUACY BY SEX IN PERUVIAN ADOLESCENTS AND ADULTS: RESULTS FROM THE ELANS STUDY

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Background and objectives: Evaluation of energy and nutrient consumption allows identifying possible nutritional deficiencies and/or excesses. The aim of this study is to assess the adequacy of energy and nutrients intake by sex in Peruvian population.

Methods: The ELANS (Latin American Health and Nutrition Study) is a transversal study conducted in 8 Latin America countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, Peru and Venezuela), in adolescents and adults (1113 peruvians, 15 to 65 years old). We obtained usual intake (Multiple Source Method) of energy , macro and micronutrients through two 24 hour dietary recall in non-consecutive days. Estimated average requirement (EAR) were used to determine the percentage of adequacy to recommendations. For energy adequacy, basal energy expenditure-BEE was calculated according to age, sex and physical activity level-PAL proposed by Gerrior et al (2006), using results from the long IPAQ. We used mean difference test for continuous variables and chi2 Fisher's exact to assess difference by sex at 95% confidence level.

Results: The energy adequacy was 95% for men vs 105% for women (p<=0.000). The percentages of energy coming from macronutrients by sex were: protein 15% vs 15% (p=0.159), fat 22% vs 23% (p<=0.000) and carbohydrates 64% vs 62% (p<=0.000), for men and women respectively. Adequacy for micronutrient intake: calcium was 57% vs 52% (p<=0.000), iron was 136% vs 72% (p<0.000), vitamin A was 109% vs 131% (p<0.000) and vitamin C was 151% vs 168% (p=0.002). Percentages of population that showed insufficient macronutrients intake were: 28% for fat (men: 35% vs women: 23%, p<0.000), in contrast to the 35% that consumed more carbohydrates than recommended (men: 41 %, women 29%, p<0.000). Micronutrients with the highest percentages of insufficient intake were: calcium (97%, men: 97% vs women 98%, p=0.083) and iron (97%, men: 15% vs women 83%, p<0.000).

Conclusions: While energy consumption does not appear to be a problem in the Peruvian population, the adequacy of fats were low while carbohydrates high, the micronutrients with greater inadequacy were calcium and iron. Given the nutritional problems in the country: micronutrient deficiencies and high carbohydrate intake, strategies that cover both problems at the same time are required.

Keywords: Energy, macronutrient, micronutrient, adequacy

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ASSOCIATIONS BETWEEN NUTRITION STATUS AND THE DEGREE OF INDEPENDENCE IN DEMENTIA ELDERLY'S ACTIVITY OF DAILY LIVING IN THE ELDERLY IN NURSING CARE FACILITIES IN JAPAN

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Background and objectives: Most of elderly who requires nursing care has chronic disease, and due to a diminished food intake and physical activity, they tend to show decreased skeletal muscle mass. As a result, there is a great increase in the risk of fall and malnutrition in the elderly. Malnutrition is known to worsen the prognosis after infection and delay healing of disease in the elderly due to decreased immune function.

Methods: We have examined the associations between nutrition status and blood biochemical parameters, the degree of independence in dementia elderly's activity of daily living, the nursing care levels, and the form of food in 1,823 elderly persons aged 61-106 y (average 86.7 y) who lives in nursing care facilities were analyzed using Spearman's rank correlation coefficient analysis and steel-dwass test.

Results: The percentages of the elderly at risk of malnutrition according to GNRI (Geriatric Nutritional Risk Index) were 67.0% for men and 66.2% for women. The GNRI scores tended to be lower according to an increase in the nursing care level. In elderly men, the GNRI scores were remarkably lower in the groups categorized as nursing care levels 4 and higher than those in nursing care level 3 or lower. In elderly women, the GNRI scores were

greatly decreased in the groups categorized as nursing care levels 2 and higher. The lower the degree of independence in dementia elderly's activity of daily living was, the lower the GNRI, and the GNRI scores of the groups categorized IIIa and over were significantly lower than those categorized as of IIb or under. The GNRI scores were associated with the provided form of food, according to the transition from regular to liquid form.

Conclusions: The results of this study suggest that the nutrition status of elderly who requires nursing care in nursing homes was associated with the degree of independence in dementia elderly's activity of daily living, the nursing care level, and the form of food, and it may be attributable to a decrease in physical function required for activity of daily living.

Keywords: Geriatric Nutritional Risk Index, elderly, malnutrition, Nursing care Facilities

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COMPARISON OF NUTRITIONAL STATUS Y PERINATAL OUTCOMES BETWEEN IMMIGRANT AND CHILEAN PREGNANT WOMEN WHO ATTENDED THEIR DELIVERY AT SAN BORJA ARRIARAN HOSPITAL IN THE YEAR 2015

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Background and objectives: The migration in Chile increased by 28% between the years 2012 and 2015. As there are no studies in the country that describe the pre-pregnancy nutritional status (NS) and perinatal outcomes of immigrant (GI) versus Chilean (GI) pregnant women, the objective of this study was to compare the NS and to analyze its association with maternal and newborn pathologies in GNI versus GI who attended their delivery at the Hospital Clínico San Borja Arriarán (2015).

Methods: A comparative study carried out at 1,078 GI and 1,520 GNI. The data were obtained from: 1.the clinical records 2.The health agenda and a survey made to the pregnant woman. The variables studied were NS (underweight, normal, obesity and overweight) determined by Atalah standard; Gestational diabetes (GD), preeclampsia (PE), intrauterine growth retardation (IUGR) and preterm birth (PTB). Data were presented as prevalences and compared with CHI2 test. Crude and adjusted (by sociodemographic, obstetric and of maternal diseases variables) logistic

regression models were performed to evaluate the association between NS and maternal and newborn pathologies.

Results: The GNI had significantly more likely to have obesity 3.0 [2.4 - 3.8] and overweight 1.7 [1.4 - 2.1] at the beginning of gestation than GI, in relation to have a normal nutritional status (50% GI and 34% In GNI, p <0.001), with no differences in the risk of underweight 1.1 [0.8 -1.5]. GI had a higher prevalence of anemia than GNI (12.6% vs 7.7, p <0.001). On the other hand, the GNI had higher prevalences of GD (8.7% vs 4.4%, p <0.001) and preeclamsia (8.3% vs 4.9%, p <0.05) than GI, while their children had a higher prevalence of PTB (14.0% vs. 6.6%, p <0.001) and IUGR (6.9% vs. 3.7%, p <0.001) than GI. Crude and adjusted logistic regression models showed that GD was associated with maternal obesity and overweight; PE was associated with obesity; while maternal underweight was associated with IUGR.

Conclusions: The GNI presented higher prevalences of obesity, DG, PE, IUGR and PTB than GI. Obesity was associated with DG and PE and the latter with PTB.

Keywords: Migration, Immigrant, Pregnant women, Nutritional status, Obesity.

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SERUM VITAMIN B12 LEVELS IN PATIENTS WITH TYPE 2 DIABETES TREATED WITH METFORMIN

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Background and objectives: According to all guidelines, metformin is the frontline treatment and the most prescribed drug for type 2 diabetic patients, that can be associated with other oral medication or insulin. Treatment with metformin may lead to a decreased absorption of vitamin B12. The purpose of this study is to evaluate serum vitamin B12 levels in patients with type 2 diabetes, treated chronically with metformin.

Methods: We evaluated 119 patients with type 2 diabetes, aged 33-86 years, who underwent annual periodic evaluation at our center. Patients provided their socio-professional and medical history, their history of diabetes treatment and supplements taking. We obtained anthropometric data: weight, height, abdom-

inal circumference (AC), body mass index (BMI), blood pressure, measured vitamin B12 serum levels and performed biochemical analyses regarding the metabolic control of diabetes. B12 vitamin deficiency was defined at serum levels below 193 pg/ml. Descriptive statistics provided frequencies, means, standard deviations and medians. Anova and Mann-Whitney U tests were used to analyze the differences between the variables.

Results: Of the 119 enrolled patients, the 87 treated with metformin for at least six months had a higher mean BMI (32.9 kg/m2 vs. 29.2 kg/m2, p = .001), a higher mean AC (99 cm vs 108 cm, p = .001) and a lower mean vitamin B12 serum level (352.28 pg/ml vs 450.09 pg/ml, p = .016). 12 patients (13.8%) on metformin had values below the lower limit of vitamin B12, compared to 3.1% from those on other treatments. No statistically significant differences were found regarding treatment duration and control, nor the dose of metformin. No evidence was found to support the diagnosis of anemia. In the metformin patients, taking supplements containing B12 was associated with a reduction in the prevalence of B12 deficit, however, those taking supplements had an average of the B 12 levels of 472.50 pg/ml vs 329.22 pg/ml, p = .05.

Conclusions: Our results found 13.8% of the patients treated with metformin had a vitamin B12 deficit. We recommend periodic evaluation of the level of vitamin B12 for patients receiving chronic metformin treatment. B12 supplementation may be protective against B12 deficiency.

Keywords: B12 vitamin, type 2 diabetes, metformin

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ASSESSMENT OF FOOD CONSUMPTION AND NUTRIENT INTAKE OF OUTPATIENTS WITH CHRONIC DISEASES AT A UNIVERSITY FEDERAL HOSPITAL IN RIO DE JANEIRO

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Background and objectives: The assessment of food consumption is often carried out to develop and implement nutritional advice. Due to the high prevalence of chronic diseases and its relation with nutrient intake, the objective of this study was to assess food consumption and nutrient intake of patients with chronic diseases.

Methods: During the consultation, two nutritional questionnaires were applied (non-consecutive two days 24 hour and food frequency) in 45 outpatients from February 2016 to April 2017. Daily food consumption, and quantity of energy, macro and mi-

cronutrients related to chronic diseases were estimated. Socio-economic and anthropometric information were also collected.

Results: Most respondents (85%) were female, 67% were 50 years or older (58,8 ± 12,1 years), 40% were white, 36% had 4 to 7 years of study, and 82% presented more than one chronic disease. Obesity was observed in 45%, Hypertension in 62%, and Diabetes in 54%. Soft drinks (11%) and sweets (20%) daily consumption were significant; fruits (60%), vegetables (37%), beans (47%) and milk (64%) consumption were considered insufficient. Elevated salt consumption was observed in 13% of individuals. Average energy intake was 1400±420,2 kcal, protein 20,2±6,6%, carbohydrate 52,3±13,8%, lipids 27,5±10,6%. It was observed high prevalence of inadequate nutrient intake for vitamin D (72,2%) and calcium (95,5%) and expressive prevalence for vitamin C (42,8%) and zinc (18,4%).

Conclusions: Food consumption and nutrient intake in this group of outpatients with chronic diseases was considered not healthy and preoccupant due to expressive presence of simple sugars and salt as well as insufficient amount of fiber and micronutrients such as calcium and zinc, and vitamins C and D.

Keywords: food frequency; anthropometry; vitamin D; Calcium; vitamin C;

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IS NECK CIRCUMFERENCE A GOOD INDICATOR TO IDENTIFY MUSCLE WASTING IN CHILDREN AND ADOLESCENTS WITH MALIGNANT NEOPLASMS?

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Background and objectives: Children and adolescents with malignant neoplasms may present muscle wasting early, and this finding may be underestimated when only the Body Mass Index is considered, due to the various metabolic changes, and the side effects caused by antineoplastic therapy. It has been considered in the literature that even Arm Muscle Area (AMA) or Calf Circumference (CC) present strong correlation with muscle mass stores. Neck circumference (NC) is a measure of easy gauging and applicability in clinical practice. The main objective of this study was to verify if there is a correlation between NC with AMA and CC.

Methods: A cross-sectional study that assessed children and adolescents from 0 to 20 years old with malignant neoplasms at a Pediatric Oncology Specialized Institute between October 2015 and March 2017. Measurements of NC and CC were evaluated, all performed by trained evaluators, following anthropometric techniques standardized by the literature, besides middle upper arm

circumference and triceps skinfold (to calculate AMA). For statistical analysis, Pearson's correlation and one-way ANOVA were used, with significance level p<0.05.

Results: Among the 1656 assessments, 56.9% (n=943) were male. The mean age, for male and female were 9.0 ± 5.8 and 8.5 ± 5.4, respectively. The median NC, AMA and CC, for male and female were 28.4 ± 4.62 vs 27.4 ± 3.84 cm; 21.2 ± 12.47 vs 21.6 ± 10.1 cm2; 26.0 ± 7.16 vs 26.8 ± 8.58 cm, respectively. Significant differences were observed between sexes in AMA (p=0,017) and NC (p=0,000). It was also observed that there were no significant difference for CC (p=0,064), considering sexes. The correlation between NC with AMA and CC was positive, very strong and significant (r=0.9 vs r=0.8; p=0,000) respectively.

Conclusions: It is concluded that NC has a strong correlation with AMA and CC, being a promising indicator to identify muscle wasting in children and adolescents with malignant neoplasms.

Keywords: Malignant Neoplasms. Neck Circumference. Muscle Wasting. Children. Adolescent.

Further collaborators:

Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text; Priscila Santos Maia-Lemos helped to implement the study and to write the text; Karen Jaloretto Teixeira Guedes helped the data collection, helped implement the study, and helped to write the text; Eliana Maria Monteiro Caran contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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ENERGY DENSITY AND NUTRITIONAL ADEQUACY IN DIET OF CHILDREN AND ADOLESCENTS IN A SUMMER CAMP, 2017

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Background and objectives: Diabetes type 1 (DM1) results from cell-mediated autoimmune destruction of pancreatic B-cells. Its treatment includes insulin therapy, meal planning and physical activity. Educational measures are fundamental to reach the best metabolic control and the Summer Camps for Diabetic Youngster can contribute for the instruction of these measures. The aim of this work was to analyze the diet offered to participants of Summer Camps with DM1 of the 2017 season.

Methods: The 37th season of the 2017 Summer Camps was held in Sapucaí Mirim, a city of Minas Gerais, Brazil, for six days. The menu was elaborated by nutritionists for the 81 participants with DM1, from 8 to 16 years old, considering the educational play activities during the season. The nutritional value of the meals was

calculated based on food composition tables and nutritional information from manufacturers. The classification of macronutrients was made according to the current guidelines of the Brazilian Society of Diabetes and the calories were obtained by adding the nutrients multiplied by their respective caloric values. The energy density (ED) of the meals was calculated by two methods: the first (M1) considered all foods and caloric liquids, the second (M2) excluded all liquids except milk and both were evaluated according to the American Institute for Cancer Research (2007).

Results: From M1 to M2, a reduction in calories and an increase in ED were observed due to the absence of caloric liquids. However, both were found to be adequate on almost all days, except for dinner on the third day and breakfast on the fourth, that presented values higher than the reference, by both methods. Regarding the macronutrients, the hyperlipidic distribution of the third day and the predominance of adequate values on the other days are emphasized. Pizza was served for dinner at the third day. Possibly, the presence of fruits and vegetables in the main meals contributed to this suitability and all participants were encouraged to consume it daily by stimulating healthy eating.

Conclusions: Most meals during the 37th Summer Camp were adequate for the campers, highlighting the importance of consuming a variety of fresh foods including fruits and vegetables.

Keywords: Diabetes type 1. Diabetes education. Summer Camps.

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ELEVATED NECK CIRCUMFERENCE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS

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Background and objectives: Type 2 Diabetes Mellitus (DM2) has a great impact on public health due to its complications. Anthropometric measures are able to predict nutritional status and excess adiposity, such as neck circumference (NC). The main objective of this study was to evaluate the prevalence of excess adiposity considering Body Mass Index (BMI) and NC, and verify its correlation.

Methods: A cross-sectional study that evaluated adults and elderly patients, above 20 years old, with diagnosis of DM2 in a hospital in Taubate, Sao Paulo, from June 2015 to May 2016. The data collected were weight, height, body mass index (BMI), NC, sex, age, diagnosis of Type 2 Diabetes Mellitus. For classification of nutritional status, the cut-off points proposed by the World Health Organization (WHO) for adults and Lipschitz for the elderly were

used. The cut-off points of NC used to identify excess adiposity were 34 and 37 cm, for female and male respectively. Data analysis was performed using descriptive statistics. The correlation between NC and BMI was determined by the Pearson`s correlation, with significant value p<0.05.

Results: Among the 175 patients with DM2 evaluated, 52,57% (N=92) were male. The mean age, for female and male were 67.73 ± 14.71 vs 67.71 ± 14.67, respectively. There was high prevalence of excess adiposity, considering BMI, even in adults (60%) or in elderly patients (78.52%). Regarding to the NC, it was verified that 62.5% of the adults and 75.5% of the elderly showed elevated NC. There was a positive, moderate, and significant correlation between NC and BMI for the female and male sex (r = 0.52 vs 0.61, p<0,05).

Conclusions: It is concluded that the majority of adult and elderly patients with DM2 presented excess adiposity according to BMI and NC. There was a moderate correlation between NC and BMI for the female and male sex. NC is a measure of easy gauging and applicability in clinical practice, especially with hospitalized patients.

Keywords: Neck Circumference. Nutritional Status. Body Mass Index. Type 2 Diabetes Mellitus. Hospitalized patients

Further collaborators:

Caroline Pereira da Silva, Ronaldo Ortiz da Silva, Adriana Lisboa Mendes Roman and Adriana Aparecida da Silva Alvarenga helped to implement the study and data collection. Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

displaying served food in plates, based on Regular Hospital meals to give it content validity. Relative weights were determined for different domains (portion estimation: absolute/relative and nutritional content: qualitative/quantitative) and a dichotomy checklist were established for test correction. Test was designed to be performed by observing photographs of served food on a computer and completing the results on printed paper grids. Pilot test with Registered Dietitians (RD) experts was performed for internal consistency. Discriminative validity was assessed by "known groups" comparison technique between RD as a reference group, and novice (N) and intermediate (I) students. Man Whitney test was applied.

Results: Test was performed between Dec 2014 and Dec 2015. RD (n: 27), N (n: 30) and I (n: 73). Students performed the test without qualification conditioning. Cronbach's Alpha was 0.70 in the RD. Between RD and N there was a significant difference in total score (p< .000) with median = 57% (86.7% - 38.8%) and 39.9% (50.8% 22, 9%) respectively. Difference between RD vs. I (p< .000) and I vs. N (p< .000) could also be observed.

Conclusions: Test's reliability was acceptable in reference population (RD) and proved discriminative validity when comparing extremes groups (RD vs. S). This result would support construct's contents and the way they were measured.

Photography is an available easy to use and unexpensive resource. Knowing its strengths and weaknesses, contextualizing and developing skills in food management is possible. This Test could be useful in grade level students as a diagnostic, learning and reflection-oriented instrument for improvement. It is necessary to continue with the validation process and to determine when the students become competent.

Keywords: Dietary intake - Competencies - Educational Assessment -

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OBJECTIVE STRUCTURED TEST TO EVALUATE FOOD INTAKE ASSESSMENT SKILLS ON NUTRITION & DIETETIC STUDENTS

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Background and objectives: An important requirement for health professions education is to develop a framework integrating theory and practice for professional competencies' achievement. Evaluating Competencies requires valid and reliable instruments. The aim of this study was to design a Test for nutrition & dietetic students (S) to evaluate Food Intake Assessment Skills (FIAS) and to initiate the validation process by determining internal consistency and discriminative capacity.

Methods: A construct was defined including dimensions attributable to FIAS. Test's Cases were represented by photographs

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COMPARISON OF PREDICTIVE EQUATIONS OF LEAN MASS IN WOMEN

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Background and objectives: Adequate lean mass (LM) measurement is important since it is a predictor of functional capacity, daily activities, morbidity and mortality. Therefore, the aim of the present study was to evaluate which predictive equation estimates correctly the LM of women.

Methods: Eighty-one women with 19 to 81 years were recruited. The anthropometric variables evaluated were body weight, height, waist circumference and skin folds (bicipital, tricipital, subscapular and suprailiac). The LM was assessed by dual ener-

gy x-ray absorptiometry scanning (DXA) and was also estimated using the predictive equations: Hume I and Hume II; Salamat et al. and Kulkarni et al. I and Kulkarni II. ANOVA one-way and Tukey's post-hoc test was performed to compare the values of LM measured by DXA and estimated by equations. Pearson's correlation was performed to verify the correlation of LM quantified by equations and DXA. Bland-Altman analysis evaluated the percentage of underestimation and overestimation of the equations.

Results: It was observed that Salamat et al and Kulkarni II equations resulted in the same values of LM as measured by DXA (36.62±4.47; 38.86±5.67 and 36.59±4.56, respectively). The equations of Hume I and Kulkarni I estimated higher values (41.71±5.23 and 46.29±6.47, respectively), while Hume II lower values (19.72±4.00) of LM than that quantified by DXA. Hume I, Salamat et al., Kulkarni I, Kulkarni II and Hume II equations showed a positive correlation with LM values of DXA (r=0.89; r=0.69; r=0.87; r=0.89, and r=0.81, respectively). In the Bland-Altman analysis it was observed that Salamat and Kulkarni II equations overestimated in the LM 0.12% and 5.75%, respectively. Additionally, it was observed that the Hume I and Kulkarni I overestimated the LM in 13.07% and 23.22%, respectively and Hume II equation underestimated in 60.77%.

Conclusions: The equations that presented better prediction of LM were Salamat and Kulkarni II, but it should be used in clinical practice with caution.

Keywords: Lean Mass, Predictive equations, DXA

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MUSCLE WASTING AND NUTRIENT INTAKE ASSESSMENT OF PATIENTS HOSPITALIZED WITH PRESSURE INJURY UNDER ORAL AND ENTERAL NUTRITIONAL THERAPY

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Background and objectives: Inadequate nutrients intake for hospitalized patients is of paramount importance and it is related to complications in the clinical setting, higher mortality rate, higher costs and length of hospitalization, and the occurrence of pressure injury (PI).The main objective of this study was to evaluate the muscle wasting and nutrient intake of adult and elderly patients hospitalized with PI under oral and enteral nutritional therapy.

Methods: A cross-sectional study was carried out with adult and elderly patients above 20 years old in a hospital in Taubate, Sao Paulo, with PI under oral or enteral nutrition therapy between February and June 2016. To assessment of muscle wasting, Calf Circumference measure was evaluated, considering cutoff point below 31 cm to this outcome. To evaluate the nutrient intake were considered type of nutritional therapy used. For patients under Oral Nutrition Therapy, percentage of food acceptance and a food composition table (TACO) were used to calculate nutrition intake while for patients under Enteral Nutritional Therapy, a total amount of diet infused, according to the formula used, were considered. Regarding evaluation of nutrients intake (vitamin A, E, C, selenium, zinc) was considered as reference the Estimated Average Requirement (EAR) proposed by the Dietary Reference Intakes (DRIS) developed by the Foods and Nutrition Board/Institute of Medicine of the United States. Descriptive statistics were used to analyze the data.

Results: Among the 29 patients evaluated, 72.41% were male. It was verified that 58.6% of the patients presented muscle wasting. In relation to nutrients intake, 55.17% presented vitamin C intake above, 41.37% below and 3.44% within EAR values; 86.20% presented vitamin E intake above, 10.34% below, and 3.44% within EAR; Regarding to vitamin A, 68.96% presented above, 33.42% below and 3.44% within EAR; 55.17% presented selenium intake above EAR, 31.03% below and 13.79% within EAR; 82.75% of the patients had zinc intake above, and 17.24% below EAR.

Conclusions: It was concluded that the majority of patients presented muscle wasting, and there was predominance of patients with higher intake than EAR for vitamins C, E, A, zinc and selenium.

Keywords: Pressure Injury. Muscle Wasting. Nutrient Intake. Patients Hospitalized.

Further collaborators:

Marcela Aparecida Diniz Camargo, Letícia Mourão, Isabela Gonçalves Camargo helped to implement the study and data collection. Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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PREVALENCE OF MALNUTRITION IN HOSPITALIZED PATIENTS WITH PRESSURE INJURY

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Background and objectives: The hospitalized patients, especially malnourished, are likely to develop Pressure Injury (PI). Early identification of risk situations in nutritional diagnosis allows adequate planning of actions for prevention and treatment of diseases. The main objective of this study was to identify the prevalence of malnutrition in adult and elderly hospitalized patients with PI.

Methods: A cross-sectional study that evaluated adult and elderly above 20 years old in a hospital in Taubate, Sao Paulo, between February and June 2016. To nutritional status assessment, the measure of Calf Circumference was obtained (cutoff value below 31 cm to identify malnutrition). The Braden scale was used to identify the risk, hight and moderate, to development of another PI. C Reactive Protein (CRP) values were obtained from patient`s chart to assess inflammation status (reference value above or equal 0.5 mg/dL to identify inflammation). Statistical Descriptives were used to analyse the data.

Results: Among the 40 patients evaluated, 62.5% were male. The mean age were 65.8 ± 16.12 and 68.0 ± 15.88 years, for female and male sex, respectively. Regarding nutritional status, 62.5% of the patients were malnourished. It was verified that 87.5% had one PI and 12.5% developed two PI, and the highest percentage of lesions found in the sacral region (69%). In relation to the risk assessment for the development of PI, 55% of patients were at high risk and the remainder 45% presented moderate risk. Considering the patients classified as having moderate and high risk of another PI development, 61.11% and 63.63% were malnourished, respectively. Regarding CRP levels, 97.5% of the patients presented high values.

Conclusions: It is concluded that 65.5% of the patients presented malnutrition, being propitious to the development of new PI and worse clinical outcomes.

Keywords: Pressure Injury. Malnutrition. Calf Circumference. Patients Hospitalized

Further collaborators: Letícia Mourão, Isabela Gonçalves Camargo, Marcela Aparecida Diniz Camargo, Francine de Souza da Cruz and Gabriela Moura Santos Botan helped to implement the study and data collection. Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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BIOEQUIVALENCE OF MICRONUTRIENT POWDERS TO CONVENTIONAL FORTIFICATION ON SERUM ZINC LEVELS OF MODERATELY MALNOURISHED CHILDREN IN THIKA INFORMAL SETTLEMENTS, KENYA

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Background and objectives: Corn Soy Blend (CSB) is the standard protocol of treating malnourished children. CSB however, has poor micronutrient bioavailability and may result into poor outcomes during nutrition recovery of the children. Micronutrient powders (MNPs) have a potential to improve micronutrient nutrition. Zinc(Zn) is an essential micronutrient for immune-protection, growth and sensory development. Scientific evidence on the efficacy of MNPs in improving Zn status among moderately malnourished children is scarce. the study aimed at establishing bioequivalence of MNPs to conventional fortification in improving Zn status of moderately malnourished children in Thika Informal settlements, Kenya.

Methods: In a cluster randomized trial, twelve villages were randomized to four study groups. Three experimental groups received different formulations of MNPs added to CSB; multiple micronutrients (MMN) containing Zn (CSB-sprinkle-MMNZn), MMN without Zn (CSB-sprinkle-MMN) and Zn singly (CSB-sprinkle-Zn). The control group received conventionally Zn-fortified CSB containing MMN. CSB was prepared centrally in the participating villages and enrolled children fed daily. Dietary intake was assessed using 24-hour recall. Enrolled children underwent physical examination and anthropometric measurements. Serum Zn levels were determined pre-post intervention. Daily consumption of CSB was monitored for a period of six months. Sample size was calculated to show bioequivalence within ±20% limit. A total of 346 children (MUAC ≥11.5 - <12.5cm) were enrolled ; CSB-sprinkle-MMNZn (N=84), CSB-sprinkle-MMN (N=88), CSB-sprinkle-Zn (N=93) and control group (N=81). Analysis was by intention-to-treat.

Results: At baseline, 64.2% of the children were Zn deficient, Zn intake was sub-optimal for 95.7% of children. A mixed effects linear regression was used to model pre-post change in serum Zn levels, adjusting for age, sex and socio-economic status. Compared to control group, the change was significantly lower for CSB-sprinkle-MMN (β= -20.0µg/dL; 95% CI: -26.5, -13.5) and significantly higher for CSB-sprinkle-MMNZn (β=5.9 µg/dL; 95% CI: 0.5, 11.3). No significant difference was observed between CSB-sprinkle-ZN and control group (β=-2.1; 95% CI: -8.3; 4.2). Conventional fortification was not bioequivalent to MNPs in improving serum Zn levels (t-tests 95% CI: -2.2; 8.9 p>0.05).

Conclusions: MNPs were more effective in improving Zn status of malnourished children compared to conventional fortification and are therefore recommended in fortification programmes.

Keywords: Malnutrition, Zinc, Deficiency, Micronutrient Powders

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144/2855

NUTRITIONAL STATUS OF ADULT AND ELDERLY HOSPITALIZED WITH SYSTEMIC ARTERIAL HYPERTENSION

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Background and objectives: Systemic arterial hypertension (SAH) is the leading cause of cardiovascular disease in adults and the

elderly, according to the World Health Organization, and may worsen the clinical picture of hospitalized patients. Excess weight is strongly associated with elevated blood pressure. The main objective of this study was to evaluate the nutritional status of hypertensive adult and elderly patients admitted to a hospital in Taubate, Sao Paulo.

Methods: A cross-sectional study that evaluated adults and elderly patients diagnosed with hypertension, aged over 20 years, at a Hospital in Taubate, São Paulo, between February 2015 and May 2016. The variables evaluated were sex, age, weight and height for the calculation of body mass index (BMI). Nutritional status classification was made through World Health Organization criteria for adults, and Lipschitz criteria for the elderly, considering as parameter BMI. For statistical analysis, the t-test for independent samples and one-way ANOVA were used, with a Tukey post hoc analysis, with a significance value $p < 0.05$.

Results: Among the 176 patients evaluated, 63% (n = 111) were female. The median age for the female and male sex was 65.3 ± 11.3 and 67.4 ± 13.1, respectively. There was a significant difference between the sexes ($p < 0.05$). With data analysis, 63% (n = 71) of women were overweight, 27.9% (n = 31) presented eutrophy and the others were underweight. Regarding the males, 61% (n = 40) were overweight, 30.7% (n = 20) presented eutrophy and the others were underweight, and this difference was observed among all groups, through post hoc analysis ($p < 0.001$).

Conclusions: It is concluded that there is a high prevalence of overweight in hypertensive adults and elderly, and this outcome was higher to female sex. This is considered an injury to the hypertensive patient, and intervention measures are necessary to reduce excess adiposity.

Keywords: Systemic Arterial Hypertension. Nutrition Status. Overweight. Body Mass Index. Hospitalized Patients.

Further collaborators:

Francine de Souza da Cruz, Gabriela Moura dos Santos Botan, Ariane Nunes Novais Calisto and Livia Resende de Aguiar helped to implement the study and data collection. Roberta de Lucena Ferretti conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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NUTRITIONAL STATUS AND WEIGHT LOSS EVOLUTION IN CHILDREN WITH MALIGNANT NEOPLASMS SUBMITTED TO RADIOTHERAPY UNDER SEDATION

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Background and objectives: Patients with cancer submitted to radiotherapy (RxT) often are undergo prolonged fasting, which may favor the development of malnutrition. The objectives of this study were to identify the fasting time performed by patients submitted to RxT under sedation and to verify nutritional status evolution in three moments.

Methods: A longitudinal study that assessed children with malignant neoplasms, aged 2 to 8 years old, at a Specialized Institute of Pediatric Oncology, Sao Paulo, from July 2015 to September 2016. Data were collected in three moments, Pre, During ans Post RxT . Weight, height/length were analyzed, to calculate the Body Mass Index (BMI). Measures of middle upper arm circumference and skinfold tricptal were obtained to calculate Arm Muscle Area (AMA). Nutritional Status was assessed through z-score of BMI, according to World Health Organization recommendation. Patients were divided into two groups, A (fasting up to 14hours) and B (above 14 hours). Δ BMI z-score were calculated (variation of BMI z-score among three moments).

Results: Among the 19 patients assessed, 57.8% were male. In group A (n=11), during 3 moments, there was 9%(1st),9%(2nd),9%(3rd) of leanness, respectively, 82%(1st), 82%(2nd) and 91%(3rd) of eutrophy and 9%(1st), 9%(2nd) and 0%(3rd) of obesity. Regarding to AMA percentile<5, there were 9%, 9% and 18% of patients, respectively. In group B (n=8), in 3 moments were observed 0%(1st),12.5%(2nd),12.5%(3rd) of leanness, respectively,100%(1st), 87.5%(2nd), 87.5%(3rd) of eutrophy. Regarding to AMA below adequate there were, in 3 moments,12.5%, 12.5% and 37.5%, respectively. Weight loss was present in 47.5%, 73.5% and 52.6% in three moments, respectively. Regarding to the Δ BMI z-score, there was a greater variation for worsening of the BMI z-score, for group B (Δ BMI z-score=0.8) while Group A Δ BMI z-score=0.4.

Conclusions: It is concluded that the mean fasting time exceeded the recommendations of ACERTO project. Nutritional Status was predominantly eutrophic with AMA within normal range, however, there was weight loss (larger decrease of the BMI z-score) in a large part of the sample, being this endpoint higher in the group of patients who underwent longer fasting.

Keywords: Nutritional Status. Malignant Neoplasms. Children. Radiotherapy. Fasting Time.

Further collaborators: Adriana Garófolo, Priscila dos Santos Maia-Lemos and Roberta de Lucena Ferretti helped to implement the study interpreted data, wrote and revised the text. Karen Jalo-

retto Teixeira Guedes conceived, designed, and implemented the study, collected and interpreted data, wrote and revised the text was responsible for coordinating original study and contributed to the intellectual content. All authors have sufficiently contributed to the development of this study.

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ASSESSMENT OF NUTRITIONAL STATUS, COMPARATIVE STUDY. CONCORDANCE BETWEEN MULTIFREQUENCY, MONOFREQUENCY BIOELECTRICAL IMPEDANCE ANALYSIS AND ANTHROPOMETRY

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Background and objectives: To determine the nutritional health of an individual, we used nutritional assessment with anthropometric techniques and bioelectrical impedance analysis (BIA), two of the field methods most used for their easy application, good reproducibility and low cost.

We aimed to establish the concordance between two cohorts who were assessed by anthropometry and BIA.

Methods: We included 2871 patients between 18 and 90 years old in two cohorts of patients according to availability of bioimpedance equipment (2013-2015). Nutritional status was assessed by monofrequency BIA, multifrequency BIA and anthropometry with 4 skinfold thickness measurement. The Bland and Altman method was used to evaluate concordance between groups.

Results: 1168 studies were performed by BIA monofrequency, 69% (n = 807) female. Mean age 41 years (DS 15), mean BMI of 30 kg / m2 (DS 8). Mean % of body fat measured was 33.12% (DS 11), mean % of body fat measured by anthropometry was 34.3% (DS 10).

1703 multifrequency bioimpedance were performed, 70% (1187) female. Mean age was 44 years (DS 16) and mean BMI 30.5 (DS 7.7). Mean % of body fat was 37.7 (SD 11), mean % of body fat measured by anthropometry was 35.3 SD (12).

Bland-Altman comparison Limits of agreement (-11.587 to 9.317) Mean difference: -1.135 (CI -1.335 to -0.936) Range: 4.750 to 55.550 Pitman's Test of difference in variance: r =0.411, n = 2638, p =0.000

The limits of agreement were broad. At highest fat percentage averages there were difference in means between methods. This variability is not consistent across the graph.

Conclusions: Body composition assessment estimates by BIA monofrequency, multifrequency and skinfold method were different especially at greater body fat, concluding that these methods are not interchangeable

Keywords: Bioelectrical impedance analysis (BIA)

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CORRELATION OF VISCERAL FAT LEVEL WITH WAIST CIRCUMFERENCE IN PATIENTS WITH NORMAL WEIGHT

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Background and objectives: The aim of assessing nutritional status is to determine the general health of a patient from a nutritional point of view. Anthropometric techniques and bioelectrical impedance analysis (BIA) are two of the most widely used field methods due to their easy application, good reproducibility and low cost.

Knowing the size of visceral compartment allow us to predict metabolic risks.

We aimed to correlate visceral fat level with waist circumference in patients with normal weight.

Methods: We analyzed data from retrospective studies of patients undergoing nutritional assessment in the period 2015 by multifrequency BIA according to medical criteria. Anthropometry with 4 skinfold thickness and waist measurement was evaluated. The Spearman method was used to evaluate correlation between groups.

Results: 1470 multifrequency bioelectrical impedance were performed. 19% (281) patient with normal weight 72% (202) female, Media BMI 22.4 kg/m2, 22% (44) of female population had a % of total body fat ≥ 35% and a 25% (50) had visceral fat higher than normal limit.

28% (79) were male, Media BMI 22,1 kg/m2, 5,1% (4) had a total body fat ≥ 25%.

Global Rho spearman = 0.38 p 0.0000. By groups Female Rho spearman 0.64 p 0.000 and Male Rho spearman 0.73 p 0.0000

The Clinical Research and Bioethics Committee of the Hospital Italiano de Buenos Aires approved the study.

Conclusions: In all patients evaluated a weak linear relationship can be seen, concluding than waist circumference should not be used as a single method for an estimate of visceral fat in normal weight patient probably because it does not take into account height.

The visceral fat size was independent of anthropometric indicators of adiposity such as BMI and waist circumference. Data analyzed by sex, evidenced an increased correlation in women.

Keywords: Bioelectrical impedance analysis (BIA)

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PREVALENCE OF MANLNUTRITION IN ENRICH PROGRAM SITES OF BANGLADESH, KENYA, MYANMAR, PAKISTAN AND TANZANIA

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Background and objectives: ENRICH is a Maternal Newborn and Child Health and Nutrition program funded by the Government of Canada and implemented in Bangladesh, Pakistan, Myanmar, Kenya and Tanzania. ENRICH will use nutrition pathway to reduce U5M by strengthening health systems and improving basic nutrition and nutrition sensitive services and addressing nutrition-related causes such as: poor breastfeeding, stunting, wasting, and vitamin A and zinc deficiencies (Lancet, 2013). One of the strategies is promotion of production and consumption of biofortified micronutrient-rich crops which help to reduce vitamin A deficiency and improved iron status among CU5

Methods: The anthropometric nutrition assessment was done as part of baseline household survey of the ENRICH program. The sample size for each country was estimated using ENA for SMART software. A proportional stratified multi-stage cluster method was used to select respondents. Ethical approval was secured from University of Toronto and from the concerned authorities at country level. Anthropometric measurements were done among 6-59 months old children.

Results: Prevalence of stunting was 31.0% in Bangladesh, 33.1% in Kenya, 31.5% in Tanzania, 44.6% in Pakistan, and Myanmar 39%. The prevalence of wasting was 6.5%, 5.3%, 4.9%, 10.2% and 7.0% in Bangladesh, Kenya, Tanzania, Pakistan and Myanmar respectively. Under weight prevalence was also 20.8%, 17.8%, 15.3%, 29.7% and 28.2% in the same order. Poor infant and young child feeding practices, food insecurity and poor access to nutrition and health services were found to be some of the contributing factors. The proportion of severely food insecure households ranged from 11% to 32.3% among the five countries.

Conclusions: Malnutrition is a serious public heath problem in ENRICH project sites of the implementing countries. Chronic food insecurity and poor infant and young child feeding practices are some of the factors contributing to the high level of malnutrition. Integrated nutrition specific and sensitive interventions which are effective in reaching the poor are required to address critical underlying determinants of malnutrition. Assessment of other local determinates of poor feeding practices and tailored interventions can also play a central role in preventing undernutrition.

Keywords: Stunting, Wasting, Underweight, Undernutrition
Further collaborators:
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THYROGLOBULIN IN CHILDREN WITH LONG-TERM EXPOSURE OF IODINE EXCESS

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Background and objectives: This study investigated thyroglobulin (Tg) concentrations in children with long-term exposure of iodine excess from water.

Methods: In a multi-stage cross-sectional survey, we collected, on two nonconsecutive days, two 24-h urine samples and determined 24-h urinary iodine excretion (24-h UIE, µg/d) and then calculated habitual daily iodine intake. Tg of children was detected.

Results: In this study, 2034 children had Tg measured including 1001 boys and 1033 girls. The water iodine content in this study was 181 µg/L (67.1-403) µg/L.. The habitual daily iodine intake of children was 298 µg/d (188-436) µg/d. The median Tg concentration of children was 16.0 µg/L (9.8-26.1) µg/L in this study, and 237 (12%) children had Tg>40 µg/L while 85 (4.2%) children had Tg<4 µg/L. Tg was not associated with iodine intake concentrations up to the threshold value of 120 µg/d. When the iodine intake concentration was >120 µg/d, Tg was associated with increased iodine intake (β: 0.5; 95% CI: 0.4, 0.6; P<0.001). Taking iodine intake of 100-149 µg/d as the reference, logistic regression analysis for the association between iodine intake and Tg>40 µg/L, indicating that children from iodine intake range of ≥600 had higher risk of TGR compared to iodine intake of 100-149 µg/d (OR: 2.4 95% CI: 1.2, 4.9; P=0.018) while no differences were observed in other iodine intake ranges.

Conclusions: Tg concentrations of children who were exposed to high iodine intake were higher, however, the risk of Tg>40µg/L was not different among different iodine intake levels.

Keywords: Children, thyroglobulin (Tg), iodine excess
Further collaborators:
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DETERMINATION OF IODINE CONTENT BY ICP-MS FOR IODINE BALANCE STUDY

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Background and objectives: Iodine balance study on adults, neonates, pregnant and lactating women is essential to provide strong evidence for Dietary Reference Intakes (DRIs. Thus iodine content in a host of food, water, table salt, urine, breast milk and feces samples need to be analysed. Meanwhile demand for assessment of iodine content in serum and saliva samples is increasing due to the rising awareness of iodine status. Inductively Coupled Plasma Mass Spectrometry (ICP-MS) prevails in determining elements, including iodine, as its rapidity, low detection limits and minimal sample amount needed for analysis. This study aims to develop a fast, simple, and cheep method to determine iodine concentration in massive samples for iodine balance study and iodine status survey or evaluation.

Methods: Weigh 0.2g shredded food or feces samples and digest with 4.8mL 1% tetramethylammonium hydroxide (TMAH) in 5mL eppendof (EP) tube at 90°C for 24h, then transfer 0.5mL supernatant into 2mL EP tube after centrifuge at 3000 rpm for 15min, dilute with 1.5mL ultra-purified (UP) water, and finally centrifuge at 12000 rpm for 5min. Transfer 0.25mL breast milk samples into 5mL EP tube while with 2.75mL 0.5% ammonia at 90°C for 3h, then centrifuge at 3000 rpm for 15min and transfer 0.5mL supernatant into 2mL EP tube followed by diluted with 1.0mL UP water. Driking water, salt, serum, urine, and saliva samples are directly diluted with 7mmol/L ammonia. The final sollution can be injected into ICP-MS for iodine analysing.

Results: The precision (RSD: 2.65%-8.85%) and recovery rate (88.08%-115.04%) of the method for assessment of above samples were satisfactory.

Conclusions: These sample treatments make iodine determination in a large number of samples fast, simple and cheep and it can be used for iodine status survey or evaluation, especially for iodine balance study.

Keywords: Iodine; determination; ICP-MS

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NEW INSIGHTS INTO THE PANDEMIC OF LOW VITAMIN "D" LEVELS AND ITS ASSOCIATION WITH SEMEN QUALITY AND HORMONAL LEVELS IN FERTILE AND INFERTILE MALE SUBJECTS

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Background and objectives: Vitamin D is a versatile signaling molecule, that targets also male reproductive organs, in addition to effects on bone, calcium and phosphate homeostasis. Accumulating evidence from animal and human studies suggests that it is involved in reproduction metabolism. Objective: To evaluate the influence of vitamin D status on semen quality and hormonal profile in male fertility and infertility.

Methods: We evaluated 100 men (aged 18 to 50 y.o.) from a private medical clinic. Infertility (n=70) and fertility (n=30) groups. According to vitamin D level status all of them were classified in sufficient (group 1 - 25OHvitD ≥ 30ng/ml), insufficient (group 2 - 25OHvitD from 21 to 29ng/ml) and deficient (group 3 - 25OHvitD ≤20ng/ml). Blood samples were collected to analyze serum vitamin D, LH, FSH, estradiol, total and free testosterone, prolactin and SHBG levels. Semen was analyzed according to WHO guidelines, strict criteria and sperm functional tests were performed (ROS, CK, beads). In addition, karyotype, frequency of varicocele, smoking, alcohol ingestion, and body composition were considered. Statistical analysis was performed by SPSS program version 19.0 (SPSS Inc., Chicago, IL). T-test was used for unpaired samples for statistical analysis. Statistical significance was considered with P value < 0, 05.

Results: According to vitamin D status, patient distribution was: Infertile: group 1 - 28.5% (20/70), group 2 - 43% (30/70) and group 3 - 28,5% (20/70). Fertile: group 1 - 34% (10/30), group 2 - 40% (12/30) and group 3 - 26% (8/30). Sperm motility was significantly lower in group 3 in comparison to group 1 in infertile patients. Regarding fertile men, we found higher sperm volume in group 3 than the group 1, a significant reduction of sperm concentration and worse morphology by strict criteria in group 3 in comparison to group 1. Hormonal levels were similar in all vitamin D groups.

Conclusions: Our results demonstrated that sufficient vitamin D levels has a positive influence on spermatogenesis and semen quality, suggesting that vitamin D replacement should highly be concerned on male fertility treatment and that low vitamin D have reached epidemic proportions in industrialized cities.

Keywords: Nutrition and Male infertility. Male fertility treatment. 25OHvitaminD deficiency.

Further collaborators: Financial support: Androscience and CNPQ

144/2943

EVALUATION OF HEMOGLOBIN MEASUREMENT TOOLS FOR CHILD ANEMIA SCREENING IN RWANDA

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Background and objectives: Blood hemoglobin (Hb) level is a common indicator for diagnosing anemia and is often determined through laboratory analysis of a venous or capillary blood sample. Drawing blood samples, however, poses challenges in young children, increases the risk of infection and disease transmission, and is sometimes unacceptable to caregivers. One alternative to laboratory-based methods is use of the handheld HemoCue® Hb 201+ device, which requires a finger prick and wicking of blood into a pretreated cuvette for analysis. This wicking method is commonly used in clinic and community settings, but an alternative HemoCue® gravity method is being investigated for improved accuracy. Further, recent developments in noninvasive technologies could provide an accurate, rapid, safe, point-of-care option for Hb estimation while addressing some limitations of current tools, but the performance of these devices has not been assessed in low-resource settings. This study evaluated the performance of two HemoCue® Hb 201+ blood sampling methods and a noninvasive device (Pronto® with DCI-mini™ sensors) in a Rwandan pediatric outpatient clinic.

Methods: Reference Hb values were determined in 132 children 6 to 59 months of age by using a standard hematology analyzer (Sysmex KN21). 66 children were tested using the HemoCue® wicking method and 66 were tested using the HemoCue® gravity methods. 112 of the children had successful Hb readings with Pronto® DCI-mini™. Statistical analysis was used to assess the level of bias generated by each method and the key drivers of bias.

Results: The HemoCue® gravity method was the least biased compared with the HemoCue® wicking method and the Pronto® with DCI-mini™ sensors. The biases of the HemoCue® wicking and Pronto® DCI-mini™ methods were inversely related to the Sysmex KN21 results. Both HemoCue® sampling methods correctly classified patients' anemic status at or above 80%, while the Pronto® DCI-mini™ device had a correct classification rate of only 69%.

Conclusions: The HemoCue® gravity method was more accurate than the traditional HemoCue® wicking method in this study, but its accuracy and operational feasibility should be confirmed by future studies. The Pronto® DCI-mini™ devices showed considerable promise but require further improvements in sensitivity and specificity before wider adoption.

Keywords: Hemoglobin. HemoCue®, Noninvasive Device, Rwanda, Children

144/2951

DETERMINATION CONTENTS OF THE DIGESTIBLE INDISPENSABLE AMINO ACIDS (DIAAS) OF NINE KINDS OF GRAIN CEREAL USING RAT MODEL

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Background and objectives: Recently, for the grains, most of the researches are mainly focus on the antioxidation, prevention of chronic diseases and processed food as well as its nutritional compositions. However, there are few researches about the grain amino acid in vivo digestibility and formula design with digestible indispensable amino acid (DIAA) of grains. This research studies the contents of the digestible indispensable amino acids (DIAAS) of the nine typical grain cereals from different provinces in China.

Methods: The research has been made on the impacts of the protein sources in such nine kinds of grains on the apparent, true ileal amino acid digestibility and DIAA using rat model. To prepare diets using 9 grains for atmospheric pressure cooked that meet the nutritional needs of rats according to NRC requirements.

Results: The results showing that the average total apparent ileal amino acid digestibility values in the whole wheat and coix groups are significantly higher than other grain groups (P < 0.05) and the ileal true amino acid digestibility and ileal apparent amino acid digestibility values are characterized by a basically consistent trend; the available lysine digestibility is highest in the whole wheat and millet groups but lowest in the tartary buckwheat group and there is no significant difference in others groups (P > 0.05). Moreover, the research has been made on the ileal DIAA and available lysine contents of the protein sources in different grains, with the results showing that the digestible lysine contents in the oats and rice groups are higher than the millet, foxtail millet, coix and whole wheat groups but lower than the common and tartary buckwheat groups (P < 0.05) and the amino acids in legumins are more easily digestible than that in prolamins.

Conclusions: The nutritional value of the 9 grains was further evaluated by digestible indispensable amino acid score (DIAAS), the order were as follows: buckwheat group>tartary buckwheat group>oat group>brown rice group>polished rice group>whole wheat group>coix group>millet group>proco-millet group.

Keywords: grain cereals; protein; digestible indispensable amino acids (DIAAS)

144/2952

QUALITY INDICATOR IN THE NUTRITIONAL CARE OF CRITICALLY ILL PATIENTS IN A PRIVATE HOSPITAL - BRAZIL

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Background and objectives: Patients on nutritional therapy should be monitored routinely, and this evaluation should ensure that the best therapy is being offered for clinical recovery. Our objective was to create a tool to measure and monitor the quality of therapy provided to the critical patient aiming at nutritional recovery.

Methods: All hospitalized patients underwent a nutritional evaluation and were classified into 2 groups: with or without nutritional risk. Patients with nutritional risk were reevaluated every 7 to 10 days, taking into account: tolerance of the oral, enteral or parenteral therapy, biochemical tests and anthropometric measures. Based on the results, the patient was classified into three categories: worsening, maintenance or improvement of nutritional status. The monthly goal was to achieve at least 75% maintenance or improvement of nutritional status in these patients.

Results: The proposed target was reached between January and June 2016 (mean 92.1%), so in July a new target of 92% was proposed. Between July 2016 and April 2017, only 2 monthly measurements showed results below the expected target: October 2016 (91.5%) and January 2017 (89.3%). Analyzing the data, specific actions were implemented to reverse the critical points of nutritional care like early oral supplementation or enteral therapy.

Conclusions: Nutritional therapy is essential for the critical patient and the implementation of tools to measure the quality of care contributes to an effective and individualized nutritional therapy aiming at the clinical recovery of patients, at a lower cost.

Keywords: Quality Indicator, Nutrition Assistance

144/2983

BIOMARKERS OF INFLAMMATION AND MICRONUTRIENT CONCENTRATIONS IN RESPONSE TO A NOROVIRUS IMMUNOLOGIC CHALLENGE

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Background and objectives: Characterizing the effects of inflammation and the acute phase response on nutrient biomarkers is a critical research gap to improve accurate assessment of micronutrient status. The objective of this study was to quantify the relationship between Norovirus infection and common biomarkers used to assess inflammation [C-reactive protein (CRP) and alpha-1-acid glycoprotein (AGP)] and micronutrient status.

Methods: A longitudinal norovirus challenge study was conducted among apparently healthy adults at Emory University from 2006-2009. Of 64 volunteers, 26 became infected (norovirus detectable in stool by RT-PCR). Sandwich ELISA technique was used to measure proteins in banked serum collected at ten time points including one pre-challenge and nine post-challenge samples (1,2,3,4,7,14,21,28 and 35d post-exposure). A repeated measures study of 52 subjects (age, gender matched) was conducted to assess change in CRP, AGP, ferritin, transferrin receptor (sTfR), and retinol binding protein (RBP) over time by norovirus infection status. We calculated range of biomarker concentrations across the 35d period and report median range biomarker values. The non-parametric rank median test was used to assess differences in range of concentrations over time by infection status.

Results: Among infected individuals, CRP, AGP and ferritin concentrations rose to peak values by day 3-4 post-exposure, while uninfected individuals did not show increased concentrations post-exposure. RBP concentrations of infected individuals declined up to day 4-7 post-exposure. Median (quartile1, quartile3) range of biomarker concentrations [uninfected; infected] over time were CRP(mg/L) [1.8 (0.8, 3.2); 17.0 (7.8, 29.3) (p<0.001)], AGP(g/L) [0.4 (0.2, 0.5); 0.6 (0.5, 0.8) (p=0.001)], ferritin (μg/L) [30.7 (15.8, 46.3); 58.1 (48.0, 85.3) (p=0.001)], sTfR (mg/L) [1.5 (1.2, 3.1); 1.8 (1.4, 2.4) (p=0.27)], and RBP(μmol/L) [0.7 (0.4, 0.9); 0.8 (0.6, 1.2) (p=0.10)].

Conclusions: The median concentrations ranges of CRP, AGP, and ferritin were greater among infected than uninfected volunteers. Quantifying the magnitude and duration of micronutrient concentration changes, over the course of norovirus infection, will improve the understanding of micronutrient status in areas with high prevalence of inflammation and common infection from gastroenteritis.

144/2985

AGREEMENT BETWEEN TWO NUTRITIONAL ASSESSMENT METHODS FOR PREGNANT ADOLESCENTS WHO ATTEND PUBLIC HEALTH SERVICES OF PARAGUAY

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Background and objectives: Introduction: Nutritional assessment of adolescent pregnant women is vital to ensure maternal and fetal health. Most countries in Latin America use Atalah et al. charts to assess nutritional status of pregnant women. In Paraguay Rosso-Mardones criteria is used. Objectives: to evaluate the agreement between two nutritional assessment methods for pregnant women, Rosso-Mardones and Atalah et al.

Methods: Material and Methods: analytical cross sectional study. Analysis of sociodemographic and anthropometric data of pregnant adolescents collected in 2015 from the Food and Nutrition Surveillance System (SISVAN by its Spanish acronyms) at public health services of 18 Sanitary Regions. Nutritional status was assessed by Rosso-Mardones and Atalah et al criteria. The results were compared using percentages and the concordance between both methods was determined by Cohen's Kappa. A p value <0,05 was considered significant.

Results: 2.208 pregnant adolescents between 15 and 19 years old were included. The average age was 17, 4±1,3 years old; 58,2% lived in urban areas (n=1284) and 78% were in a couple relationship. Nutritional status according to Rosso- Mardones vs Atalah et al. criteria was: underweight 43, 8% (n=966) vs 34% (n=750), normal weight 31,5% (n= 696) vs 46,6% (n=1.028), overweight 10,2% (n=226) vs 14,1% (n=311) and obesity 14,5% (n=320) vs 5,4% (n=119). Cohen's Kappa indicated a good agreement between both methods: 96,4% for underweight, 65,2% for normal weight, 38,3% for overweight, and 100% for obesity(0,617; p=0,0001).

Conclusions: Even though underweight and obesity were higher according to Rosso-Mardones, a good concordance was observed between both methods. At the national level there is no consensus on the best criterion for nutritional assessment of pregnant adolescents. Therefore, it is essential to analyze the epidemiological situation of this population and to establish the objectives to be achieved at the public health level in order to select the most appropriate method.

Keywords: Nutrition Assessment, nutritional status, pregnancy in adolescence.

144/3005

COMPARATIVE STUDY OF THE AMINO ACID COMPOSITION OF PEELS, PULP AND CORE OF SEEDLESS BREADFRUIT (ARTOCARPUS ALTILIS)

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Background and objectives: Seedless breadfruit (Artocarpus altilis) is a large, round, starchy fruit which is usually eaten either boiled or fried. Originally native to the West Indies, it has found its way to Africa including Nigeria. The pulp of the seedless breadfruit which is generally consumed is known to be rich in nutrients notably carbohydrates. However, there is no much information on the nutrient content of the parts not commonly consumed hence the need for the study.

Methods: Samples of mature seedless breadfruit were purchased from the market at Ekpoma (6.7491oN, 6.0732E), Edo State, Nigeria. In the laboratory, the samples were peeled and the pulp separated from the core. Thereafter, they were pulverized and dried in an oven at 60oC for 48 hours before being milled. They were then stored in air tight containers at 4oC in the refrigerator before analysis. Protein (N x 6.25) was determined by the Kjedahl method while the amino acid profile in the different seedless breadfruit samples were determined using the ion exchange chromatographic method (Technicon sequential multi-sample amino acid analyzer).

Results: From the results obtained, breadfruit was found to contain both essential and non essential amino acids. The total amino acid content was highest in the core, followed by the pulp and peel with values of 714.1, 617.7 and 589.0 mg/g protein respectively. Interestingly however, although the core was found to have the highest concentration of amino acids, the peel which is usually discarded was found to contain the highest percentage of essential amino acids (48.64%) This was followed by the core (45.97%) and the pulp (44.83%). Every portion of the seedless breadfruit is thus important with respect to amino acid content.

Conclusions: There is therefore the need to harness the essential amino acids in the peel of the seedless breadfruit for both man and animal consumption.

Keywords: Amino acid, Breadfruit
Further collaborators: Osagie Victor

144/3010

ASSOCIATION OF IODINE STATUS WITH SALT INTAKE AND SALT IODINE CONTENT IN SCHOOL CHILDREN AND ADOLESCENTS

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Background and objectives: Salt fortification with iodine is mandatory to prevent, control and eradicate iodine deficiency disorders. It is important to monitor iodine consumption and its content in salt, but it is also necessary to prevent the excess of its intake.

The aim was to evaluate the association between iodine status in children and adolescents, with sodium intake through its urinary levels and with the content of iodine in salt available at household level.

Methods: Cross –sectional, descriptive and analytic study. Previous written consent, urinary iodine was dosed in children and adolescents (ammonium persulfate method) and evaluated for status according to WHO/VMNIS (Vitamin and Mineral Nutrition Information System) criteria. Sodium (Na) was also measured in early spot urine samples by the Ion-Selective Electrode (ISE) method as an indicator of salt consumption. Iodine levels were determined in salt samples (volumetric method-Thiosulfate). ANOVA and Chi square Test was used, p value <0.05 was considered significant.

Results: old); 53,1% were woman. The median urinary iodine level was 301.2 mg/L (51-646 mg/L), according iodine status 4,8% had mild iodine deficiency (50-99mg/L), 16.4% was adequate (100-199mg/L), 32.1% was more than adequate (200-299mg/L), 46.7% shows risk of adverse health consequences (>300mg/L). Average urinary Na was 161.2 mmol/L (9.0–459.2mmol/L), it was lower for children with mild iodine deficiency (113.6mg/L) versus those with risk of adverse health consequences (170.5 mg/L), more than adequate (168.1 mg/L) or adequate (147.2mg/L) iodine status (ANOVA, p<0.0001). Iodine levels were adequate (20-40 mg/k) in 60% of salt samples, insufficient (<20 mg/k) in 14.8% and excessive (>40mg/k) in 25.2%, none was negative. The percentage of risk of adverse health consequences of iodine status was 29% when iodine content in salt was excessive vs 20% when salt iodine was adequate (c2, p=0,02). Correlation between urinary Na and iodine was no found (Pearson correlation r=0,145).

Conclusions: By iodine urinary, 1 of each 2 child/adolescent present iodine status of risk of adverse health consequences, which is associated with higher intake of salt and when salt contains iodine above the recommended.

Keywords: iodine, salt, iodine urinary, children, adolescents
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144/3410

USE OF DRIED MATRIX SPOTS FOR NUTRITIONAL BIOMARKER ANALYSIS

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Background and objectives: Background

Dry Matrix Spots (DMS) are dried spots of fluids, including blood, serum, urine, saliva and breast milk, which have been used for remote collection. A device separating RBCs from plasma without centrifugation would be useful for nutritional assessment in developing countries.

Objectives

To obtain and evaluate blood collection devices (BCDs) for measurement of nutritional biomarkers (NBs). Using DMS, to determine the best methods to measure NBs, including: ferritin, folate, retinol binding protein (RBP), 25OH-D, B12, thyroglobulin (Tg), zinc, methylmalonic acid (MMA), homocysteine (HCY), alpha-1-acidglycoprotein (AGP), and C-reactive protein (CRP).

Methods: Criteria were established for successful BCDs and analytical methods. Nine BCDs were obtained and tested. Analytical methods included single-plex enzyme immunosorbent assays

(EIA), microbiological assays (folate, B12), chemiluminescence multiplex EIA, and LC-MS/MS (25OH-D, MMA and HCY).

Short-term folate stability was tested in the ViveBio-collected RBCs using a microbiological assay. Both dry cells and liquid-stabilized were tested at 23°C, 37°C and 45°C. RBC volume was calculated using the measurement of potassium.

Results: None of the BCDs met the selection criteria. Many exhibit chromatographic effects, provide too little plasma for analytical testing, or do not separate RBCs from plasma.

A prototype BCD from ViveBio (Alpharetta, GA) that separates RBCs in a vertical format yielding hemoglobin-free plasma on a collection pad was used, permitting analysis of serum-based components and RBC markers.

RBC folate was most stable in the dry cells. A cocktail containing sodium azide and bovine serum albumin (BSA) provided the best results of the liquid stabilizers.

Some NBs could not be measured using single-plex EIAs due to sample dilution, therefore, the QuanSys multiplex was used successfully. It offers the advantage of obtaining results for 6 NBs (AGP, CRP, Ferritin, Tg, RBP, and TfR) simultaneously.

Using LC-MS/MS, MMA, HCY and 25OH-D were successfully measured in eluates from DMS and in extracts stored at 23°C, 37°C and 45°C.

Conclusions: ViveBio DMS collection device was identified which separates RBCs from plasma. Both compartments were used to test NBs. The stability of 12 NBs at 5 temperatures is being measured in DMS using QuanSys multiplex, microbiological, and LC-MS/MS methods.

Keywords: biomarkers, nutrition assessment, dry blood spots, vitamins, multiplex

Further collaborators: Funded by the Bill and Melinda Gates Foundation

144/3638

EVALUATION OF NEW TECHNOLOGY-BASED TOOLS FOR DIETARY INTAKE ASSESSMENT

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Background and objectives: There is growing pressure in the area of dietary intake assessment to improve the accuracy and reduce costs of data collection and processing. New technology-based tools are available and more are under development, including web-based programs, mobile applications, and digital image-assisted and digital image-based tools, among others. The ILSI Europe Dietary Intake and Exposure Task Force launched this project to characterize and evaluate technology-based dietary assessment tools in order to develop general quality standards for future applications.

Methods: A comprehensive literature review identified new technology-based tools using key word searches with the following inclusion criteria: publications were in English, papers were published from 2011-2016, and the tool features, functions and uses were detailed. A total of 29 dietary assessment tools were identified. Scoring criteria were developed to evaluate tool features, results outputs, sources and completeness of food composition data, target audience and suitability for research. Each tool was rated on 27 features.

Results: Most of the tools identified (23/29) relied on self-reporting of dietary intake data, either through web-based programs or mobile apps. Eleven used digital images to help identify and quantify foods consumed, and one used a barcode scanner. Most tools reported energy (22/29) and macronutrients (21/29), but fewer reported micronutrients (19/29) and food groups (17/29). Only 16/29 allowed for data to be exported to researchers or other health professionals. Few publications on the tools included details about food composition tables or the ability to add missing items (5/29) or custom recipes (2/29). Scores for the tools ranged from 4 to 18 with an average of 11 out of 27 possible attributes.

Conclusions: Dietary assessment methods that utilize technology provide rapid feedback to users and offer potential cost-savings for researchers. There remain gaps in many of these tools before they will be ready to replace more traditional interview-based

methods for research purposes, and most require validity testing, additional description of the food composition tables used and details on how the foods are identified and quantified. This project will provide perspective on quality standards that could be recommended for future development and reporting of technologies in the area of dietary intake assessment.

Keywords: Dietary assessment, digital images, mobile app, web-based tools.

Track 6: Functional Foods and Bioactive Compounds

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EFFECTS ON POSTPRANDIAL BLOOD GLUCOSE AND INSULIN LEVELS AND HYDROGEN EXCRETION THROUGH THE INHIBITORY EFFECTS OF 1, 5-ANHYDROGLUCITOL ON DISACCHARIDASES IN RATS AND HEALTHY HUMANS

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Background and objectives: 1,5-Anhydro-D-glucitol (1,5-AG) is found in low levels in natural plant foods and also produced sparingly from glycogen in the liver. 1,5-AG which is mostly contained in the body is used as a marker of blood glucose control in patients with diabetes mellitus. The objective is to investigate whether 1,5-AG, which is ingested excessively as a food ingredient, has a specific physiological function.

Methods: The inhibition by 1,5-AG was determined on disaccharidases of small intestine of rats and humans, and compared with that of rare sugars. To investigate the metabolism and fate of 1,5-AG, 1,5-AG was administered orally to rats prior to human experiments and the effects on blood concentrations and urinary excretion of 1,5-AG and hydrogen excretion were determined. In addition, a sucrose or glucose solution with or without 1,5-AG was administered orally to rats, and the suppressive effects on postprandial blood glucose and insulin was determined. Similar physiological functions were also investigated using healthy human participants.

Results: 1,5-AG distinctly inhibited the activity of sucrase, maltase, trehalase and lactase, while D-sorbose and L-arabinose strongly inhibited sucrase but barely inhibited trehalase and lactase. The inhibition of 1,5-AG on sucrase and maltase were similar between humans and rats. 1,5-AG in serum showed a peak 30 min after ingestion of 1,5-AG (10 g) by healthy subjects, and decreased gradually over 180 min. About 60 % of 1,5-AG was excreted into the urine for 9 h following ingestion, while mostly 100 % of 1,5-AG was excreted into the urine 24 h after administration in rats. Hydrogen was scarcely excreted in both rats and humans 24 h after administration of 1,5-AG. 1,5-AG significantly suppressed the elevation of blood glucose and insulin by the ingestion of sucrose or glucose. A large amount of 1,5-AG (20 g) caused no side effects among healthy participants. Ingested 1,5-AG was readily absorbed from the small intestine and excreted rapidly into the urine. Thus, the available energy of 1,5-AG is 0 kcal/g and 1,5-AG does not cause osmotic diarrhoea.

Conclusions: 1,5-AG which has a very low toxicity and is safe, could be use as low energy bulking sweetener in food products.

Keywords: 1,5-anhydroglucitol; postprandial blood glucose; disaccharidase; hydrogen excretion; inhibitory effect.

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EFFECTS OF 1,5-ANHYDROGLUCITOL-FEEDING ON GROWTH, ORGAN WEIGHT, BLOOD BIO-CHEMICAL MARKERS AND OXIDATIVE STRESS IN RATS

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Background and objectives: 1,5-anhydro-D-glucitol (1,5-AG) which has 60 % of the sweetness of sucrose, is found in low levels in natural plant foods and also produced sparingly from glycogen in the liver. 1,5-AG which is mostly contained in the body, is used as a marker of blood glucose control in patients with diabetes mellitus. The objective is to investigate whether 1,5-AG, which is ingested excessively as a food ingredient, does not cause the harmful effect and has a specific physiological function.

Methods: Male Wistar rats aged 4-wk were raised using consecutive feeding of diets (AIN93G) containing 5% and 10% of 1,5-AG for 31 days (n=5 in each group). Erythritol, which is easily absorbable and excreted in the urine without degradation, and fructooligosaccharide (FOS), which is non digestible and completely fermentable were used as controls. Body weight and food intake were determined every day and blood was collected on 24th day of experiment to measure oxidative stress. The urine and feces were collected between 27th and 29th day of experiment using metabolic cage.

Results: The growth and organ weights of the rats were not significantly different between the control group and the other 4 groups, because the amount of dietary intake was adjusted to become identical by light restricted feeding. In the experiment of revenue and expenditure, almost 100% of the 1,5-AG ingested was recovered from urine collected for 24 h. These results demonstrate that almost 1,5-AG ingested is absorbed from the small intestine and is excreted in the urine without degradation, with the available energy being 0 kcal/g. 1,5-AG did not affect the concentration of blood glucose or triacylglycerol following consecutive feeding for 31 days and also did not induce morphological abnormalities in organs and tissues without cecal enlargement in the FOS group. The anti-oxidative potential and oxidative index of plasma and the urinary excretion of 8-hydroxy-2'-deoxyguanosine were not significantly different between the five groups.

Conclusions: Ingestion of 1.6 g of 1,5-AG/kg body weight per day (average intake during experiment) does not have harmful effects on the growth and physical condition of rats. Taken together these results demonstrate that 1,5-AG is a safe ingredient in food.

Keywords: 1,5-anhydroglucitol; oxidative Stress; blood biochemical markers; organ weight.

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ACCEPTABILITY OF FORTIFIED WHEY PROTEIN CONCENTRATE SUPPLEMENTS WHEN ADDED TO CUSTOMARY THIN GRUELS (ATOLES) BY WOMEN IN THE WESTERN HIGHLANDS OF GUATEMALA

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Background and objectives: Dietary surveys have shown a gap in the daily intake of protein and other micronutrients, among lactating women in the western highlands of Guatemala. Culturally, during lactation, women consume additional amounts of thin gruel beverages (atoles), which can serve as a vehicle to secure the missing nutrients. Simple addition of whey-protein concentrate (WPC) supplement to thin gruels has been found acceptable; nonetheless addition of micronutrients could change some organoleptic characteristics. We sought to determine, among women of different socio-demographic settings, the acceptability of fortified WPC supplements added to thin gruels.

Methods: 55 women aged 17-70y were recruited locally across two socio-demographic settings in Quetzaltenango, Guatemala. They were asked to bring a home-prepared gruel of their preference.

Three cups containing 100 ml of the gruel and different WPC presentation were served for sensory evaluation: alone; fortified with recommended dosage of micronutrients for lactation (FWPC); and fortified with twice the recommended dosage of micronutrients for lactation (2xFWPC). Sensory evaluation involved responding as to any detectable differences in taste and selecting their most and least preferred options.

Results: 91% of the women detected a difference in taste among the beverages. Participants were equally inclined to choose either WPC or 2xFWPC as their preferred beverage, both reported at 38%, with 24% favoring FWPC. For the least preferred beverage,

44% chose 2xFWPC and WPC and FWPC tied with 28% each. When responding to the question of voluntarily drinking either of the fortified offerings on a regular basis, 97% of the women responded that they would do so willingly.

Conclusions: A fortified WPC supplement, mixed with thin traditional gruels, proves to be not only a culturally-pertinent, but also a plausible vehicle for the micronutrients needed to fill the existing gaps to reach recommended intakes for lactation.

Keywords: Acceptability, whey protein concentrate, thin gruel beverages, guatemalan western highlands

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COMPUTER-AIDED TOOLS IN THE ANALYSIS OF TASTANT/BIOACTIVE PEPTIDES OCCURRING IN FOOD-ORIGINATING PROTEIN SEQUENCES

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Background and objectives: Peptides significantly affect the sensory attractiveness of foods, because they feature the taste properties of products by affecting the following taste sensations: umami, sour, sweet, salty and bitter. The latter one can be regarded by consumers as undesired, especially when thinking about ripening cheeses and formulas composed of protein hydrolysates.

Methods: The aim of the study was the computer analysis of food derived protein sequences being potential source of tastant peptides. Analyses included: elaboration of the profiles of potential sensory activity of proteins as well as the computer simulation of hydrolysis of proteins to generate tastant/bioactive peptides. The selected plant and animal protein sequences (derived from oil and leguminous plants, crops, milk, fish, and meat) were taken for the bioinformatic studies. Methods: **Results:** Based on the profile of potential sensory activity of proteins, we found that majority of peptides located in proteins were bitter. Moreover, potentially the largest number of tastant peptides was present in milk and carp proteins (caseins and myosin, respectively). The data concerning the milk proteins as the source of bitter peptides were consistent which the results confirmed in in vitro studies. Many peptides located in proteins were dipeptides. It was found that ficin and papain were the proteases, which potentially released the largest number of taste peptides from all protein sequences analyzed. It was also concluded that some peptide tastants revealed biological potential as the dietary components supporting the metabolic syndrome prophylaxis. Our studies confirmed the suitability of selected bioinformatic tools in studying the proteins as the food components being the source of tastant/bioactive peptides.

Conclusions: Our studies confirmed the suitability of selected bioinformatic tools in studying the proteins as the food components being the source of tastant/bioactive peptides.

Keywords: sensory peptides, proteins, in silico analysis, hydrolysis

Further collaborators:

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DIFFERENTIAL PERIPHERAL BLOOD METHYLATION BY ALPHA-LIPOIC ACID AND EPA SUPPLEMENTATION IN OVERWEIGHT/OBESE WOMEN DURING A WEIGHT LOSS PROGRAM

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Background and objectives: It has been reported that α-lipoic acid (LA) supplementation alone or in combination with eicosapentaenoic acid (EPA) may help to promote body weight loss and reduce inflammatory and cardiovascular disease–related risk markers in conjunction with hypocaloric diets. The present study aimed to assess methylation modifications in white blood cell genes induced by EPA and/or LA supplementation, as well as their possible relationship with metabolic risk biomarkers in obesity during weight loss.

Methods: Apparently healthy overweight/obese women followed a hypocaloric diet (-30%) during 10 weeks after being randomly assigned to 1 of 4 parallel dietary groups: a control group or groups supplemented with 1.3 g EPA/day, 0.3 g LA/day, or both. DNA from white blood cells was hybridized in an Infinium Human 450K methylation microarray.

Results: Differentially methylated changes (after-before) were identified in EPA (228 CpGs), LA (125 CpGs) and EPA+LA (279 CpGs) groups as compared with control group. These included CpG regions from NCK adaptor protein 2 (NCK2), fat storage inducing transmembrane protein 2 (FITM2), transcription domain-associated protein (TRRAP), regulatory associated protein of mTOR (RPTOR) and CREB binding protein (CREBBP). Of note, LA significantly upregulated NCK2, TRRAP and RPTOR mRNA in PBMC, which correlated with changes in body weight and fat mass. The variations in cg10320884 (TRRAP) methylation site were negatively associated with changes in TRRAP gene expression, while had a highly significant positive correlation with the changes in the Framingham score.

Conclusions: These results suggest the involvement of epigenetic mechanisms in LA and EPA metabolic actions.

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EARLY LIFE PROGRAMMING BY OMEGA-3 FATTY ACIDS IN OBESITY-ASSOCIATED INFLAMMATION

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Background and objectives: Over half of American women of child bearing age are either obese or overweight. Hence, the prevalence of childhood obesity is predicted to increase. Maternal programming through diet is critical for prevention of several diseases in the offspring, including childhood obesity. Clinical trials with n-3 polyunsaturated fatty acids (PUFAs) such as docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) reported various health benefits, including reduced serum triglycerides and obesity-associated inflammation, and increased insulin sensitivity. However, it remains unclear whether maternal consumption of n-3 PUFAs can protect offspring from the adverse metabolic effects of consuming high fat diets during pregnancy. Accordingly, we hypothesized that n-3 PUFAs supplementation during pregnancy will reduce maternal obesity- associated inflammation and reduce/prevent adverse metabolic effects in offspring.

Methods: To test this hypothesis, we fed B6 mice high fat diet (HF) or HF supplemented with fish oil, rich with EPA (HF-EPA) for 8 weeks pre-pregnancy through lactation. After weaning, offspring from HF or HF-EPA dams were either continued on their respective diet or switched to the opposite diet. Five treatment groups were created including a low fat (LF)-LF control group (LF maternal diet and LF post-weaning), HF-HF, HF-EPA, EPA-HF, EPA-EPA, respectively.

Results: Metabolic phenotyping of these mice included body weight and body fat, glucose and insulin tolerance tests. Offspring born to dams fed EPA and continued on EPA (EPA-EPA) showed significantly higher glucose clearance rates compared to other treatment groups but was lower compared to LF animals. Similarly, significant improvements in insulin sensitivity was observed in the EPA-EPA fed group compared to other HF treated groups. EPA-EPA and HF-EPA had lower fat mass compared to HF-HF and EPA-HF. Additional mechanistic studies are ongoing in serum and tissues collected from the offspring to determine molecular mechanisms mediating EPA effects on high fat diet-induced obesity and inflammation in dams and their offspring.

Conclusions: In conclusion, these studies will help to understand the differential contribution of maternal dietary lipids to metabolic health of the offspring.

Keywords: Obesity, Eicosapentaenoic acid (EPA), fish oil, mice, in utero, childhood obesity

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ANGIOTENSIN I-CONVERTING ENZYME INHIBITORY ACTIVITY OF OAT PROTEINS HYDROLYSATES

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Background and objectives: The increase of interest in food ingredients with specific health-related activities have been observed. Biopeptides derived from food proteins are considered as regulators of e. g. cardiovascular system. The best known bioactive peptides with antihypertensive properties are angiotensin I-converting enzyme (ACE) [EC 3.4.15.1] inhibitors. They play a role in lowering high blood pressure and regulating the cardiovascular system activity. Oats proteins may be the source of biopeptides. Nutritional value of proteins from oat seeds is comparable to meat, eggs and milk proteins. The aim of the study was to examine the angiotensin I-converting enzyme inhibitory activity of oat proteins hydrolysates.

Methods: The extracts of oat proteins were taken. The study covered the in silico part – with the use of UniProt database, BIOPEP database and tools available within (http://www.uwm.edu.pl/biochemia/), Fragment Ion Calculator application and Sequence Specific Retention Calculator application. The next step of analysis was hydrolysis with the use of commercial enzyme preparations. Bioactive peptides were identify using reversed-phase liquid chromatography with mass spectrometry detector (RP-HPLC-ESI-MS) based on the expected retention times. The SDS-PAGE method was used to verify the progress of hydrolysis. The ACE inhibitory activity of obtained hydrolysates was assayed according to method by Jimsheena and Gowda (2009).

Results: It was found that the degree of hydrolysis and ACE inhibition increased during the hydrolysis process. The sample treated with commercial digestive enzymes demonstrated the highest degree of ACE inhibition (89%, IC50 = 0.42 mg/ml). The degree of ACE inhibition of this sample was higher in comparison with the blank sample (49%, IC50 = 24.89 mg/ml). The proteins

are only partially hydrolysed with pepsin in the stomach, so the sample hydrolyzed by pepsin was characterized by a lower degree of inhibition (77%, IC50 = 4.87 mg/ml) in comparison with the 'gastro-duodenal' samples

Conclusions: The results showed that the oat proteins can be the source of peptides with ACE inhibitory activity that are released during the simulated digestion. The identification of ACE inhibitory peptides in hydrolysates of oat proteins was possible thanks to the combination of computer and experimental methods.

Keywords: ACE, inhibitory peptides, oat proteins

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THE BIOPEP - DATABASE OF FOOD BIOLOGICALLY ACTIVE PEPTIDES AND PROTEINS

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Background and objectives: Peptides derived from food proteins affect biological, functional, immunological and sensory properties of food products as well as provide information concerning product composition, authenticity or history. Proteins apart from their function as the nutrients act as the precursors of peptides with variety of functions.

Methods: The database of protein and peptide sequences called BIOPEP (http://www.uwm.edu.pl/biochemia) has been designed mainly for scientists working in the area of food and nutrition. BIOPEP database consists of four sequence databases: proteins, bioactive peptides, allergenic peptides with their epitopes and sensory peptides. The information concerning peptide or protein covers its sequence; data about activity or taste; references or in the case of allergenic protein database reference, sequence of experimental and theoretically predicted linear epitopes [Minkiewicz et al. 2012]. Sequence analysis options include: profiles of the potential biological activity, epitopes or sensory activity, calculation of the quantitative parameters A and B useful for evaluation and classification of proteins as precursors of bioactive or sensory peptides as well as immunogenic fragments. The options available in particular databases of BIOPEP include also the simulation and design of proteolysis as well as data mining. BIOPEP contains also the collection of links to other databases and programs ("Useful links" bookmark).

Results: Proposed workflows for use of BIOPEP database of bioactive peptide sequences cover among others: using sequences of peptides as queries for database screening or identification of peptides from BIOPEP among products of protein hydrolysis. Selected examples of applications of the database, described by other authors will be presented. Our intention was to establish BIOPEP as the database integrating information about various properties of fragments originating from food proteins. All subelements of the BIOPEP database are continuously updated with the new se-

quences with experimentally confirmed bioactivities as well as calculation functions helping to evaluate the protein value as the source of biopeptides.

Conclusions: To date, apart from the data concerning different biological properties of peptides, BIOPEP may serve as a tool supporting the experimental and theoretical studies on food-derived biopeptides.

Keywords: bioactive peptides; database; food proteins; hydrolysis

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ANTIHYPOXIA AND ANTIOXIDANT EFFECTS OF SMALL MOLECULE OLIGOPEPTIDES ISOLATED FROM PANAX GINSENG C. A. MEYER

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Background and objectives: To investigate the effect of Panax ginseng oligopeptide of Jilin providence (GOP) on antioxidation in oxidative damaged rats induced by D-galactose and antihypoxia capacity in mice.

Methods: 90 specific pathogen free (SPF) male SD rats are randomly divided into 9 groups: namely blank control group, model control group, whey protein control group, and six groups of GOP at different doses. Except the control group, all other groups are given with 125 mg/kg of D-galactose by intraperitoneal injection for 6 weeks. Then, rats in the six samples groups were gavaged with 0.0625, 0.125, 0.250, 0.500, 1.000, 2.000 g/kg of GOP; rats in control group and model group were gavaged with the same volume of distilled water; and rats in whey protein group were gavaged with 0.250 g/kg of whey protein for 45 d. At the same time, rats are given with D-galactose uninterruptedly. The oxidative stress parameters in serum and liver tissue are then determined. Besides, 180 SPF male mice are randomly divided into three experimental sets for the detection of different indicators. Each set of mice are then randomly divided into 6 groups: namely blank control group, whey protein control group, and four groups of GOP at different doses. Mice in the four samples groups were gavaged with 0.075, 0.150, 0.300, 0.600 g/kg of GOP; mice in bland control group was gavaged with the same volume of distilled water; and mice in whey protein control group were gavaged with 0.300 g/kg of whey protein for 30 d. The survival time of oxygen deprivation, intoxication and cerebral ischemic hypoxia of mice are then determined.

Results: The levels of lipid peroxide and protein peroxide of GOP groups are significantly lower than these of model group, meanwhile, the activities of antioxidant enzyme and the levels of antioxidants significantly increase compared with these of model group, and the effects are better than those of the whey protein.

The survival time of oxygen deprivation, intoxication and cerebral ischemic hypoxia of mice are significantly longer than these of whey protein control group.

Conclusions: GOP has antioxidant effect on D-galactose induced oxidative damaged rats as well as antihypoxia capacity on mice.

Keywords: Panax ginseng oligopeptide of Jilin providence; antioxidant; antihypoxia

Further collaborators: Some issue about the peptide nutrition.

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THE INFLUENCE AND MECHANISM OF BOVINE COLLAGEN OLIGOPEPTIDE ON WOUND HEALING IN MICE

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Background and objectives: To investigate the influence and mechanism of bovine collagen oligopeptide on wound healing in mice.

Methods: A total of 240 ICR mice are randomly assigned to 6 groups, including a control group and 6 bovine collagen oligopeptide intervention groups (0.375, 0.75, 1.5, 3.0, 6.0g/kg bw). And each group is randomly assigned to 4 subgroups. The mice are carried out by mice stomach-lavaging continuously for 16 days after excisional wound model. And the mice will be sacrificed separately at day 4, day8, day12 and day 16. Wound closure is assayed, and the serum SDF-1a parameter is conducted. After fixation of the skin biopsy samples in 4% formalin, they are embedded in paraffin and stained with HE.

Results: It has been found that Bovine collagen oligopeptide treatment could significantly decrease the wound region (p<0.05 or p<0.01) and increase the secret of SDF-1α(p<0.05 or p<0.01).

Conclusions: These findings suggest that Bovine collagen oligopeptide have an obvious promote on wound healing and the underlying mechanism may be related to enhancing SDF-1α.

Keywords: Bovine collagen oligopeptide; wound healing; SDF-1α

Further collaborators: Some issue about the peptide nutrition.

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THE EFFECTS OF WALNUT PEPTIDE ON LEARNING AND MEMORY ABILITIES IN YOUNG MICE

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Background and objectives: To investigate the improvement effects and their mechanisms of walnut peptide (WP) on learning and memory abilities in young mice.

Methods: 48 male weaning C57BL/6J mice were randomly divided into 4 groups, the control group, low WP intervention group, middle WP intervention group, and high WP intervention group(the concentrations of WP were 110mg/kg·bw, 220mg/kg·bw and 440mg/kg·bw respectively), with 12 mice in each group. After 30 days feeding, the Open-field test, Morris Water Maze, Step-down test and Shuttle test were performed, in order to observe the ability of autonomic activities and emotional responses, spatial memory ability, and the active and passive avoidance reactions in mice.

Results: According to the results of Morris Water maze, the escape latency of high WP group was significantly reduced compared with the control group (P<0.05), and for middle and high WP groups, the times staying in the target quadrant and the numbers of crossing over the position where the platform had been were increased compared with the control group (P<0.05). The Step-down test indicated, after the training 24 hours, compared to the control group, the low and high WP groups had less error times (P<0.05), and three intervention groups had longer step-down latency (P<0.05). After the training 5 days, the declines of learning and memory in the middle WP group was effectively reduced (P<0.05). Shuttle test showed that, compared with the control group, after the intervention of the low, middle, and high doses of WP, the numbers of active avoidance reaction increased (P<0.05), while the times of electric shock decreased in mice (P<0.05). The activities of T-SOD and GSH-Px in three WP groups were higher, and the level of MDA were lower compared with the control group (P<0.05).

Conclusions: The walnut Peptide could enhance the abilities of learning and spatial memory and the abilities of active and passive avoidance in young mice, and WP could delay the declines of learning and memory in mice. The mechanism was related to the antioxygenic property of WP.

Keywords: Walnut Peptide; Young mice; Learning and memory ability

Further collaborators:
Some issue about the peptide nutrition.

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LONG-TERM DIETARY NUCLEOTIDES SUPPLEMENTS AND LIVER FIBROSIS IN AGING RATS: A MIRNA INVESTIGATION

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Background and objectives: Previous studies suggested that nucleotides were beneficial for liver function, lipid metabolism and so on. The present study aimed to investigate the anti-fibrosis effects of dietary nucleotides on aging liver.

Methods: Full liver samples from the rats at the age of 24-26 months (aged control, 0.01% NTs and 0.64% NTs; n=6/group) were excised for analysis. Another group of male S-D rats (n = 8) which were fed with the control diet were sacrificed at the age of 12 months to be used as the middle controls. The liver samples were used for investigation on Hyp, oxidative Stress and cytokines level, as well as the expression levels of miRNA and their target genes.

Results: This study established the association of miR-182 and miR-328a* with NTs in aging liver, meanwhile highlighted the correlation of miRNA expression with their target genes Thbs-2 and Pdgf-b. It also identified that long-term administration of NTs inhibited the age related decrease activity of Hyp, oxidative Stress and inflammatory level in the chronological aged liver.

Conclusions: The present study demonstrated that the anti-fibrosis effects of long-term NTs on chronological liver aging, which possible because NTs affect miR-182 and miR-328a* through their target genes Thbs-2 and Pdgf-b in the aged liver of S-D male rats.

Keywords: dietary nucleotides (NTs); aging liver; miRNA; S-D rats

Further collaborators:
Some issue about the dietary nucleotides nutrition

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CHARACTERIZATION OF ANTIOXIDATIVE PEPTIDES FROM THE OIL PALM (ELAEIS GUINEENSIS JACQ.) KERNEL PROTEIN HYDROLYSATE

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Background and objectives: Plant proteins play essential roles in human nutrition. Oil palm fruit is the most important oilseed crops globally where its kernel is obtained as waste after palm oil production. Our previous study demonstrated that oil palm kernel protein hydrolysate (OPKH) obtained after pepsin-pancreatin hydrolysis showed strong antioxidant activity. Hence, this study aims to purify and identify the antioxidative peptides from OPKH.

Methods: First, the OPKH was purified by ultrafiltration, followed by reversed-phase (analytical) and semi-preparative HPLC to collect the bioactive fractions. Subsequently, antioxidant capacities (ACs) of the purified peptides from OPKH were evaluated using ferric reducing antioxidant power (FRAP), β-carotene-linoleate bleaching (BCB) assay and 2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid) (ABTS) radical scavenging activity assay. In relation, the amino acid compositions of the purified peptide fractions were also determined. Finally, the amino acid sequence of the antioxidative peptide was identified by electrospray ionization/multi-stage mass spectrometry (ESI/MS/MS) coupled with Q-TOF LC/MS and PEAKS studio software using de novo sequencing.

Results: Nine active fractions (F1-F9) were collected and purified. Fraction F6 showed the highest AC. Fraction F6 was collected and re-chromatographed on the same analytical column where three sub-fractions (F6a, F6b and F6c) were obtained. Three antioxidative peptides, Val-Val-Gly-Gly-Asp-Gly-Asp-Val (VVGGDGDV), Val-Pro-Val-Thr-Ser-Thr (VPVTST) and Leu-Thr-Thr-Leu-Asp-Ser-Glu (LTTLDSE) in this fraction F6 were identified using MS/MS. The molecular masses of the peptides VVGGDGDV, VPVTST and LTTLDSE were 717.34, 602.3 and 777.37 Da, respectively. The three peptides did not show any similarity with other antioxidant peptides listed in BLAST database of NCBI.

Conclusions: Three novel peptides with ACs from OPKH were characterized. These active peptides may be useful as ingredients for food products and nutraceutical applicants.

Keywords: oil palm kernel protein hydrolysate (OPKH), antioxidant capacity (AC), peptide, amino acid sequence, LC-MS/MS

EFFECT OF POWDER DRY ADZUKI BEAN PASTE IN PLACE OF WHEAT FLOUR ON RESISTANT STARCH CONTENT AND SENSORY CHARACTERISTICS OF COOKIES

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Background and objectives: Traditional Japanese sweets have been popular among Japanese, and are often eaten particularly by middle-aged and elderly people. A lot of traditional Japanese sweets contain adzuki bean paste(ABP). Adzuki beans are a good source of carbohydrate as well as of protein, because these are starchy pulse. Furthermore, they contain a lot of dietary fiber and also include resistant starch (RS). RS escapes digestion until reaching colon and acts like dietary fiber. Recently, many studies recommend taking this new type of dietary fiber for health benefits. The purpose of this study was to investigate feasibility of replacing wheat flour to powder dry ABP by analyzing RS contents and sensory characteristics in cookies.

Methods: Cookies were prepared from various blends of wheat flour(WF) and powder dry ABP(100%WF:0%ABP, 50%WF:50%ABP, 25%WF:75%ABP, 0%WF:100%ABP). RS content of these cookies were measured by Resistant Starch Assay Kit (Megazyme International Ireland, Ireland) and ranking test was applied for evaluating sensory characteristics.

Results: RS content of powder dry ABP was 5.3% and RS contents of cookies blended flour with 50%ABP, 75%ABP, 100%ABP were 1.6%, 2.1%, 3.0%, respectively. As a ratio of ABP in the cookies increased, a ratio of RS content also increased. Sensory evaluation indicated that 50%ABP cookies was not different from 0%ABP cookies in terms of flavor, sweetness, texture and overall acceptability.

Conclusions: These results implied that cookies made of powder dry ABP in place of wheat flour increased amount of RS in cookies. Taking account of sensory evaluation, 50% replacement of powder dry ABP cookies were found to be acceptable.

Keywords: dry adzuki bean paste, resistant starch, sensory characteristics, cookies

THE PHYSIOTHERAPIST AND THE FUNCTIONAL FOODS IN THE QUALITY OF LIFE IN HEALTH

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Background and objectives: The Unified Health System (SUS), whose principles are the pursuit of universality, integrality and equity, forming several productions and questions regarding the assistance adopted. There is a need for more active professionals in the epidemiological reality inserted in the SUS, in this context the Physiotherapy is inserted in the system with an exclusively rehabilitating and curative character. Objective: To analyze the main actions of the physiotherapist of the multiprofessional team, aimed at promoting healthy eating habits.

Methods: This is a literature review in the SciELO (Scientific Electronic Library Online) and LILACS (Latin American and Caribbean Literature in Health Sciences) databases, with the descriptors in health: functional foods AND physiotherapy. Criteria to inclusion and exclusion were applied, and 4 studies were selected for analysis.

Results: The increase of obesity has caused great concern to sanitary skills, presenting as a significant health risk factor, such as: diabetes, hypertension, hypercholesterolemia, among others. Physiotherapy in its work with regard to nutrition aims to promote and raise awareness in the community in promoting healthy eating habits and performance of physical exercises. A balanced diet is essential to health by providing the necessary nutrients and functional foods are the newest frontiers in the food market, as they still perform therapeutic functions. In Brazil 75% of the food sold is linked to health, this audience is divided into classes of A & B, present in the market, among them

we can mention: yogurts with pro-biotics that regulate intestinal function, iron-enriched milks that help in prevention and in treatments Anemias, vitamins and with Omega 3 acid, highlighting eggs and margarines enriched also with Omega-3, among several other foods.

Conclusions: Functional food has low cost and is of great nutritional value, favoring the indication by several professionals in the health area. In this way, physiotherapy in the search for the well-being of its patient, has the duty not only to encourage or accompany the practice of exercises, but also to plan actions related to the theme, together with the multiprofessional team, actions in the prevention and promotion of Health of the individual or community.

Keywords: Physiotherapist, Functional foods, Promotion of health.

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EXPLORATION OF BIOFUNCTION OF SIPHO-NAXANTHIN, A CAROTENOID DERIVED FROM GREEN ALGAE, ON HEPATIC LIPOGENESIS

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Background and objectives: Non-alcoholic fatty liver disease (NAFLD) is notable for its high morbidity and mortality accompanied by a series of complications including diabetes, hypertension, dyslipidemia etc. Carotenoids have been well-known for their various activities, such as anti-oxidation, anti-photoaging, anti-angiogenesis and anti-obesity. In concern with the diverse functions of carotenoids, their potential to prevent and alleviate NAFLD has also been investigated. Siphonaxanthin is a rare marine carotenoid present in some green algae. In this research, we investigated the potential function of siphonaxanthin on preventing and attenuating NAFLD and its mechanisms.

Methods: We conducted a preliminary assessment of the effect of siphonxanthin on hepatic lipid metabolism by conducting an in vitro study. HepG2 cell line, derived from human liver cancer, was used as a model of liver. We used a synthetic agonist of liver X receptor α (LXRα) to simulate an aggravated lipogenesis in HepG2 cells and investigated the effect of siphonaxanthin on hepatic lipid synthesis from several aspects including triacylglycerol accumulation, mRNA levels of related genes, protein level of a transcription factor named sterol regulatory element binding protein-1c (SREBP-1c) and LXRα activity.

Results: Siphonxanthin significantly suppressed the excess accumulation of triacylglycerol induced by LXRα agonist by down-regulating the expression of SREBP-1c and a set of genes related to de novo lipogenesis. On the other side, fatty acid translocase (CD36) and fatty acid binding protein-1 (FABP1) which regulate fatty acid uptake also showed a significant decrease in

translational levels. Furthermore, we found out that siphonxanthin inhibited LXRα activation induced by its agonist, T0901317.

Conclusions: In the present study, we discovered that a rare carotenoid named siphonaxanthin, possesses a strong inhibitory effect on hepatic lipogenesis. Based on this study, it is plausible to speculate that siphonaxanthin may be promising in nutraceutical application targeting pathological liver disorders such as NAFLD.

Keywords: Siphonaxanthin, Hepatocyte, Lipogenesis, LXRα, SREBP1c.

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ASSOCIATION BETWEEN AMINO ACIDS, BIO-MARKERS OF PROSTATE CANCER AND INFLAMMATION IN NORWEGIAN PROSTATE CANCER PATIENTS

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Background and objectives: Earlier our research group had shown that a nutritional intervention with tomato products alone or in combination with selenium and n-3 fatty acids soy isoflavones, grape/pomegranate juice, and green/black tea lower prostate-specific antigen (PSA) in patients with non-metastatic prostate cancer. However, the mechanism is still undefined. Dysregulation of amino acids has been reported in cancers. Therefore, our aim was to study the amino acid profile in prostate cancer patients following a tomato products-based intervention in relation to PSA and inflammation.

Methods: For this analysis, we included 74 patients with prostate cancer from a previous study. Prior to curative treatment, the patients were randomized to nutritional interventions with either 1) tomato products containing 30 mg lycopene per day; 2) tomato products plus selenium, omega-3 fatty acids, soy isoflavones, grape/pomegranate juice, and green/black tea (tomato-plus); or 3) control diet for 3 weeks. Plasma samples from baseline and after the intervention were analysed. The level of total PSA was determined on the AutoDELFIA automatic immunoassay system. Plasma carotenoids and amino acids were detected using HPLC. An ANOVA adjusted for the baseline was performed to evaluate differences between groups after the dietary intervention. Correlation between parameters was estimated by computing Pearson's correlation coefficient using the delta (t1-t0). All statistical analyses were performed using SPSS 24.

Results: For all patients, we found a significant correlation between the lycopene change and total PSA (r=-0.247; p=0.034) and

ornithine (r=0.238; p=0.041). Furthermore, the change in ornithine was inversely correlated with total PSA (r=0-0.311, p= 0.007). Finally, the change in total PSA was correlated with C-reactive protein (CRP) (r=0.301; p=0.011).

Conclusions: The increase of lycopene was associated with an increase of ornithine. The change in ornithine showed to be inversely correlated with PSA, which in turn is associated with the inflammatory biomarker, CRP. Further analyses are needed to study a possible link between ornithine and CRP.

Keywords: Carotenoids, Lycopene, Amino acids, Prostate cancer, Inflammation

Conflict of Interest Disclosure: RB has interests in Vitas AS. All other authors disclose no conflict of interest.

IDENTIFICATION OF PROPROTEIN CONVERTASE SUBTILISIN/KEXIN TYPE 9 (PCSK9) INHIBITORS FROM NATURAL PRODUCTS

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Background and objectives: Proprotein convertase subtilisin/kexin type 9 (PCSK9) is a new target for lowering serum cholesterol levels. PCSK9 inhibition retards degradation of low-density lipoprotein receptor (LDLR), resulting in enhancement of LDL-cholesterol uptake in the liver. Daily intake of foodstuffs containing compounds which inhibit PCSK9 activity is expected to prevent hypercholesterolemia.

Methods: We constructed a food extracts library and screened for PCSK9 inhibition. A human hepatocellular cell line (HepG2) was treated with test samples and cultured for one day. Secreted mature PCSK9 proteins from the culture medium were determined by western blotting. Active compounds in the food extracts responsible for PCSK9 inhibition were separated and isolated by chromatography. Chemical structures of the compounds were determined by LC-Q-TOF-MS and NMR analyses. To investigate the mechanisms of PCSK9 inhibition in the food items, HepG2 cells were transfected with the siRNA of PCSK9 regulators and then treated with the active compound.

Results: Female hop cones (Humulus lupulus L.) and lemon peel showed PCSK9 inhibitory activity. The active compounds responsible for inhibition of PCSK9 were identified as lupulone and 5-geranyloxy-7-methoxycoumarin from hop and lemon, respectively. The active compounds contained an isoprenoid side-chain and prenyl and geranyl moieties. We also found PCSK9 inhibitors

in natural products: xanthohumol, bergamottin and α-mangostin, all of which contained an isoprenoid side-chain. It is likely that isoprenoid side-chain contributes to PCSK9 inhibition because the basic skeletons of the active compounds are different (phloroglucinol derivative, coumarin, flavonoid, xanthonoid). Of the compounds tested, lupulone showed the strongest PCSK9 inhibitory activity. RNAi experiments showed that knock down of hepatocyte nuclear factor 1α (HNF1α), a positive regulator of PCSK9, impaired the PCSK9 inhibitory activity of lupulone. Furthermore, lupulone decreased HNF1α protein expression in HepG2, suggesting that lupulone inhibits PCSK9 expression through HNF1α downregulation.

Conclusions: We isolated and identified PCSK9 inhibitors from food and natural products and suggest HNF1α is involved in the PCSK9 inhibitory mechanisms of lupulone.

Keywords: PCSK9, Natural product, HepG2, RNAi, HNF1α.

INVESTIGATION OF MICROBIAL FLORA AND RE-GIONAL DIFFERENCE OF KUMISS USING ARISA

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Background and objectives: Kumiss is a prepared by fermenting fresh horse milk with some lactic acid bacteria and yeasts in dry inland Asia. Kumiss is carbonated beverage containing about 1 to 2.5 % alcohol traditional ethnic drink for nomads in maintain health. In this study, we investigated regional differences in the type and amount of microorganisms using automated rRNA intergenic spacer analysis (ARISA).

Methods: Nucleic acids were extracted from 32 samples of horse kumiss which was transported in frozen state from Mongolia using an automated nucleic acid extractor (magLEAD). The extracted DNA was amplified by PCR using Bac-2 primer set and Fun-1 primer set. Agarose gel electrophoresis was carried out to confirm the PCR amplification band. After that, we requested fragment analysis of PCR product and estimated the kind and quantity of microbial species from the obtained data. We investigated the relationship between these and regional differences.

Results: Similar results were obtained in kumiss in the same area. The presence of various bacteria and fungi was revealed in any kumiss. In many samples there were intense signals of bacteria and fungi near ARISA fragment length (bq) 305 and 701, respectively, whereas samples showing different peaks existed. They were in the range of ± 0.1%, and it was judged that they are the same type of microorganisms.

Conclusions: It is suggested that microorganisms different from each other are involved in kumiss. In the future, we will conduct identification tests of microorganisms in which signal has appeared strongly and proceed with identification of bacterial species. We will also investigate the relationship with general ingredients and analyze the metabolic products of bacteria contained in kumiss.

Keywords: Kumiss, Arisa, Inland Asia, Bacteria.

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D-ALLULOSE, FUNCTIONAL RARE SUGAR, NOR-MALIZED BODY WEIGHT VIA REGULATING LIPID METABOLISM IN DIET INDUCED OBESE MICE

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Background and objectives: Recently there has been a global shift in diet towards increased intake of energy-dense foods that are high sugars. D-psicose, a C-3 epimer of D-fructose, has been reported as one of anti-diabetic food components, however, its mechanism is not yet completely understood.

Methods: Sixty C57BL/6J mice were divided into six dietary groups and fed a normal diet (ND), a high-fat diet (HFD, 20% fat, 1% cholesterol, w/w), HFD with 5% glucose(GLU), fructose(FRU), erythritol(ERY), D-allulose(ALL) supplement for 16 weeks. A pair-feeding approach was used so that all groups receiving the high fat diet would have the same calorie intake.

Results: In our study body weight and body fat mass in ALL group were significantly decreased toward level of normal group with a simulataneous decrease in plasma leptin and resistin concentration. D-allulose lowered plamsa and hepatic lipids while elevating fecal lipids with a decreased mRNA expression of Ppara, CD36, ApoB48 and FATP4 in the small intestine in mice. In the liver, activities of both fatty acid synthase and -oxidation were down-regulated by D-allulose to that of the normal group; however, in WAT, fatty acid synthase was decreased while -oxidation activity was enhanced.

Conclusions: Taken together, our findings suggest that 5% dietary D-allulose led to the normalization of the metabolic status of diet-induced obesity by altering lipid-regulating enzyme activities and their gene-expression level along with fecal lipids.

Keywords: D-Allulose, Obesity, Fecal lipid excretion, Lipogenesis.

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COMPARISON OF EFFECT ON LIPID PARAMETERS AND MALONDIALDEHYDE CONTENT BETWEEN WHITE BREAD AND WHITE BREAD ADDED WITH GARLIC AND RESISTANT STARCH IN AN EXPERIMENTAL MODEL IN RATS

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Background and objectives: Daily consumption of white bread can contributes to the development of metabolic syndrome because of its high content on carbohydrates of rapid absorption from wheat flour. On the other hand, it may be a good vehicle for the introduction of others components such as garlic, that presents antioxidant effects due to its high content of organosulfur compounds, and resistant starch with a behavior equivalent to of dietary fiber.

The aim of this study was to evaluate in a model rat the effect of three different diets intake during 60 days on lipid-lipoproteins profile and malondialdehyde levels as an indicator of oxidative stress.

Methods: Twenty four male Wistar rats recently weaned (8/ group) were fed with a control diet and two semisynthetic diets prepared with bread formulated with wheat flour (WB) and bread formulated with wheat flour adding garlic (3%) and resistant starch (20%) (GRB) during 60 days. At the end of the study blood was withdrawn and liver was excised. The obtained serum samples were examined for cholesterol, triglycerides, proteins and malondialdehyde concentration.

Results: The results showed that GRB had lower total cholesterol and non HDL-cholesterol than WB without significant differences with C (mg/dL) (86,4± 9,2 vs 118,2± 17,6 vs 87,6 ±10,9 and 53,0 ±10,8 vs 80,9± 12,4 vs 62,9 ± 21,2 respectively). No differences in HDL –cholesterol were observed among groups (36,5 ± 9,1vs 41,1 ± 11,4 vs25,0 ± 13,2) and GRB and WB presented lower triglicerides levels than C without significant differences between them (32,3 ±10,7 vs 29,2± 11,4 vs 96,0± 30,1). Moreover, GRB showed the lowest levels of MDA in serum (nmol/g protein) (24,9 ±4,4 vs 37,0± 7,6 vs 31,4± 5,3) and liver (nmol/100 g protein) (8,75 ± 3,5 vs 26,3 ± 2,1 vs 35,6 ± 7,3) comparing with WB and C (p<0.05).

Conclusions: Bread containing garlic and resistant starch, showed a prebiotic effect improving lipoprotein profile and lowering malodialdehyde content comparing with white bread. The observed beneficial health effects allow us to consider the design of breads healthier than those made only with wheat flour.

Keywords: Garlic , Resistant starch, Prebiotic effect.
Further collaborators:

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EVALUATION OF KNOWLEDGE AND CONSUMPTION OF FUNCTIONAL FOODS BY ADOLESCENTS

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Background and objectives: Functional food in addition to its nutritional value inherent in its chemical composition may play a potentially beneficial role in the prevention and treatment of diseases if consumed frequently and in adequate amounts. The objective of this study was to evaluate the knowledge and consumption of functional foods in the school meal service.

Methods: A Food Frequency Questionnaire (FFQ) was applied with a focus on functional foods for students aged 15 to 18 years of Technical School (n0 139). The questionnaire was divided into two parts, the first part about knowledge, asked the interviewee if he knew what was a functional food (if the answer was "YES" was asked to explain the definition), and the second part was (Soups, fish, milk / dairy products, vegetables / fruits, eggs, sauces / seasonings, and soy / dairy products) were used on a daily basis (daily, weekly, monthly or never). After completing the questionnaire, a lecture was given explaining and exemplifying the definition and importance of the consumption of these foods.

Results: Regarding the results of the first part of the questionnaire: Do you know what functional food is? The adolescents answered 93.5% No and 6.47% Yes. To whom answered Yes was asked the second question: Do you know the importance of functional foods for your health? The students answered: "Foods that help in the proper functioning of the body or organism". The second part of the questionnaire was about the consumption of functional foods (divided into groups and their frequency), we can observe the following results: Soups (70%) and fish (81%) consumption is monthly; Dairy products (69%), vegetables (42%), fruits, eggs (77%), sauces (72%) and seasonings (73%) weekly consumption and soybeans / derivatives (70%) never consume. In relation to the lecture given the adolescents were very interested in the discussion, commenting and asking a lot about the food and its functional action in the body.

Conclusions: The interviewees' lack of knowledge about functional foods was visible, but the interviewed population frequently consumes some foods with functional properties.

Keywords: Feeding, Health, Composite bioactive, Diners.

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THE EFFECTS OF RESISTANT STARCH ON BONE LOSS VIA INTESTINAL MICROBIOTA AND INFLAMMATION IN OVARIECTOMISED MICE

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Background and objectives: Recent studies have suggested an important role for gut-bone signalling pathways and microbiota in regulating bone health through modification of the immune status. Altered immune status associated with oestrogen deficiency can lead to bone loss; however, the intestinal microbiota can modulate the host metabolism and immune status. Resistant starch (RS) is a type of dietary fibre that is not absorbed in the small intestine of healthy humans, and is fermented to a large extent by microbiota in the colon, resulting in changes in the composition of gut microbiota and pre-biotic effects. Therefore, we hypothesised that intake of RS modulates intestinal microbiota and inflammation of the intestine and bone, resulting in reduced bone loss caused by oestrogen deficiency. The present study evaluated the effect of diet supplemented with RS on intestinal microbiota, bone mineral density (BMD), and inflammatory gene expression in the colon and bone marrow of ovariectomised mice.

Methods: Female ddY strain mice, aged 8 weeks, were either sham-operated (Sham, n = 8) or OVX. OVX mice were randomly divided into the following three groups (8 per group): OVX control (OVX); OVX fed 20 % high amylose cornstarch (HAS) diet (OVX + HAS); OVX fed 20 % acid-hydrolysed high amylose cornstarch (AHAS) diet. AHAS was more resistant to enzymatic digestion than HAS. RS was included as 34% or 60% of dry weight in HAS or AHAS, respectively.

Results: After 6 weeks, treatment with HAS and/or AHAS accelerated fermentation and increased the β-glucosidase activity in the cecum, and increased the rate of Bifidobacterium spp. in the faeces. The mRNA of the anti-inflammatory cytokine IL-10 tended to be up-regulated in the large intestine by treatment with AHAS. Conversely, the mRNAs of the osteoclastogenic cytokine RANKL and inflammation-related IL-7R were downregulated in the bone marrow by treatment with AHAS. Treatment with AHAS protected against OVX-induced bone loss.

Conclusions: Our findings suggest that an AHAS diet might alter the microbiota and immune status of the large intestine and bone marrow, resulting in attenuated bone resorption in OVX mice.

Keywords: Osteoporosis. Resistant starch. Microbiota. Inflammation. Bone.

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AMELIORATED EFFECTS OF ETHANOL EXTRACTS FROM CAJANUS CAJAN (L.) MILLSP. ROOTS ON METHYLGLYOXAL-INDUCED INSULIN RESISTANCE IN RATS

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Background and objectives: Cajanus cajan (L.) Millsp. root cooked with the ribs can cure diabetes is recognized an aboriginal traditional therapies in Taiwan. Previous studies known after a series of separation and purification from ethanol extract of C. cajan root was obtained Betulinic acid, biochanin A, 5,2'-dihydroxy-7,4'-dimethoxyisoflavanone (cajanol), genistein, 2'-hydroxygenistein and other differences flavonoids. Many studies have confirmed the above components such as: genistein has excellent antioxidant capacity and the ability to inhibit the decomposition of carbohydrates.

Methods: We investigated whether ethanol extracts of C. cajan roots (EECR) could protect against methylglyoxal (MGO; 500 mg/kg bw)-induced insulin resistance (IR) in male Wistar rats between days 1 to 84. Rats treated with MGO were used to examine the hypoglycemic effects of EECR. The rats were divided into six groups and orally supplemented with MGO except for group 1 (normal controls). Group 3 was orally supplemented with Metformin (hypoglycemic drugs) (MET;10 mg/kg bw), group 4 with EECR-L (10 mg/kg bw), group 5 with HIP EECR-M (50 mg/kg bw), and group 6 with EECR-H (100 mg/kg bw). MET and EECR were provided daily between days 21 to 84 in rats. Oral glucose tolerance (OGTT) and insulin tolerance (ITT) tests in 6 groups were evaluated every 2 weeks.

Results: The results indicated that body weights, water and food intake for each group revealed no significant difference (P>0.05). In ITT tests, serum glucose levels of MGO-treated group were slightly change during 120 min (no insulin sensitivity) after intraperitoneal injection of insulin, however, L-, M- and H-EECR-treated rats significantly increased insulin sensitivity (P <0.05) and the effects were comparable MET groups. Blood sugar, lipid and glycosylated hemoglobin (HbA1c) as well as serum insulin, glycation end products (AGEs) of MGO-treated groups were significantly higher than that of blank groups (P <0.05). All EECR-treated groups significantly improved above insulin resistance status. Moreover, we also found that malondialdehyde (MDA) formation and SOD activity were significantly improved in the liver of oral treatment EECR of rats (P <0.05).

Conclusions: Overall, EECR effectively improve insulin resistance in rats treated with MGO possibly through attenuation of oxidative damage in living system.

Keywords: Cajanus cajan (L.) Millsp. roots, methylglyoxal, hypoglycemic, advanced glycated end-products, insulin resistance

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FOLATE AND VITAMINE C CONTENT IN COMMERCIAL FRUIT/VEGETABLES-BASED SMOOTHIE

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Background and objectives: Fruit and vegetable are are rich in water-soluble vitamins (vit. C, B-vitamins), provitamin A, phytosterols and show a high variety on minerals and phytochemical. In many countries the daily uptake of fruit and vegetables was estimated to be lower than the recommended dietary intake (RDI). To increase their intake, the food industry offers smoothies as an alternative and/or addition to the consumption of fresh fruit and vegetables. Smoothies are characterized by a high nutrient concentration with low energy content [Watzl, 2008]. However there is a risk that traditional thermal preservation and storage time may lead to loss of nutritional beneficial components. Therefore, the study was undertaken to identify the folate and C vitamers content in selected commercial smoothie available on the Polish market, to provide nutritionists with guidelines how smoothie consumption contributes to the daily folate and vitamin C intake.

Methods: Folates were extracted in a 0.1 M phosphate buffer (pH 6.1), followed by deconjugation (rat serum) and separated by HPLC after clean-up using SAX spe. cartridges. Vitamine C have been measured using HPLC.

Results: In most examined Smoothie only one form of folate was identified. 5-methyltetrahydrofolate content ranged from 0.0 to 55 μg per bottle (250 ml) or approximately 0 to 14% of the RDA for folate, which is 400 μg per day. The vitamin C content of the Smoothie ranged between 0.4 to 36.7 mg/100 g (about 1.0 – 92.0 mg per bottle). Only 3 analysed smoothies were able to supply the recommended dietary allowance (RDA) for adults of vitamin C of around 90 mg per day. Both folate and vitamin content ranged widely, independent whether it was a pure fruit smoothie or a smoothie composed of fruit and some vegetables.

Watzl, B. 2008. Smoothie-wellness aus der Flasche? Ernährungsumschau, 6, 351-353.

Conclusions: Smoothie can be helpful to achieve the recommendation of vitamin C and to some extent of folate. Most bioactive component, however, may be reduced by prolonged storage and destroyed by high temperature used during preparation.

Keywords: Smoothie, Folate, Vit. C

EFFECT OF POMEGRANATE JUICE CONSUMPTION ON THE LEVELS OF GLUCOSE AND LIPIDIC PROFILE

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Background and objectives: Diabetes mellitus represents the second cause of mortality in Mexico and its prevalence continues to increase. Nowadays, an increased interest of functional foods as an alternative treatment is taken place. It has been proposed that pomegranate, through its high content of phenolic compounds, is capable of reducing glucose and also possesses antiatherogenic effects. The aim of this research was to evaluate the consumption of pomegranate juice and its effect on glycemia and lipid profile in diabetic rats.

Methods: A longitudinal and experimental study was performed with 18 wistar rats induced hyperglycemia by streptozotocin and divided into 3 groups exposed to standard diet and water. In addition, the following interventions: group 1 (G1) pomegranate juice. Groups 2 (G2) and 3 (G3) solution with sucrose at the same concentration as the brix degrees of juice. G3 was also given insulin treatment. Liquid consumption was recorded every 24 hours for 28 days. Plasma levels of glucose, cholesterol and triglycerides were measured every 7 days.

Results: An analysis of variance (ANOVA) was performed with a Tukey mean comparison test. G1 consumed on average 33.59 ml of juice. Groups G2 and G3 consumed on average 77.6 and 82.8 ml of sucrose solution respectively. The average glycemia levels at the beginning and the end of the intervention were for G1: 417-365mg/dl, G2: 461-383mg/dl, G3: 429-214mg/dl respectively. At the end, for glucose concentration, the ANOVA showed a statistically significant difference between the groups ($p < 0.05$). The average cholesterol was for G1: 79mg/dl, G2: 92mg/dl, G3: 78mg/dl. The mean triglycerides for G1: 180mg/dl, G2: 248mg/dl, G3: 169mg/dl. No statistically significant differences were found between cholesterol and triglycerides in the groups.

Conclusions: Pomegranate juice had a lower degree of preference with respect to a sucrose solution. In spite of this, the group exposed to juice had lower blood glucose levels, and statistically significant difference between groups were obtained. This suggests that pomegranate juice may act as an alternative complement during the treatment of hyperglycemia.

Keywords: Diabetes mellitus, Pomegranate juice, Consumption, Glycemia, Lipid profile.

EFFECT OF MEDICINAL HERB HANGRYON ON GHRELIN SECRETION OF GASTROENTERIC-BRAIN HORMONE MECHNISM

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Background and objectives: Korean medicinal herb Hangryon extract has applied to ghrelin function on gastroenteric-brain hormone mechanism. The ghrelin is a peptide hormone produced by stomach cells in gastrointestinal tract circulating to hypothalamic area through blood brain barrier which regulates food intake.

Methods: Tests have been conducted to use human microvascular endothelial cells (HMVECs) and male Sprague-Dawley (SD) rats in in vitro and in vivo models respectively. Ghrelin was measured by enzyme immunoassay (EIA) in cell culture supernatant or rat serum.

Results: The ghrelin concentration was significantly decreased to $92 \pm 2\%$, in vitro and $73 \pm 9\%$, in vivo compared to control group when Hangryon extracts was applied to model systems. It means low ghrelin level affects to satiety signal and appetite control. Physicochemical characteristics of ghrelin level with sample extract on the extract were tested on cell viability and hormone level in various pH and temperature conditions. Concentration of ghrelin hormone has shown 91% to 96% on pH change 2 to 10 and 92% to 95% on 60ºCto 100ºC. Cell proliferation was 94% to 100% on sample concentration at 500 μg/mL.

Conclusions: It results that the sample has no cytotoxicity as well as inhibition rate of sample extract was no difference significantly and stable on ghrelin suppression in pH or temperature changes. That also suggested that natural medicinal herb Hangryon would be able to developed to functional food ingredient for anti-obesity product related to gastroenteric-brain hormone mechanism with activity maintenance during processing or digestion in our body.

Keywords: Medicinal herb, Ghrelin concentration, Cell and animal test, Physicochemical characteristics.

Conflict of Interest Disclosure: Abstract title: effect of medicinal herb Hangryon on ghrelin secretion of gastroenteric-brain Hormone mechnism

The authors in above the title declare NO conflict of interest.
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144/737

FOLATE CONTENT IN RED RASPBERRIES

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Background and objectives: Raspberries are widely consumed fruits due to their unique flavor and beneficial health properties. For years were used for the treatment of various ailments including diabetes, inflammatory diseases and as antimicrobial agents. Several studies have shown preventive effect of raspberries in a variety of diseases, including cancer, diabetes, obesity, cardiovascular diseases, macular degeneration, neurodegeneration as well as inflammation and oxidative stress (Carvalho et al., 2013). Most of the research on raspberries focus on their antioxidant properties together with polyphenolic compounds, vitamin C and tocopherols. However, it is of special interest to analyze another health beneficial compounds contents. Therefore, the aim of the study was to determine folate, vitamin B, content in fresh red raspberries.

Methods: Test material (10 samples of raspberries from different cultivators) was obtained from the local fruit processing plant during the harvest period. Folate content was determined according to Czarnowska & Gujska (2012) using HPLC method.

Results: Based on the chromatographic separation of folate standards, two folate derivatives, 5-methyltetrahydrofolate and tetrahydrofolate were identified in raspberries samples. The total folate content expressed as folic acid, ranged from 37.6 to 69.5 µg/ 100 g fresh weight. According to the European Food Safety Authority (EFSA), a Population Reference Intake for folate was established at the level of 330 µg/ day, with an increase to 600 µg/ day during pregnancy or lactation (EFSA, 2014).

Conclusions: Efforts are being directed to improve the nutritional value of raspberries by breeding and biotechnological programs. Therefore, it is important to provide information on the individual bioactive components, including vitamins, which can be found in these fruits. Our study has shown, that the consumption of fresh raspberries can contribute well to the daily intake of folate, which deficiency is common worldwide.

Carvalho E., Fraser P.D., Martens S. 2013. Food Chemistry 139, 744–752.

Czarnowska, M., & Gujska, E. (2012). Plant Foods for Human Nutrition, 67, 401–406.

Keywords: Raspberries, Folate, HPLC

144/772

A SOLUTION TO NUTRITIONAL PROBLEMS OF CHILDREN AT PUBERTATE PERIOD

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Background and objectives: In recent years the link between diet and health of people has become well established, especially importance of nutrition of children during pubertate period which was one of the main issues of Second International Conference on Nutrition (ICN2) in 2014. This generates the need to develop healthy foods, specifically targeting children which has benefits on children's health as well as their potential in reducing risk of disease. Developing functional foods, instead of mostly consumed unhealthy diets such as fast foods, made by local products will be best choice for school children which will improve physiological functions and health of children.

Methods: Chicken meat, sesame oil, "Extracti Prosopis Farcta fluidum", "Extracti Artemesia Absinthi" and 200 µm powder of Pepper chillis that is grown in Bagyr village of Ashgabat city in 2015 crumbled by special Chilli grinding Machine was used in making sausage was used. Pharmaco-toxicological and antioxidant properties of sausage and its additives studied on experimental animals (rabbits, rats, mice). Antioxidant property studied by measuring the concentration of malondialdehyde in the tissues, organs of experimental animals.

Results: Experiment results conducted on experimental animals showed that no toxicological and high antioxidant effect of sausage and its additives. Because of the insufficiency of unsaturated fatty acids, which are very important for metabolism, in meat products we used sesame oil to compensate this. Also we used "Extracti Prosopis Farcta Fluidum", "Extracti Artemisia Absinthi" and chili pepper as exchange product for usual xenobiotic products that is used in sausage production and at the same time it will increase antibacterial activity and stability of food. Food that is made by using local products and without synthetic substances will affect to the health of people positively, especially children at pubertate period.

Conclusions: Method of preparation of real functional food from chicken meat and local medicinal plants was developed.

Keywords: Functional food, Children, Health, Medicinal plants.

GLABRIDIN INHIBITS MUSCLE ATROPHY THROUGH P38/FOXO3A AND GLUCOCORTICOID RECEPTOR SIGNALS

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Background and objectives: Deterioration of muscle weight due to muscle atrophy decreased quality of life as one of the social problems. Since skeletal muscle weight is maintained by a balance of the synthesis and degradation of proteins, muscle atrophy caused by this collapses. In this study, we search for the food ingredient which is effective in promoting protein synthesis or preventing protein degradation to improve its balance, and try to elucidate this mechanism.

Methods: C2C12 skeletal muscle cells were treated with each food components and 1.0 μCi L-[3,5-3H]-tyrosine in differentiation medium. Protein synthesis was determined to measure the incorporation of radio activity into cellular proteins. Protein degradation was determined to measure the release of radio activity induced by dexamethasone (Dex) after pulse label L-[3,5-3H]-tyrosine. Protein expression and phosphorylation levels were detected by western blotting.

Results: Among 15 kinds of food compounds glabridin, 4-hydroxyderricin, and xanthoangelol suppressed the Dex-induced protein degradation. On the other hand, all food compounds tested did not promote the protein synthesis. We focused on glabridin and tried to elucidate underlying molecular mechanism. Glabridin inhibited proteolysis through a decrease in the expression levels of MuRF-1 and Cbl-b, which are ubiquitin ligases involving in muscle atrophy. Glabridin also inhibited Dex-induced phosphorylation levels of Foxo3a in nuclear fraction. It is suggested that Foxo3a translocated in nuclear by phosphorylation, resulting in promoted the expression of ubiquitin ligases, MuRF-1 and Cbl-b. We confirmed that glabridin-rich food materials also inhibit muscle atrophy in mice with the same molecular mechanisms.

Conclusions: We found glabridin, 4-hydroxyderricin, and xanthoangelol as the food compounds to improve muscle dysfunction. Of these, glabridin prevented phosphorylation of Foxo3a in nuclear fraction, this would be led to down-expression of ubiquitin ligases MuRF-1 and Cbl-b to prevent Dex-induced protein degradation.

Keywords: Glabridin, Muscle atrophy, Glucocorticoid receptor; p38; FOXO3a.

Further collaborators:
Dr. Yoko Yamashita

THERAPEUTIC EFFECTS OF EDIBLE BROWN ALGA UNDARIA PINNATIFIDA (WAKAME) IN THE MICE INFECTED WITH HERPES SIMPLEX VIRUS

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Background and objectives: Herpes simplex virus type 2 (HSV-2) causes genital herpes that is a lifelong infection in populations worldwide. The development of therapeutic agents for preventing genital herpes has become very important in recent years. In the present study, the in vivo anti-HSV-2 effects of wakame proteins (WT), wakame peptides (WP) prepared by protease treatment of wakame and the major dipeptides of WP were assessed.

Methods: Female BALB/c mice were inoculated vaginally with HSV-2. WT, WP and three dipeptides, Val-Tyr (VY), Ile-Tyr (IY) and Phe-Tyr (FY), were administered orally from 3 days prior to virus inoculation until 7 days after inoculation. The vaginal washes collected at 3 days after virus inoculation were subjected to virus titration. Clinical signs of infection and survivors were recorded for 2 weeks. In the other experiments, the anti-HSV-2 activities of sera obtained from the mice administered with WP were evaluated.

Results: WT suppressed the lesion scores and enhanced the survival rates of mice as compared with distilled water-administered control mice. WP showed significant effects in the suppression of herpetic lesions, virus yields and death of mice. WP contains VY, IY and FY as the major dipeptide components. Among them, IY and FY exerted higher therapeutic effects in the suppression of herpetic lesion, virus production and death of mice. When the mice were treated with single oral administration of WP, the sera obtained during 0 – 8 hours after administration showed potent anti-HSV-2 activities.

Conclusions: When the wakame peptide was orally ingested in HSV-2-infected mice, the peptide exhibited potent therapeutic effects. The dipeptides contained in the wakame peptide might play a pivotal role in those effects.

Keywords: Brown alga, Undaria pinnatifida, Herpes simplex virus, Genital infection, Therapeutic effects.

EFFECT OF THE KIWIFRUIT EXTRACT (ACTANNINE®; ACT) ON THE INTESTINAL LIPID ABSORPTION

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Background and objectives: Actannine® (Act) is a polyphenol enriched Kiwifruit extract. Polyphenols, which are distributed in various plants, are recognized as potent antioxidants and are shown to exhibit a series of other pharmacological effects, (e.g. the lipase inhibitory activity of grape seeds). In this study, we investigated the effect of Act on intestinal lipid absorption in mice fed a high-fat diet.

Methods: Inhibitory activity against lipase of Act was measured using an enzymatic in vitro assay kit. Act was administered orally for 6 weeks in high-fat diet (HFD) fed mice, and the time course of body weight change, food intake, organ weight (fat, liver and kidney), plasma parameters (triglyceride, total cholesterol, glucose, AST, ALT, HDL, LDL, leptin, adiponectin and insulin) and lipid contents in the liver and feces were measured.

Results: Act significantly inhibited lipase activity in a dose-dependent manner in vitro. In HFD fed mice, Act significantly inhibited an increase in body weight and visceral fat weight, and triglyceride (TG) levels in the blood and liver were reduced. Moreover, the TG level of feces was increased.

Conclusions: Our study indicates that Act has the potential to reduce intestinal lipid absorption due to its lipase inhibitory activity.

Keywords: Actannine, Kiwifruit extract, Polyphenol, Lipase inhibitory activity.

Conflict of Interest Disclosure: Satomi Iwata is an employee of Omnica Co., Ltd. The other authors have no potential conflict of interest.

EFFECTS OF FREEZE-DRIED HERBAL POWDER ON THE LIVER OF MICE FED A HIGH-FAT, HIGH-SUCROSE DIET

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Background and objectives: [Background and objectives: **Methods:** [Methods: **Results:** [Results: **Conclusions:** [Conclusions: **Keywords:** Sweet basil, Coriander, Liver enlargement, A high-fat and high-sucrose diet, Lipid metabolism.

THE EFFECT OF ADDITIONAL CONSUMPTION OF ONE EGG PER DAY ON SERUM LIPIDS AND ANTI-OXIDANT PARAMETERS IN HEALTHY AND MODERATELY HYPERCHOLESTEROLEMIC MALES

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Background and objectives: The egg is a nutrient-dense food and contains antioxidative carotenoids, lutein and zeaxanthin, but its impact on serum cholesterol levels has been a matter of concern. Here, we conducted the intervention studies to investigate whether daily additional consumption of an egg might affect serum lipid profiles and antioxidant parameters in both healthy and moderately hypercholesterolemic males.

Methods: Study 1: Fourteen healthy male adults participated, consuming breakfast including a boiled egg for 4 weeks. Before and at the end of the study period, blood samples were obtained after an overnight fast.

Study 2: Nineteen moderately hypercholesterolemic male adults (TC > 5.2 mmol/L) participated, consuming one soft boiled egg per day for 4 weeks in addition to their habitual diet. Before and at weeks 2 and 4, blood samples were obtained after an overnight fast.

Results: Study 1: At the end of intervention, serum concentrations of total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) were unchanged, despite the significant increase in the intake of dietary cholesterol. In contrast, a significant increase in high-density lipoprotein cholesterol (HDL-C) and a reduction of the LDL-C/HDL-C ratio were observed. Interestingly, the malondialdhyde modified-LDL (MDA-LDL)/LDL-C ratio was decreased and the LDL oxidation lag time, reflecting the resistance of free-radical-induced LDL lipid peroxidation (ex vivo), was significantly prolonged.

Study 2: At weeks 2 and 4, the subjects' serum concentrations of TC and LDL-C did not increase. The serum MDA-LDL concentrations was significantly decreased and the LDL oxidation lag times (ex vivo) was prolonged after 2 and 4 weeks. At weeks 2 and 4, the subjects' serum lutein + zeaxanthin concentrations were significantly higher than their baseline values and showed both an inverse relation with MDA-LDL and a positive relationship with the LDL oxidation lag time.

Conclusions: These studies showed that the additional consumption of one egg per day for 4 weeks did not have adverse effects on serum TC or LDL-C, and it might reduce the susceptibility of LDL to oxidation through an increase in the serum lutein and zeaxanthin concentrations.

Keywords: Egg, Dietary cholesterol, Serum lipids, LDL oxidation.

Conflict of Interest Disclosure: Y.K., C.T. and E.S. are affiliated with an endowed research department from Kewpie Corporation.

144/845

INVOLVEMENT OF THE VAGUS NERVE IN THE ENHANCEMENT OF THERMOGENESIS BY INTRAGASTRIC ADMINISTRATION OF TRPM8 AGONIST

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Background and objectives: Obesity increases risk for various diseases and reducing exceeded body fat stores is important for maintaining good health. Thermogenesis contributes to the maintenance of body temperature, and it requires metabolic fuel availability and contributes to energy balance. Therefore, the enhancement of thermogenesis would be important to reduce body fat accumulation. Transient Receptor Potential Melastatin 8 (TRPM8) is a cold receptor activated by mild cold temperature (< 28ºC) and it is involved in cold sensation and thermoregulation. Interestingly, TRPM8 is also activated by edible herb components such as menthol (mint) or 1,8-cineole (found in laurel, basil, rosemary). Previous studies have reported that intragastric administration of menthol and 1,8-cineole induces thermogenesis in anesthetized mice, however, the detailed mechanism is unclear. TRPM8 mRNA is detected in various tissues, including the gastrointestinal mucosa, and in the vagal afferent nerve. Based on these facts, in this study, we aimed to investigate whether TRPM8 expression in the vagal afferent nerve is involved in the enhancement of thermogenesis induced by intake of TRPM8 agonist.

Methods: Male mice (C57BL/6, 7wks) were anesthetized with urethane (1.4 g/kg) and thermistors were set on the tail skin, colon, and intrascapular brown adipose tissue (IBAT). Each temperature was used as an index of heat diffusion, core temperature, and local thermogenesis, respectively. A cannula was then inserted into the stomach or jugular vein to administer the solution. The temperature was measured for 10 min before administrating the 1,8-cineole or vehicle and for 180 min after administration.

Results: Intragastric administration of 1,8-cineole increased IBAT and colonic temperatures, and M8-B-treatment (TRPM8 antagonist) inhibited these responses. Intravenous administration of 1,8-cineole also showed similar effects. In vagotomized mice, the responses induced by intragastric administration of 1,8-cineole were attenuated.

Conclusions: Vagus nerve are involved in the enhancement of thermogenesis induced by intake of TRPM8 agonists.

Keywords: Thermogenesis, TRPM8, Brown adipose tissue, Mice, Vagus nerve.

144/965

ENRICHMENT OF PREMIX OF FLOUR SUITABLE FOR CELIAC AND ACCEPTABILITY OF BAKED PRODUCTS

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Background and objectives: In Paraguay, Law 20.830/98 regulates the enrichment of wheat flour as a strategy for the prevention of anemia. This law does not apply to the premix of flour suitable for celiacs. Anemia in celiac disease is 50%. When enriching foods, one of the criteria states that the organoleptic characteristics must be acceptable or should not be modified. Therefore, our objective was to enrich the premix of flour suitable for celiacs with iron and B vitamins, to evaluate the acceptability of two types of high-demand baked goods (bread and sticks) and to further evaluate compliance with the provisions of law.

Methods: In specialized kitchens, we elaborate 2 types of products: bread and sticks, each in two versions, with vitamin mix and without vitamin mix. Acceptability was evaluate used a hedonic scale of 9 points and evaluated the characteristics of color,

odor, taste, texture, hardness, appearance and overall score (sum of the average characteristics/6) of the 4 samples presented. The products were presented in individual packages, labeled in numerical form. The volunteers tested each of the 4 products and subsequently completed a self-administered questionnaire. Student's t-test was used.

Results: In 105 volunteers with celiac disease (81% female) the mean age was 34.5 ± 10.9 years, 60% reported having had anemia at some point. The evaluated products had the following mean global score: unmixed bread 7.42 ± 1.33 (95%CI 7.17-7.68), bread with mixture 8.00 ± 1.06 (95%CI 7.80-8.21), unmixed stick 7.91 ± 1.05 (95%CI 7.71-8.11), and mixed stick 7.86 ± 1.17 (95%CI 7.64-8.09). The differences were minimal, however, mixed bread was significantly more acceptable than unmixed bread (0.58 points, p=0.001) and between the scores of the sticks there were no significant differences (0.05 points p=0.749). We evaluated the compliance with Law 20.830 / 98 and found that the premix for celiacs complies with the contribution of micronutrients (iron, B1, B2, B3 and folic acid).

Conclusions: We found that the bread with mixture had a high acceptability and that when the premixture for celiacs was soaked, it could be complied with what was established in the law

Keywords: Enrichment, Flour, Celiac, Baked goods, Acceptability.

Further collaborators: Laura Elizabeth González Cespedes

DIETARY MARINE SPHINGOLIPIDS AS FUNCTIONAL FOOD COMPONENTS

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Background and objectives: Sphingolipids are ubiquitous in all eukaryotic organisms and have attracted attention as physiologically functional lipids. Recently, various physiological functions of dietary sphingolipids, especially improving the skin barrier function, have been demonstrated. Sphingolipids of marine invertebrates have atypical types of chain length, unsaturation, and hydroxylation in sphingoid bases. In addition, sphingolipids having C-P bonds, such as ceramide 2-aminoethylphosphonate (CAEP) are found in marine invertebrates. In this study, we evaluated the absorption and functions of dietary marine sphingolipids to utilize marine sources for functional foods.

Methods: The intestinal absorption was evaluated via a lipid absorption assay of lymph from the thoracic duct in SD rats. To investigate the effects of dietary sphingolipids on skin, we characterized the recovery of skin barrier using a special Mg-deficient diet induced atopic dermatitis-like hairless mice model.

Results: We previously indicated that the intestinal absorption of dietary plant glucosylceramide is extremely low (J. Lipid Res. 51, 1761-1769, 2010). In the case of sea cucumber cerebroside, the recovery into lymph was similar to plant glucosylceramide. On the other hand, the lymphatic recovery of sphingoid bases from dietary squid CAEP was about ten times higher than those from glucosylceramide, similar to milk sphingomyelin (Lipids 50, 987, 2015). We previously found that dietary plant glucosylceramide and animal sphingomyelin can accelerate the recoveries of damaged skin barrier functions (Exp. Dermatol. 21, 448-452, 2012). Dietary supplementation with marine sphingolipids involved in both sea cucumber cerebroside and squid CAEP to hairless mouse also improved the skin barrier function.

Conclusions: Our findings contribute to our understanding of the absorption of dietary sphingolipids from marine sources and their effects on the host as a dietary integrant. This work was partly supported by the Program for Promotion of Basic and Applied Researches for Innovations in Biooriented Industry (BRAIN) to TS and the Japan Society for the Promotion of Science (JSPS) KAKENHI (Grant No. 16H04923 to TS, YM and TT; Grant No. 15J01143 to NT).

Keywords: Intestinal absorption, Seafoods, Skin barrier, Sphingolipids.

CLINICAL EFFECTS OF EVIDENCE-BASED BILBERRY EXTRACT ON ASTHENOPIA

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Background and objectives: We evaluated the effect of evidence-based bilberry extract (EBBE) intake for asthenopia.

Methods: Placebo-controlled double-blind randomized clinical trial was conducted in 30 Japanese healthy volunteers (adults: 20-59 years old). Subjects took 160mg of EBBE (contain 37% Vaccinium myrtillus anthocyanin) or placebo daily for 4 weeks. On the first and the last day of the administration, objective examinations were performed three times: before, prompt after, and 20 minutes after video display terminal (VDT) work. They played Tetris game for 30 minutes on iPhone as deemed VDT work. Accommodation was examined by using TriIRIS® C9000.

Results: Two of accommodative functions "Miosis" and "Convergence" were statistically improved in EBBE group compared with controls at 20 minutes after VDT work (P<0.05 and 0.1).

Conclusions: Oral intake of qualified EBBE saved asthenopia objectively when abusing eyes.

Keywords: Asthenopia, Miosis, Convergence, Evidence-based bilberry extract, VMA

Conflict of Interest Disclosure: Marie Kosehira is an employee of Omnica Co., Ltd. The other authors have no potential conflict of interest.

144/994

ORANGE BAGASSE AS AN INGREDIENT IN THE FORMULATION OF A GLUTEN FREE MUFFIN

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Background and objectives: Recently, the number of companies dedicated to the production of natural juices and fruit concentrates is increasing. As a result, an increase in the amount of citrus waste, such as orange bagasse is produced. This orange bagasse can be utilized in animal feed mixes, however it has valuable components for human health, which makes it an appropriate ingredient in the formulation of new food products. The objective of this research is to obtain a nutritional product, gluten free muffin, for a population segment with special needs, as celiac, using as main ingredient the orange bagasse.

Methods: Orange bagasse was obtained from a local juice food plant, and it was dried in a solar dryer. Then it was ground, until it was less than 250 microns in size, obtaining dry orange bagasse powder. The orange bagasse was characterized, doing physicochemical and microbiological analyses. Different formulations to obtain muffins were tested, being the most successful, the one using a mix one part corn, one part rice and one part orange bagasse. The muffin was ginger flavoured. Sensorial analyses were developed with a non-trained panel.

Results: The values for the physicochemical characterization of the orange bagasse flour were in agreement with the literature, being the moisture content of 10%, which increases its shelf life and prevents deterioration. Fat content was low, less than 1% and ash and protein were less than 5% each. Muffin was evaluated and had the characteristics of a flour muffin, and after the sensorial profile, the panel showed a high percentage of acceptance of the product.

Conclusions: The use of natural products, like the orange bagasse, is a new way of using agro-industrial wastes in the food industry, in order to obtain a food product, with high added value, targeting a population with special needs such as celiac people.

Keywords: Orange bagasse, Gluten free muffin, Orange bagasse flour, Celiac, Functional food.

144/1004

EFFECTS OF THE PARTICLE SIZE OF YOUNG BARLEY LEAF POWDER ON INTESTINAL BACTERIAL FLORA IN RATS

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Background and objectives: Young barley leaf powder (YBLP) is a component of the popular drink "Aojiru" used as a dietary supplement in Japan. We examined effects of the particle size of YBLP on the patterns of intestinal bacterial flora and fermented products in rats.

Methods: Seven week-old, male Wistar rats were divided into 4 groups (each 7 rats), and fed ad libitum for 14 days on the following AIN93G-based diets containing no cellulose ("fiber-free"), 4.5% cellulose ("C-4.5"), 3% cellulose plus 3% YBLP (fine particles) ("fine YBLP"), and 3% cellulose plus 3% YBLP (coarse particles) ("coarse YBLP"), respectively. Then, the rats were anesthetized with pentobarbital, and their ceca were removed and weighed. The short chain fatty acids of the cecal contents were determined by HPLC (High Performance Liquid Chromatography), and the patterns of intestinal bacteria flora were analyzed by T-RFLP (Terminal Restriction Fragment Length Polymorphism).

Results: The total amounts of the short chain fatty acids in the cecal contents of the " fine YBLP" and "coarse YBLP" groups were significantly greater than those of the "C-4.5" group. The concentration of n-butyric acid of the "fine YBLP" group was greater than that of the "coarse YBLP", and the value was lowest in the "C-4.5" group. As for the intestinal bacterial flora, the ratio of Clostridiales species increased in the "fine YBLP" and in "coarse YBLP" groups while Bacteroidales increased in the "fine YBLP" group.

Conclusions: YBLP is suggested to contain some components favored by Bacteroidales, and the "fine YBLP" may show more clearly the efficacy of YBLP than the "coarse YBLP".

Keywords: Young barley leaf powder, Intestinal bacterial flora, Short chain fatty acids.

144/1040

EFFECTS OF PEPTIDES FROM JAPANESE BARLEY ON PC12 CELLS GROWTH AND MICROTUBULE FORMING

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Background and objectives: Barley is useful as a foodstuff, because it contains high levels of protein, dietary fibers and minerals. We have searched the biological active peptides from Japanese barley flour obtained from the outer layer of the grain. Microtubules are important components of several subcellular structures. Recent reports have demonstrated that impairment of the microtubule system is related to the pathogenesis of Alzheimer's disease. Brain atrophy and decrease in cell number also have observed in Alzheimer's disease. In the present study, we investigated the effects of peptides obtained from barley flour on PC12 cells growth and microtubule assembly.

Methods: Japanese barley flour was extracted in water and the extract was dialyzed with a Cell Sep T1 (nominal MW=3,500). The external solution of dialysis was evaporated and taken to dryness. Then the sample was dissolved in water and subjected to size exclusion chromatography on a Bio Gel P-4 column. The molecular weights of these fractions were confirmed by HPLC analysis with Tosoh TSK 3000SW column.

PC12 cells were cultured in DME medium containing 5% FBS, and 0.3% penicillin/streptomycin and incubated at 37° in a 5% CO_2 in a humidified atmosphere. After 48 h of incubation, the medium was replaced in with a fresh DME medium containing 0-10mg/ml P4-1 fraction. After 24h cultivation, cell viability was assessed using Cell Counting Kit-8. Percentage viability of cells in comparison to control cells was calculated. The GTPase assay was performed by HPLC system.

Results: Five fractions (P4-1, P4-2-1, P4-2-2, P4-3, and P4-4) were identified by the preceding sequential steps. From the results of analysis of molecular weight, P4-1 fraction was considered short peptides with four amino acids. Percentage viability of PC12 cells was increased depending on the levels of P4-1 fraction added.

Conclusions: Fraction P4-1, peptide from Japanese barley flour, is considered as PC12 cell growth factor. This oligopeptides promoted the microtubule assembly in PC12cells.

Keywords: Peptides, Barley, PC12 cells.

144/1051

A NOVEL A-GLUCAN FROM AN EDIBLE MUSHROOM, GRIFOLA FRONDOSA (MAITAKE), EXERTS THE THERAPEUTIC EFFECTS ON INFLUENZA A VIRUS INFECTION

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Background and objectives: Grifola frondosa (Fr.) S.F. Gray, called Maitake in Japanese, is an edible mushroom that has been consumed in Asian countries. We have isolated efficiently a novel α-glucan with MW of approximately 1 x 107 Da (Maitake α-glucan) from its fruiting body. In the present study, the therapeutic effects of the α-glucan were evaluated in immunocompetent and immunocompromised mice infected influenza A virus (IFV).

Methods: Maitake α-glucan was isolated from the dried materials by extracting with hot water and precipitating with ethanol. Oseltamivir-sensitive (A/NWS/33) and -resistant viruses (H1N-1pdm09) were propagated on MDCK cells. In animal experiments, female BALB/c mice with normal immunity or immunocompromised mice treated with 5-fluorouracil were intranasally infected with IFV, and the α-glucan or oseltamivir was administered orally. Virus yields of the mice were measured at 3 days post-infection, neutralizing antibody titers were determined by plaque assays and virus-specific IgA by ELISA at 14 days post-infection.

Results: When the immunocompetent and immunocompromised mice were infected with an oseltamivir-sensitive IFV, the α-glucan suppressed the weight loss of the mice caused by virus infection and the virus replication, while increasing the neutralizing antibody and secretory IgA levels in both mouse groups. In the mice infected with oseltamivir-resistant IFV, the α-glucan suppressed the viral replication more markedly and produced higher titers of virus-specific antibody as compared with oseltamivir.

Conclusions: The present results suggested that Maitake α-glucan might be useful for therapy and prevention of IFV infections even in the immunosuppressive state.

Keywords: Maitake α-glucan, Influenza virus infection, Animal experiments, Therapeutic effects.

BENEFICIAL EFFECTS OF SMALL MOLECULE OLIGOPEPTIDES ISOLATED FROM PANAX GINSENG C. A. MEYER IN LOW-DOSE ALLOXAN- AND HIGH-CARBOHYDRATE/HIGH-FAT DIET-INDUCED DIABETIC RATS, PARTIALLY BY AMELIORATE PANCR

Li, Yong.

Peking University.

Background and objectives: This study aimed at investigating whether treatment with oligopeptides from ginseng (GOP) could modulate type 2 diabetes mellitus (T2DM)-related hyperglycemia in rats induced by high fat diet and low doses of alloxan and its therapeutic mechanisms.

Methods: Male Sprague-Dawley rats made type 2 diabetic with 1 injections of 105 mg/kg alloxan and 4 weeks of the high-carbohydrate/high-fat diet were fed high-carbohydrate/high-fat diet with or without GOPs administration (0.125 g/kgBW, 0.5 g/kgBW and 2.0 g/kgBW) for 7, 24 and 52 weeks, respectively. Oral glucose test tolerance (OGTT), plasma glucose, serum insulin, the level of antioxidant and the score of b-cell function were measured. Morphological observation was performed by light microscopic analyses. The level of insulin and the expression of NF-κB signaling in pancreatic islets were also studied using western blot. Additionally, the survival time and rate were observed.

Results: After the treatment, the score of b-cell function and the abnormal OGTT of diabetic rats were partially reversed by GOPs treatment. The efficacious effect of GOPs was also manifested in the amelioration of pancreatic damage by microscopic analyses. Moreover, GOPs treatment increased normal insulin content and decreased the expression of NF-κB signaling and the number of apoptotic cells in diabetic islets. Additionally, compared with the model control, the survival time and rate were significantly longer.

Conclusions: These findings suggest that GOPs might have auxiliary therapeutic potential for diabetes, partially by ameliorate pancreatic beta-cell dysfunction and death.

Keywords: Panax ginseng oligopeptide, Pancreatic beta-cell failure, Type 2 diabetes mellitus, High--carbohydrate/high-fat, Alloxan.

Further collaborators: Some issue about T2DM

EFFECT OF BLACK TEA DERIVED POLYPHENOLS ON MUSCLE ATROPHY AND RECOVERY IN MICE

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Background and objectives: Recently, there are some reports that polyphenols have some good effects on muscle. Our laboratory originally purified high-molecular-weight polyphenols extracted from black tea. We named it Mitochondria Activation Factor (hereafter, MAF), because MAF enhanced mitochondrial membrane potential of ciliated protista Tetrahymena pyriformis (Fujihara et al.). We found MAF raises AMPK (regulator of PGC-1 alpha, which stimulates mitochondria biogenesis) phosphorylation level and improves endurance performance in mice (Eguchi et al.). Recently, we extracted crude MAF fraction with 80% ethanol, and named this fraction E80. In this study, we examined whether E80 prevented skeletal muscle of mice during tail suspension or promoted recovery from muscle atrophy.

Methods: Adult mice (8 weeks of age) were fed on food containing 0.5% E80 during 2 weeks of tail suspension and 5 days or 10 days of recovery after 2 weeks of tail suspension. After these process, mice were euthanized by cervical dislocation and excised soleus muscle.

Results: We measured muscle wet weight and molecules regulating muscle mass. Then, we found E80 may have potential for promoting recovery of muscle mass from atrophy by tail suspension.

Conclusions: Previously, we reported E80 promote muscles hypertrophy during functional overload in mice. In this study, we demonstrated E80 has potential for promoting recovery of muscle mass from atrophy.

Keywords: Polyphenol, Unloading, Reloading, Skeletal, Muscle.

RESVERATROL AMELIORATES RENAL ISCHEMIA-REPERFUSION INJURY VIA ACTIVATING GLYOXALASE 1 ACTIVITY AND THIOREDOXIN REDUCTASE/THIOREDOXIN SYSTEM

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Background and objectives: The glycative stress is partially responsible for the damage of renal ischemia-reperfusion (IR) injury. Accumulating evidences indicate that resveratrol has beneficial effects on markers of oxidative stress in diseases. In this study, we used a renal IR model to demonstrate pretreatment of resveratrol showed the protective effects on renal IR injury.

Methods: Mice were assigned to sham-operation group, renal IR group, pretreat apocynin, and pretreat resveratrol group. Serum cystatin C and creatinine (Cr) levels were analyzed. The renal methylglyoxal (MG), malondialdehyde (MDA) levels and also glyoxalase 1 (GLO-1) activity were detected. Renal thioredoxin reductase/thioredoxin system and caspase 3 were measured by western blotting.

Results: Our model of renal IR resulted in severe kidney dysfunction 24 hour after reperfusion indicated by significant increases in serum Cr levels. We also determined that mice subjected to IR increased MG accumulation and MDA level and decreased GLO-1 activity in the kidneys. Compared with vehicle control, intravenous tail vein injection of resveratrol (10 mg/kg bw) markedly improved the renal function, reduced oxidative stress, and cell apoptosis in renal IR injury models, strongly suppressed the IR-induced endogenous MG accumulation and increased the activity of GLO-1.

Conclusions: This study suggests that pretreatment of resveratrol could reduce the burden of endogenous MG accumulation-induced by IR with renal impairment and possibly improve the severity of renal injury.

Keywords: Resveratrol, Renal ischemia-reperfusion injury, Glyoxalase 1, Methylglyoxal.

144/1113

PROTECTIVE ACTION OF PHELLINUS LINTEUS POLYSCCHARIDE AGAINST RADIATION-INDUCED HAEMATOPOIETIC ABNORMALITY IN MICE

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Background and objectives: Radiation exposure is one of the potential carcinogenic factors in our living environment. The hematopoietic system damage is the main side effect of radiation exposure. Phellinus linteus (PL), one of the medicinal fungus in East Asia, contains rich polysaccharides, flavonoids and polyphenols , been shown to exhibit anti-cancer, anti-inflammatory and immunomodulative effects. We determined the protective effect of PL polysaccharide (PLP) on low dose of irradiated mice

Methods: Mice were divided into control group (no irradiation), irradiated group (2 Gy), irradiated (2 Gy) + WR2721 (200 mg / kg), irradiated (2 Gy) + low dose group (100 mg / Kg), irradiated (2 Gy) + high dose (500 mg / kg). Blood samples were measured 48 hours after the first irradiation. WBC, RBC, HGB, PLT. Blood samples were collected for 48 hours after each irradiation. The weight was measured weekly and recorded. In the sixth week of sacrifice. Sacrifice after the collection of blood and mouse organs, intestinal, femur for analysis.

Results: Results revealed that PLP administration, especially at high dose, significantly restored radiation-induced loss of WBC and platelets. In addition, PLP supplementation significantly ameliorated radiation-induced femur fibrosis. Similarly, PLP effectively reversed radiation-induced abnormal serum levels of immunological parameters.

Conclusions: Overall, this dissertation research demonstrated that PLP effectively protected against radiation damage by increasing antioxidant activities and ameliorating abnormal hematopoietic in mice.

Keywords: Radiation, Phellinus Linteus, Polysaccharides, Hematopoietic function.

144/1152

PRELIMINARY STUDIES OF ELABORATION, ACCEPTABILITY AND NUTRITIONAL QUALITY OF FORMULATIONS RICH IN OMEGA-3 FATTY ACIDS FOR THEIR USE IN EXPERIMENTAL MURINE MODELS

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Background and objectives: Background: Basic metabolic research of chronic non transmissible diseases often needs the use of different diets in experimental animals, these must be designed for being complete. Given the already observed functional effects of Omega-3 fatty acids and their high content in chia seeds, it is interesting to find a suitable method for their incorporation into the murine diet. Objective: to evaluate the organoleptic characteristics, acceptability and nutritional quality of food rich in Omega-3 fatty acids in Balb-c mice from the Biotherium of Faculty of Medicine, Universidad Nacional del Nordeste.

Methods: Adult mice (2 months) of the Balb-c strain were used. The protocol was approved by the Institutional Committee for Care and Use of Experimental Animals. Mice were randomly distributed in 4 lots with food and water ad-libitum. Experimental groups received a diet rich in Omega-3, while the control lots (A) were provided with a standard commercial feed for 15 days. The diets were prepared manually with natural ingredients according to nutritional requirements: one formulation with egg proteins (B) and one with milk and egg (C).The semi-solid preparations were

molded as standard pellets, which were: 1) dried in an oven for 2 h at 80°C, and 2) autoclaved (103 kPa, 120ºC) 10 min and further dried 5 h at 40°C. Thus, the four diets were: B1, B2, C1, C2. The evaluation of diets include: the organoleptic characteristics of the pellets, its acceptability and digestibility. Measurements involved the progression of mice body weight, the consumption of pellets and the study of feces. Coprologic samples were analyzed with light microscopy (40x).

Results: The smell and color of the food were conventional and similar among different groups. The diet with the greatest acceptability was C. Animals fed with diet B decreased body weight in comparison with those fed with diet C, which maintained or increased it similarly to controls.

Conclusions: This study let us conclude that the best formulation of a pellet rich in Omega-3 from chia seeds is C1. Additionally, this work might be used for evaluating Omega-3 bioavailability in further settings for metabolic models of chronic non transmissible diseases.

Keywords: Functional food , Nutrition, Chia seeds, Food technology.

144/1195

RED PITAYA PEEL EXTRACT IMPROVED STEATOSIS AND INFLAMMATION IN ALCOHOLIC LIVER DISEASE

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Background and objectives: Alcohol consumption leads to liver injury, ectopic fat accumulation in the liver and excretion of proinflammatory cytokines which may promote the progression of liver disease. Red pitaya is one of the popular fruit in Taiwan and its disposed peel is rich in phenolic compounds. Thus, the aim of the study is to investigate the beneficial effects of pitaya peel extract (PE) in a chronic plus single binge ethanol feeding model.

Methods: Twenty-four C57BL/6 mice were assigned to three groups consuming control liquid diet (C), ethanol liquid diet (E) or ethanol liquid diet plus 1000mg/kgBW red pitaya peel extract (P) for 13 days. At day 14, mice were orally gavaged with a single dose of isocaloric maltodextrin (C) or ethanol (5g/kgBW, E & P). After 9h, mice were sacrificed and we collected their blood and liver tissue for analysis. In addition, 20 rats were assigned to two groups to clarify whether PE affected ethanol absorption.

Results: At the end of the study, we found that ethanol diet significantly elevated serum and hepatic lipid concentration and increased the hepatic malondialdehyde (MDA) and proinflammatory cytokines while PE consuming group had lower hepatic lipid, MDA and interleukin (IL)-6 concentrations than the E group. We also found that PE consumption did not directly affecting the ethanol absorption rate.

Conclusions: Our results suggested that PE consumption may improve ethanol-induced hepatic steatosis and inflammation, and may be beneficial in ameliorating the progression of alcoholic liver diseases.

Keywords: Pitaya, Ethanol, Lipid, Liver, Inflammation.

144/1245

FORMULATION AND CHARACTERIZATION OF A CEREAL BAR AS A FUNCTIONAL FOOD

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Background and objectives: In recent years mankind has produced the most significant changes in their eating patterns and lifestyle. Just as hunger and malnutrition were the main focus of food policy for decades, malnutrition, anemia, and obesity are today. Increased consumption of saturated fats, simple carbohydrates and decreased fiber intake leads to a higher incidence of chronic noncommunicable diseases (CNCDs). The WHO proposes that industries produce healthier foods.

The objectives of the work were to elaborate a cereal bar fortified with iron, fiber and antioxidants and to determine its physicochemical properties, microbiological stability and sensorial acceptability.

Methods: A cereal bar was made with oats, oat bran, inflated corn, honey, fortified sugar with iron, lemon zest and sunflower oil. Variation and physical chemical and microbiological stability were studied under different storage conditions. The sensorial properties and the acceptability were evaluated by means of the hedonic scale in a population of 100 people between 9 and 78 years of both sexes residing in Tucumán.

Results: The formulation of the cereal bar is made up of 52% carbohydrates, 12% protein and 36% fat. The values of fiber (1.99 grs) and iron (0.4 mg) position it as a functional food.

With respect to acceptability, 96% of the participants considered it excellent and this facilitates their introduction into different age groups.

The study of the physical and chemical characteristics of the product, are stable being the best method to keep the dark wrapping.

Conclusions: Conclusion, a food rich in iron and with antioxidant properties was obtained. The physical and chemical characteristics of the product are stable being the best method to keep the dark packaging. With respect to acceptability, more than half of the participants considered it excellent and this facilitates their introduction into different age groups.

According to scientific evidence fiber and antioxidants have positive effects on CNCDs and iron fortification prevents anemia in schoolchildren and pregnant women. It is proposed to bring to the market a cereal bar with the mentioned compounds.

Keywords: Functional food, Cereal bar, Nutrition, Health.
Further collaborators:
Mg. Ing. Patricia Albarracín, Dra. Norma Barnes, Dra. Dora Paz, Dra. Martha Kairuz.

144/1280

EFFECT OF THE CONSUMPTION OF HAMBURG-ERS PREPARED WITH ADDITION OF WINE GRAPE POMACE FLOUR, RICH IN FIBER AND AN-TIOXIDANTS, ON PLASMA ANTIOXIDANTS

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Background and objectives: Diet is a modifiable factor for prevention of chronic diseases. Antioxidants and fiber are two bioactive components with proven beneficial health properties. Currently, fiber and antioxidants population intake is less than that recommended by the WHO. The objective of this study was to develop a functional food, enriching a high consumption meat-based food with wine grape pomace flour (WGPF), rich in fiber and antioxidants, and to study the effect of its consumption on plasma antioxidants in an intervention study.

Methods: We formulated a beef hamburger (100 g) with 7% of WGPF, containing 3.5% of fiber, 1.2 mg EAG/g of polyphenols and 17.2 μmoles Trolox/g of ORAC (WGPF-hamburger). WGPF was prepared from pressed of grapes after winemaking (Caber-net Sauvignon). A controlled intervention study of 3 months was completed in 27 male volunteers. Volunteers daily consumed one WGPF-hamburger during the first month, interrupted by a month washout period, followed by a control month period where they daily consumed a hamburger without WGPF (control-hamburg-er). Plasma antioxidants (vitamin C, vitamin E, beta-carotene and antioxidant capacity as DPPH) were evaluated at time 0, 1, 2 and 3 months.

Results: Intake of the WGPF-hamburger significantly increased vitamin C ($p<0.001$), whereas intake of control-hamburg-er significantly decreased vitamin C ($p=0.005$), vitamin E (0.050) and beta-carotene ($p=0.040$). No significant effect was observed in plasma antioxidant capacity during WGPF-hamburger and control-hamburger periods.

Conclusions: The consumption of beef hamburger elaborated with 7% WGPF protects against plasma antioxidant expenditure, vitamin C, vitamin E and beta-carotene and enhances vitamin C, showing its potential to prevent oxidative damage and the func-tionality of this food.

144/1350

MACAÍBA (ACROCOMIA INTUMESCENS DRUDE) DECREASED VISCERAL FAT IN DISLIPIDEMIC RATS

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Background and objectives: Macaíba is a palm tree. It has significant percentages of unsaturated fatty acids in its composi-tion, such as oleic and linoleic acid. In addition, it is a source of vitamin as well as high levels of carotenoids and vitamin C. The objective of this work was to evaluate the effects of macaíba pulp intake on murinometric parameters and visceral fat of dyslipidem-ic adult Wistar rats.

Methods: Male rats were divided into four groups: Con-trol (CT), Dyslipidemic (DL), Macaíba (MC) and Dyslipidemic Macaíba (MCDL), using n=9 per group. Dyslipidemia was pre-viously induced during 14 days. The animals received 1000mg/kg of body weight/day of macaíba pulp by gavage during 28 days. The research was conducted according to the Guidelines for the Care and Use of Experimental Animals and was submitted and approved by the Ethics Committee on Animal Use (CEUA) of the Center for Health and Rural Technology - CSTR / UFCG, protocol number CEP 063 / 2016. Data were evaluated with One Way Ano-va followed by Tukey ($p<0.05$) using Sigma Stat software.

Results: Feed intake, abdominal and thoracic circumference, weight, length, BMI and visceral fat were evaluated. The data demonstrated that there was no difference in the physical parame-ters, but a reduction of visceral fat in MC and MCDL was verified. Studies show that monounsaturated fats reduce the amount of cir-culating fats, and therefore fat uptake by adipocytes is reduced, thus reducing visceral fats is associated with an increased risk of developing heart disease. Therefore, macaíba shows to be a prom-ising food for preventing and/or combatting lipidic alterations that may promote correlated pathologies such as dyslipidemia.

Conclusions: Therefore, macaíba shows to be a promising food for preventing and/or combatting lipidic alterations that may promote correlated pathologies such as dyslipidemia.

Keywords: Visceral fat. Acrocomia intumescens Drude. Dys-lipidemia.

BIOCHEMICAL PARAMETERS OF DISLIPIDEMIC RATS CONSUMING MACAÍBA (ACROCOMIA INTUMESCENS DRUDE)

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Background and objectives: Macaíba is a palm tree that can be found in the northeastern and southeastern regions of Brazil as part of the Atlantic Forest Biome. The pulp stands out as a source of fiber, fatty acids, such as oleic and linoleic acid and essential aminoacids. In addition, it is a source of vitamin C and contains significant levels of total carotenoids and yellow flavonoids in its composition. Natural antioxidants such as carotenoids, vitamin C, and unsaturated fatty acids present in fruits, greenery, and vegetables have been subject of study in the fight against changes in blood lipid levels, associated with the risk of developing cardiovascular diseases. The objective of this work is to evaluate the effects of macaíba pulp intake on biochemical parameters of dyslipidemic adult Wistar rats.

Methods: Male rats were divided into four groups: Control (CT), Dyslipidemic (DL), Macaíba (MC) and Dyslipidemic Macaíba (MCDL), using n=9 per group. Dyslipidemia was previously induced during 14 days. The animals received 1000mg/kg of body weight/day of macaíba pulp by gavage during 28 days. Data were evaluated with One Way Anova followed by Tukey (p<0.05) using Sigma Stat software. Oxalacetic glutamic transaminase (OGT), pyruvic glutamic transaminase (PGT), creatinine, urea, total cholesterol (TC), triglycerides (TG), low density lipoprotein (LDL), high density lipoprotein (HDL) and atherogenic risk were calculated.

Results: The data demonstrated that there was a reduction of all the biochemical parameters in MCDL and TG in MC. MC and MCDL groups presented increases in HDL and decreases in atherogenic index (p<0.05). MCDL also presented a reduction in PGT and OGT.

Conclusions: Therefore, macaíba shows to be a promising food for preventing and/or combatting lipidic alterations that may promote correlated pathologies such as dyslipidemia.

Keywords: Dyslipidemia. Acrocomia intumescens Drude. Rat.

ORAL ADMINISTRATION OF FREEZE-DRIED POWDERS OF HONEYBEE LARVAE INHIBITS DEVELOPMENT OF ATOPIC DERMATITIS-LIKE SKIN LESIONS IN NC/NGA MICE

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Background and objectives: Honeybee larvae was pupa of honeybees and has been eaten since ancient days because human being expects/expected of its high nutrient with rich amino acid score. The suppressive effect of the oral administration of honeybee larvae on the atopic dermatitis (AD)-like skin lesions in NC/Nga mice was evaluated.

Methods: NC/Nga mice are used as the most extensively studied animal model of AD.

Results: Oral administration of 0.5% and 1.0% honeybee larvae-added diet for 46 days inhibit the development of AD-like skin lesions, and elevation of serum IgE levels, accompanying with the declined serum levels of both IL-4 and IFN-γ and IL-18 and IL-12 contents in the skin lesions. These results suggest that honeybee larvae inhibits the development of skin lesions in NC/Nga mice by suppressing both the T-helper (Th) 1 and Th 2 cell responses.

Conclusions: Our results indicate that oral administration of honeybee larvae could provide an adjuvant therapy for the management of AD.

Keywords: Atopic dermatitis, Honeybee larvae, Interferon-γ, Interleukin-4, NC/Nga mice.

THE EFFECTS OF ALMOND (PRUNUS DULCIS) ON THE POSTPRANDIAL BLOOD GLUCOSE LEVELS IN MICE

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Background and objectives: Almond is generally thought to be effective on maintaining and enhancing our health. Recently some reports revealed that almond have an effect for decreasing the postprandial blood glucose level when carbohydrate and al-

mond are ingested simultaneously in human study. However the detail of the effect including functional components and mechanism have still been unclear. In this study, we assessed the functional components and mechanism of the effect.

Methods: After being fasted for overnight, male ICR mice were orally administrated maltodextrin with one of the following diet, depending on the group; (1) whole almond paste (4 g/kg), (2) almond paste without seed coat (4 g/kg), or each fraction fractionated from whole almond; (3) almond oil, (4) water soluble fraction, (5) water insoluble fraction, (6) water as a control. The blood samples were collected from the tail at the time of 0, 15, 30, 45, 60, 90, 120 min after the administration and applied for the measurements of blood glucose and insulin level. To compare the effects of oils, we also tested the effects of other kinds of oils, that is, peanut oil, walnut oil and olive oil.

Results: The mice ingested maltodextrin with almond paste (with and without seed coat) showed significantly lower value of the blood glucose level and higher of the insulin level. Although the soluble and insoluble fractions did not show any effects, only almond oil significantly decreased the postprandial blood glucose level without the increase of insulin level, compared to the control group. Comparing the effect of oils, the walnut and olive oils showed the same tendency as that of almond oil, but peanuts oil did not.

Conclusions: Whole almond suppresses the increase of postprandial blood glucose level via enhancement of insulin secretion. Almond oil also decreased the increase of blood glucose without insulin spike.

Keywords: Almond, Blood glucose, Insulin, Oil, Mouse.

ly correlated with plasma glucose levels and insulin resistance in KK-Ay mice. In the present study, we have attempted to examine antidiabetic and antihyperuricemic effects of TXF in cultured L6 myotubes and KK-Ay mice.

Methods: L6 myoblasts were cultured in 10% fetal bovine serum (FBS)/ Dulbecco's Modified Eagle Medium (DMEM) and differentiated to L6 myotubes in 2% FBS/DMEM. Then, glucose uptake assay was conducted as already mentioned by us (Kawano et al. 2009) in the absence or presence of TXF. KK-Ay mice were maintained on regular pellet diet, and TXF (30 mg/kg body weight) suspended in vehicle (0.5% CMC-Na) was orally administered once a day for 4 weeks. Normal and diabetic control mice were given vehicle alone. At the end of experimental period, the blood was collected under isoflurane anesthesia from the inferior vena cava in the microtube with heparin to obtain plasma. Concentrations of plasma glucose, insulin and uric acid were determined with commercial kits.

Results: TXF dose-dependently (0-200 μM) and significantly promoted glucose uptake in L6 myotubes, and the rise was cancelled by Compound C (10 μM), an AMPK inhibitor, indicating an involvement of AMPK and hence GLUT4 translocation in TXF action. Plasma glucose, insulin, uric acid concentrations and HOMA-IR, an index of insulin resistance, significantly elevated in diabetic control KK-Ay mice as compared with normal ones. All the rises were significantly suppressed by TXF treatment.

Conclusions: TXF is demonstrated to be antidiabetic and antihyperuricemic.

Keywords: AMPK. Diabetes. Hyperglycemia. Hyperuricemia. KK-Ay mice.

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ANTIDIABETIC AND ANTIHYPERURICEMIC EFFECTS OF TAXIFOLIN, A POLYPHENOL PRESENT IN OCTAPLOID STRAWBERRY, IN CULTURED L6 MYOTUBES AND TYPE 2 DIABETIC MODEL KK-AY MICE

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Background and objectives: The number of diabetic patients is increasing globally. Many trials to suppress hyperglycemia by use of phytochemicals have been conducted so far. The skeletal muscle is the largest tissue in our body and plays an important role in maintaining postprandial glucose homeostasis by uptake of blood glucose through glucose transporter 4 (GLUT4) via AMP-activated protein kinase (AMPK) phosphorylation. We have recently demonstrated that type 2 diabetic (T2D) model KK-Ay mice accompany hyperuricemia as well as hyperglycemia and that taxifolin (TXF) suppresses purine bodies-induced hyperuricemia. We have also found that plasma uric acid levels are positive-

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EFFECT OF THE CONSUMPTION OF EPA AND DHA DERIVED FROM MICROALGAE IN CD1 MICE

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Background and objectives: The alpha-linolenic fatty acid (C18: 3, ALA) belonging to the n-3 family, is an essential fatty acid, cannot be synthesized in the body and should be consumed to maintain health. EPA (ecosapentanoic acid) and DHA (docosahexaenoic acid) have vegetable sources (algae and microalgae) and animals (fish, crustaceans, seafood) of marine origin as a dietary source. Cultured microalgae, a renewable source with high EPA and DHA content, can be consumed lyophilized or microencapsulated and added to food, since they have great potential in human and animal nutrition. The objective is to know the effect of the consumption of EPA and DHA derived from microalgae in CD1 mice.

Methods: 32 db/db mice, 56 days old, divided into 4 groups (n = 8) were used: a) Control (CL), b) EPA and DHA lyophilisate (Li), c) Croquette + 2% EPA and DHA (Cr), d) Coconut oil (CO).

Treatment was given for 8 weeks and sacrificed at day 112. BMI, Body weight, feed intake, water, glucose, total cholesterol, triglycerides and HDL were measured.

Results: No differences were found in BMI (p=0.117); feed intake was higher (p<0.002) in the CO group (66.05 g/day ± 2.1) and lower in the Li group (42.47 g/day ± 4.2); the water intake increased (p<0.001) in the CO group (86.02 ml/day ± 3.9) and decreased in the Li group (55.01 ml/day ± 2.3) compared to the control (67.27 ml/day ± 2.7). The concentration of glucose (p<0.008) increases with Li (127.3 mg/dL ± 5.7), but decreases with Cr (109.5 mg/dL ± 1.2) and CO (106.6 mg/dL ± 1.4). Total cholesterol did not change (p=0.062); HDL-cholest decreased (p<0.001) in the Cr group (39.2 mg/dL ± 8.4) compared to the control (50.25 mg/dL ± 9.8); triglycerides increasing (P <0.001) in the CO group (98.5 mg/dL ± 4.2), decreasing in the Li (60 mg/dL ± 2.4) and Cr (67.5 mg/dL ± 2.2) groups.

Conclusions: The effect of supplementation with EPA and DHA from cultured marine microalgae is beneficial; it does not modify BMI; the lyophilized decreases feed consumption and water; although increasing blood glucose levels, improves the concentration of triacylglycerols.

Keywords: Microalgae, Ecosapentanoic acid, Docosahexaenoic acid.

144/1430

EPA AND DHA CONSUMPTION EXTRACTED FROM MICROALGAE AND ITS EFFECT ON ANTHROPOMETRIC AND BIOCHEMICAL PARAMETERS

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Background and objectives: Long chain polyunsaturated fatty acids (LC-PUFA) are dietary components that participate in multiple physiological processes; the alpha-linolenic fatty acid (C18: 3, ALA) belongs to the n-3 family, cannot be synthesized in the body, a minimum consumption for health should be maintained. The ALA can be transformed into EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid), its dietary sources are vegetable organisms (algae and microalgae) and animals (fish, crustaceans, seafood) of marine origin. Cultured microalgae are a renewable source with high EPA and DHA content, can be consumed lyophilized or microencapsulated and added to a wide variety of foods as they have great potential in human and animal nutrition. The aim of this study was to determine the relationship between the consumption of EPA and DHA extracted from microalgae with anthropometric and biochemical parameters.

Methods: 32 db/db mice at 8 weeks of age, divided into 4 groups (n = 8): a) Control (CL), b) EPA and DHA lyophilisate (Li), c) Croquette + 2% EPA and DHA (Cr), d) Coconut oil (CO). They were given the treatment for 8 weeks and sacrificed at week 16.

BMI, Body weight, feed intake, water, glucose, total cholesterol, triglycerides and HDL-colest were measured.

Results: No differences were found in BMI (p=0.248); feed intake (p<0.011) was higher in the CO group (36.12 g/w ± 1.85) and lower in the Cr group (28.82 g/w ± 2); the water intake increased (p<0.031) in the Li group (76.32 ml/day ± 4) compared to the control (69.73 ml/day ± 1.32). No differences were found in glucose concentration (p = 0.132); total cholesterol was elevated (p<0.015) in the Li and Cr groups; HDL-cholest increased (p<0.001) in the group that consumed Li (92.1 mg/dL ± 3.9), compared to its control (57.4 mg/dL ± 6); the triacylglycerols were modified (p<0.004), increasing in the Li group (356.2 mg/dL ± 27.4) and decreasing in the CO group (199.6 mg/dL ± 2.88).

Conclusions: In diabetic mice, the effect of supplementation with EPA and DHA is beneficial, as it does not modify BMI, decreases feed intake and does not alter blood glucose, further substantially improves the concentration of HDL-cholest.

Keywords: Microalgae, Eicosapentaenoic acid, Docosahexaenoic acid, Anthropometric parameters.

144/1460

DIETARY AMINO ACIDS CONTROL LIPID ACCUMULATION IN THE LIVER, SKELETAL MUSCLE OR ADIPOSE TISSUE IN AN AMINO ACID-SPECIFIC MANNER

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Background and objectives: We have previously shown that dietary protein deprivation or dietary arginine restriction induces accumulation of neutral lipid in the liver, and by contrast dietary lysine restriction resulted in lipid accumulation in the skeletal muscle. These studies suggest that not only amounts but also balance of amino acids control lipid accumulation in a tissue-specific manner. However, effects of a single amino acid on lipid accumulation in the peripheral tissues remain largely unclear, and unveiling these effects can be a clue to understand amino acid-monitoring systems. In this study, we aimed to elucidate effects of supplementation with a single amino acid in an amino acid-deficient diet on lipid accumulation in the peripheral tissues.

Methods: We fed six-week-old male Wistar rats for one week with diets containing sufficient (15%) amino acids (control diet) or insufficient (5%) amino acids (5AA diet), or 20 kinds of single amino acid-supplemented 5AA diets in which a single amino acid was increased to the same levels as the control diet, and then measured neutral lipid content in the liver and skeletal muscle or weight of adipose tissue.

Results: Triglyceride content in the liver was increased in a 5AA group compared to a control group. Feeding of methionine- or cystine-supplemented 5AA diets enhanced this increase. In the skeletal muscle (longissimus thoracis), triglyceride content in the 5AA group was comparable to that in the control group. However, supplementation of leucine or arginine in the 5AA diet increased triglyceride content in the muscle. Analysis of weight of adipose tissue (retroperitoneal fat) revealed that feeding the 5AA diet increased the adipose tissue weight compared to the control group. In addition, supplementation with serine in 5AA diet enhanced the increase in the adipose tissue weight.

Conclusions: In summary, methionine or cystine supplementation increased neutral lipid content in the liver, leucine or arginine increased it in the skeletal muscle, and serine increased the adipose tissue weight. Taken together with other results, we concluded that a single amino acid could control lipid accumulation in a tissue-specific manner in growing rats under conditions of dietary amino acid insufficiency.

Keywords: Amino acids, Fatty liver, Marbled muscle, Adipose tissue.

144/1469

FOOD SUPPLEMENTS BASED ON COMPOUNDS FROM THE TRADITIONAL NUTRITION IN BULGARIA

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Background and objectives: Two Bulgarian food supplements are presented which contain compounds characteristic for the national traditions in nutrition, the so called Balkan diet.

Methods: The first one had a beneficial effect on the functions of the gastro-intestinal tract. This is a plant-derived product containing extracts from Golden shower, Cumin, Chebulic myrobalan, Wild grape, Cinnamon, Bay leaft, Cardamom, Ginger, Black pepper, Long pepper, Coriander and Asafoetida. The compounds are rich of etheric oils and resins. It is established that this food supplement has spasmolytic, anti-pain, carminative, antiemetic and antioxidant effects. The second one contains resveratrol which is a polyphenolic compound naturally found in grape, red wine, grape juice, peanuts.

Results: Resveratrol is shown to have a profound antioxidant effects as part of the traditional Bulgarian food products.

Conclusions: Our study suggests that resveratrol could improve specific metabolic parameters in individuals at risk for type 2 diabetes as well as in obese subjects with impaired glucose tolerance.

Keywords: Food supplements, Balkan diet, Resveratrol, Anti-oxidant effect, Obesity.

144/1501

ENZYMATICALLY-SYNTHESIZED GLYCOGEN INHIBITS INFLAMMATORY RESPONSE IN ANTIGEN-INDUCED BASOPHILIC AND MAST CELLS

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Background and objectives: Activation of basophilic cells and mast cells trigger allergic and inflammatory responses through the release of mediators such as histamine and arachidonic acid metabolites, and modulates immune responses through the production of cytokines and chemokines. Recently, allergic patients are increasing all over the world. Thus, food ingredients that suppress and alleviate allergic and inflammatory responses are required. In this study, we, therefore, investigated the effect of enzymatically-synthesized glycogen (ESG) on the degranulation and production of inflammatory cytokines and arachidonic acid metabolites in RBL-2H3 cells and clarified its underlying mechanism.

Methods: Caco-2 cells were differentiated as intestine monolayer to incubate for 2 weeks, bone marrow-derived mast cells (BMMC) were prepared from 10 weeks old mice and incubated in medium supplemented with interleukin (IL)-3 for 3 weeks. Allergic and inflammatory response was performed using not only RBL-2H3 cells and BMMC but also co-culture of Caco-2 cells and RBL-2H3 cells using a transwell system. Degranulation of RBL-2H3 cells or BMMC was monitored by measuring β-hexosaminidase activity. The β-hexosaminidase released into the medium or remaining within the cells (Triton X-100 extract) were determined using a colorimetric assay with p-nitrophenyl-N-acetyl-β-glucosaminide and expressed as the percentage of total activity. Production and release of tumor necrosis factor-α (TNF-α), IL-6 and arachidonic acid metabolites in/from cells were determined using western blotting and enzyme-linked immunosorbent assay system. Phosphorylation of intracellular molecules was detected using western blotting.

Results: ESG inhibited release of β-hexosaminidase from RBL-2H3 cells and BMMC. In Caco-2/antigen-stimulated RBL-2H3 cells, ESG inhibited release of β-hexosaminidase and production of TNF-α, IL-6, and arachidonic acid metabolites. Moreover, ESG inhibited phosphorylation of Syk, Lyn, and PLCγ1/2 as the intracellular mediators for degranulation, that of Akt, p38, and JNK as the mediators for production of TNF-α and IL-6, and that of ERK1/2 and cPLA2 as the mediator for production of arachidonic acid metabolites.

Conclusions: We demonstrated that ESG inhibited allergic and inflammatory response in antigen-stimulated basophilic and mast cells. ESG might be a beneficial food to inhibit type I allergy.

Keywords: Glycogen, Histamine, TNF-α. RBL-2H3. Caco-2 cells.

Further collaborators: Yoko Yamashita

144/1502

EFFECT OF DIFFERENT AMYLOSE CONTENT ON THE QUALITY OF FUNORI (GLOIOPELTIS FURCATA) ADDED RICE NOODLES

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Background and objectives: Rice noodles are good foods for allergy patients of wheat flour, because of the absence of gluten in rice flour. However, it is difficult to make the rice noodles without gluten. In our previous study, adding Funori (Gloiopeltis furcata), a kind of seaweed, to the rice flour as a liaison was able to make the noodles using 100% rice flour. Recently, several studies have reported that the high-amylose rice inhibits early postprandial increment of blood glucose and insulin levels. In this study, we investigated the effect of different amylose content in the rice flour on the quality of rice noodles.

Methods: Two types of rice flour, an intermediate-amylose rice "Koshihikari" (KH; the most prevalent rice in Japan) and a high-amylose rice "Koshinokaori" (KK), were used to make rice noodles. Rice noodles were prepared with 250g of rice flour, 10g of Funori, and water using automatic noodle maker (PHILIPS HR2365/01). Physical properties, color (L*, a*, b*), and sensory attributes were measured after making and boiling of noodles.

Results: In the noodle making process, the optimum quality of rice noodles were obtained at 90mL (76%) of adding water for KH and at 110mL (84%) for KK. Difference of amylose content and particle diameter of rice flour may influence for the water absorption of rice flour during noodle making. Both noodles showed a light green color derived from Funori heated by copper pan. In case of physical properties of raw noodles, KK noodles showed higher value for hardness and elasticity than KH noodles. After boiling of noodles, lower values for hardness were observed in both of noodles. KK noodles were preferred at elasticity to KH noodles in the sensory evaluation of the noodles.

Conclusions: The high-amylose rice is generally unsuitable to Japanese taste as cooked rice. However, these findings showed that the adequacy of high-amylose rice as rice noodles. More investigation of human study is necessary to evaluate high-amylose rice noodles as the effective food for glycemic control.

Keywords: Rice flour, Rice noodles, High-amylose rice, Funori.

144/1511

IN VIVO STUDY OF ANTIOXIDANT CAPACITY OF CHIA (SALVIA HISPANICA L.) IN SACCHAROMYCES CEREVISIAE

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Background and objectives: Chia is an edible oil seed of the plant Salvia hispanica L. Its consumption is recommended because of its high oil content (25-38%) rich in omega-3 (50-67% α-linolenic acid), proteins of High biological value, natural antioxidants, vitamins, minerals, dietary fiber (30-54%) and bioactive compounds such as phytosterols. The present study has focused on aspects related to the antioxidant potential of chia. It is known that oxidative stress is associated with various human pathologies. The WHO recommends the daily consumption of antioxidants through diet to prevent or attenuate these pathologies. The antioxidant power of chia seeds has been studied in vitro by several authors, however there is a great lack of knowledge about its antioxidant promoter capacity in whole organisms.

The general objective of the present investigation is to study the protective antioxidant capacity of chia polyphenolic extracts at different concentrations using the yeast Saccharomyces cerevisiae as model organism.

Methods: A method adapted to microtiter plates is used to monitor yeast growth after culture pre-incubation with food ingredients and exposure to oxidative stress by hydrogen peroxide. Polyphenolic extracts of chia at different concentrations range from 10 mg/L to 1200 mg/L were tested.

Results: As a result, the polyphenolic extracts showed a significant protective effect against oxidative stress. This effect was more evident in moderate stress conditions and increased with polyphenol concentration, the greatest effect were obtained at the concentration of 1200 mg/L.

Conclusions: In conclusion, the present work completes the information regarding the polyphenol content of chia when showing their ability to promote the antioxidant protective effect in a complete model such as yeast.

Keywords: Oxidative stress, Yeast, Chia, Polyphenols, Antioxidant capacity.

Further collaborators:

144/1513

EFFECTS OF BRAN PARTICLE SIZE ON GLYCEMIC RESPONSES. A RANDOMIZED CLINICAL TRIAL IN HEALTHY HUMANS

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Background and objectives: Diets characterized by low glycemic index (GI) and/or glycemic load (GL) have been associated with decreased risk of chronic diseases. Breads' grain particle size may affect glycemic response, possibly due to the altered starch surface, hence its susceptibility to enzymatic hydrolysis. However, the role of bran's particle size alone has not been studied. The aims of this study were a) to determine the GI and GL of three breads and b) to investigate the effects of bran's particle size on postprandial glycemic response.

Methods: Ten healthy, normal-weight subjects participated in GI investigation following International Standard Organization's protocol. Participants, in this double blind, crossover trial, consumed in random order 50g available carbohydrate portions as glucose (Glu, reference food, tested three-times) and white bread (WB), bread enriched with coarse wheat bran (CB), bread enriched with fine wheat bran (obtained by milling of the coarse bran) (FB) and the FB in which 10% of the flour was substituted with carob seed flour (CSFB), tested once, on separate occasions. Capillary blood glucose and salivary insulin samples were taken at 0,15,30,45,60,90 and 120min.

Results: CB was a high GI (70), low GL (10) bread; FB was a high GI (82), medium GL (12) bread; and CSFB was a high GI (70), low GL (8) bread. There was a significant glucoseXtime interaction (p<0.001), a glucoseXbread interaction (p=0.03) and a glucoseXtimeXbread interaction (p<0.001). There was a significant main effect of bread type on iAUC for glucose (p=0.01). Compared to the reference food, blood glucose concentrations were significantly lower: for CB at 120min (p=0.02); for FB at 15, 30, and 120min (p=0.049, p=0.004 and p=0.008, respectively); for CSFB at 15 and 30min and marginally at 45min (p=0.0008, p=0.008, p=0.06, respectively). Peak glucose rise was significantly lower only for CSFB compared to the reference food (p=0.03). No differences were observed for fasting glucose, fasting salivary insulin, iAUC for salivary insulin, time to peak rise for glucose or insulin.

Conclusions: Breads differed in GI/GL. Bran particle size and flour substitution by carob seed flour attenuated postprandial glycemic response, which may offer advantages to glycemic control.

Keywords: Bran, Particle size, Glycemic response, Carob.

144/1521

NIGAICHIGOSIDE F1 FROM LANBUZHENG (GEUM JAPONICUM THUNB.) INHIBITS OLEIC ACID-INDUCED HEPATIC STEATOSIS IN HEPG2 CELLS

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Background and objectives: Lanbuzheng (Geum japonicum Thunb.) is a wild vegetable in Guizhou province, China, which has also been used as traditional herbs as diuretics and astringents. Nigaichigoside F1 (NF1), the major triterpenoids in Lanbuzheng, has been report for its potent hypolipidemic and hypoglycemic activities. Thus, we hypothesized that NF1 would attenuate events leading to non-alcoholic fatty liver disease (NAFLD).

Methods: The culture media of HepG2 cells were added 1.0 mM oleic acid to induce hepatic steatosis. After 24 h, siginificant accumulation of lipid droplets were observed by Oil-Red-O based colorimetric assay, together with increased triacylglycerol (TAG) and malondialdehyde (MDA).

Results: The oxidative stress of HepG2 cells was significantly increased, which characterized by the content of reactive oxygen species (ROS), total antioxidant capacity (T-AOC), superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (Gpx), and the ratio of reduced and oxidized glutathione (GSH/GSSG). NF1 was purified from Lanbuzheng extract by Diaion HP-20 resin (60% ethanol elution, 3 BV/h) and characterized by ESI-MS, 1H-NMR, and 13C NMR. NF1 (10 uM) increased cell proliferation by 2.35 folds with decreased TG (43%), MDA (62%), and ROS (78%) content. The content of T-AOC, SOD, CAT, Gpx, and the ratio of GSH/GSSG were increased by 2.3, 1.27, 2.15, 1.05, and 1.72 folds, respectively. Moreover, RT-PCR results confirmed NF1 (10 uM) inhibited SREBP-1c gene expression while promoted HSL and Nrf2 gene expression.

Conclusions: In conclusion, NF1 effectively ameliorated NAFLD symptoms by decreased TAG accumulation and increased antioxidant capacity in oleic acid-induced hepatic steatosis in HepG2 cells.

Keywords: Geum japonicum Thunb., Nigaichigoside F1, Non-alcoholic fatty liver disease, Antioxidant.

THE TIME COURSE OF ACUTE EFFECTS OF THREE DOSES OF CAFFEINE ON ATTENTION, MOTOR SPEED AND MOOD

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Background and objectives: Moderate doses of 75–200mg caffeine have well established effects on measures of alertness and reaction time. However, less is known of the impact of lower doses that are more reflective of levels found in a cup of tea. Similarly, studies of behavioural effects of caffeine have focused on a 30–120 minute window, despite the demonstration that salivary caffeine levels remain elevated at 5 hours post-consumption. The aim of the current study was to explore effects of 40, 80 and 120mg caffeine over an 8-hour period.

Methods: A randomised, placebo-controlled, double-blind, parallel groups design was employed to explore the effects of caffeine (40, 80 and 120mg) on choice reaction time (CRT), tapping, 'alertness' and 'sleepiness'. Participants (n=40 per group) were healthy adult caffeine consumers (mean intake 287mg/d) required to abstain from consuming caffeine overnight prior to morning testing. Following baseline, post-drink assessments commenced at 2, 40, 100, 190, 280, 370 and 460 minutes.

Results: Significantly faster CRT was observed following all doses of caffeine compared to placebo. A trend towards a treatment x session interaction indicated beneficial effects of 40mg on CRT were still evident at 460 minutes post-drink, whilst effects of 80 and 120mg dissipated at 280 minutes. Increased 'alertness' and/or decreased 'sleepiness' was evident up until 190 minutes post-drink following 80 and 120mg but decreased 'alertness' and increased 'sleepiness' was observed later in the day. Conversely, 40mg decreased 'sleepiness' from 280-460 minutes, with no effects on 'alertness'. Interestingly, effects on CRT and mood were observed during the 2 minutes post-drink session.

Conclusions: These findings demonstrate that 40mg caffeine can modulate CRT and subjective ratings of alertness and sleepiness. Effects on CRT were observed over a time period spanning from 2 minutes to 8 hours post-drink. These findings are important due to an increasing desire to limit caffeine intake. They indicate that 40mg caffeine can improve reaction time without any initial subjective 'arousing' effect, which may be preferable to some consumers. Further research should explore individual differences in responses to caffeine, to ascertain factors which may impact upon its dose and time-course effects.

Keywords: Cognition, Alertness, Caffeine, Low-dose, Time-course.

PROTECTIVE EFFECTS OF HYDROLYZED NUCLEOPROTEINS FROM SALMON MILT AGAINST ETHANOL-INDUCED LIVER INJURY IN RATS

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Background and objectives: Oral administration of nucleic acids from salmon milt have physiological functions in the cellular metabolism, proliferation, differentiation and apoptosis of human small intestinal epithelial cells. In this study, we examined the effects of DNA-rich nucleic acids prepared from salmon milt (DNSM) on the development of liver fibrosis in an in vivo ethanol-carbon tetrachloride (CCl4) cirrhosis model.

Methods: DNSM was water-solubilized using nuclease and protease. Male Wistar rats were divided into four groups. Group 1 was the control; Group 2 was treated with ethanol and CCl4; Group 3 was treated with CCl4 alone; Group 4 was treated with ethanol, CCl4 and 0.12% DNSM. CCl4 (0.1 ml/kg of body weight diluted with olive oil to 25%) was administered by intraperitoneal injection twice a week, and 5% ethanol was administered in the drinking water ad libitum. The rats were euthanized after three weeks.

Results: Plasma aspartate transaminase and alanine transaminase were significantly less active in the DNSM-treated group than in the ethanol plus CCl4-treated group. Collagen accumulation in the liver and hepatic necrosis were observed histologically in ethanol plus CCl4-treated rats; however, DNSM-treatment fully protected rats against ethanol plus CCl4-induced liver fibrosis and necrosis. Furthermore, we examined whether DNSM had a preventive effect against alcohol-induced liver injury by regulating the cytochrome p450 2E1 (CYP2E1)-mediated oxidative stress pathway in an in vivo model. In this model, CYP2E1 activity in ethanol plus CCl4-treated rats increased significantly, but DNSM-treatment suppressed the enzyme's activity and reduced intracellular thiobarbituric acid reactive substances levels. Furthermore, the hepatocytes treated with 100 mM ethanol induced increase in cell death and were not restored to the control levels when treated with DNSM, suggesting that digestive products of DNSM are effective for the prevention of alcohol-induced liver injury. Deoxyadenosine was suppressed the ethanol-induced increase in cell death and increased the activity of alcohol dehydrogenase.

Conclusions: These results suggest that DNSM treatment represents a novel tool for the prevention of alcohol-induced liver injury.

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EFFECTS OF 6 MONTH RESVERATROL SUPPLE-MENTATION ON VERBAL MEMORY PERFOR-MANCE IN HEALTHY ELDERLY ADULTS - A RAN-DOMIZED CONTROLLED TRIAL

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Background and objectives: Resveratrol (RSV) is assumed to have beneficial effects on cognitive performance and brain-structure in humans (Huhn et al.2015). RSV, a polyphenol, occurs naturally in blueberries, peanuts, red grapes and red wine (Smoliga et al.2011). Animal models suggest that RSV is antioxidative, anti-inflammatory and mimics caloric-restriction (Athar et al.2007;Dal-Pan et al.2011). These effects might contribute to the mechanisms underlying the benefits of RSV on the metabolism, cardiovascular system and nerve-tissue found in human studies (Huhn et al.2015).

More recently, research focused on the impact of RSV on cognition. In that line, this study's aim was to evaluate the effect of 26 weeks RSV supplementation on measures of the California Verbal Learning Task(CVLT).

Methods: Subjects: 60 healthy elderly subjects (age60-78, mean68.19±5.16SD, anthropometry: table1, Drop-outs=7, randomized to RSV (N=27; 200mg/day) or placebo-supplementation (N=26) for 26 weeks.

Exclusion: stroke, major brain-pathologies, central-nervous-medication.

Measures: Blood-parameters, anthropometry, neuropsychological-test-battery including California-Verbal-Learning-Task.

Statistical Analysis: repeated-measures ANOVA was performed in SPSS (IBM,Version24).

Within-Subject-Factor: time

Within-Subject-Variables: CVLT-measures(Learning-sum, forgetting-rate, delayed-recall, recognition).

Between-Subject-Factors: RSV/placebo.

Covariates: age, sex, education.

Results: The preliminary results of the repeated-measures ANOVA did not reveal any significant time by intervention-group interaction on measures of the CVLT (all p>0.14). Compliance according to pill-counts and pill-diaries was high. Continuing analyses incorporate blood-parameters and additional cognitive measures.

Conclusions: The preliminary results of our study did not indicate significant effects of 26 weeks RSV supplementation on performance in the CVLT in healthy elderly subjects. This might partly be explained by a healthy sample that performed well already at baseline and a small scope to improve cognitive performance. Additionally, duration and/or dosage of RSV might have been insufficient to induce changes.

These results are in line with previous studies that did not find effects of RSV on cognitive measures (Köbe et al.2017;Wightman et al.2015). However, Witte et al.(2014) found, besides a moderate effect on cognition, significant changes in functional connectivity of the hippocampus, which is involved in memory processes. With subsequent analysis of additional cognitive measures, blood-parameters and sensitive high-resolution magnetic-resonance-images, we aim to further characterize the effect of RSV on cognition and brain structure. This will help to clarify the potential of RSV to improve or maintain cognitive functions in healthy elderly adults.

Keywords: Resveratrol, Cognition, Memory, Longitudinal, Elderly.

144/1664

THE ANTIOXIDANT PROPERTIES AND FATTY AC-IDS PROFILE IN ORGANIC SAMPLES OF LEEKS (ALLIUM AMPELOPRASUM VAR. PORRUM) AND GARLIC (ALLIUM SATIVUM L.) IN NATURA

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Background and objectives: The primary goal of organic agriculture is to produce foods safer than conventional agricultural foods that are produced using synthetic fertilizers and pesticides forbidden in organic systems. Studies have shown that growing conditions may influence the nutritional composition of different types of vegetables. Leeks and Garlic are source of various biologically active phytomolecules, including organosulfur compounds and polyphenols. They have been playing an important role in the human diet and in medicine for centuries. The aim of this study was to determine the antioxidant activity, proximate composition and fatty acids content of organics leeks (Allium ampeloprasum var. porrum) and garlic (Allium sativum L.).

Methods: The organics leeks (L) were analyzed with different solvents, methanol (70:30,v.v) (LM) and water (LW), garlic also (G), methanol extract (GM) and water (GW). The samples were characterized for total phenolic compounds and antioxidant activity using three different methods: DPPH, β-carotene/linoleic acid system and the test of oxygen radicals absorbance capacity (ORAC).

Results: Methanol:water (70:30,v.v) extract produced the best results the samples of organics leek for total phenolic compounds(1.23 ± 0.4 mg/EAG g). The water extract of garlic in natura (3.04 ± 0.7 mg/EAG g) indicates the best results of samples in the same analysis. As predominant palmitic, linoleic and linolenic acids present in leeks samples and in garlic in natura were palmitic and linoleic acid. The inhibition of β-carotene/linoleic acid peroxidation (%IOL) is better in LM and with different solvents presents similar results between them GM and GW (57.15 ± 2.2% e 57.59 ±1.5 %). The ORAC value of LMA and LW (88.45 ± 8.6 ET μmol/g and 47.09 ± 1.2 ET μmol/g) reduce in compare the samples of GM e GW (112.52 ± 0.1 ET μmol/g e 65.68 ± 4.5 ET μmol/g).The LM, LW, GM and GW exhibited antioxidant activity by DPPH method.

Conclusions: These results suggested that organic leeks and garlic presented antioxidant activity and contained significantly levels of phenolics. The consumption of leeks and garlic in natura can be able to provide significant health protection in order to prevent chronic diseases.

Keywords: Antioxidant, Allium ampeloprasum, Allium sativum, Bioactive compounds, Fatty acids.

144/1694

EFFECTS OF DIETARY PHENOLIC COMPOUNDS FROM SOUTH AMERICAN PLANTS ON FATTY ACID-MEDIATED INTERLEUKIN-6 RELEASE FROM MAMMALIAN GLIAL CELLS

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Background and objectives: Phenolic compounds are secondary metabolites of plants, which can exert beneficial effects on the central nervous system after food intake. Thus, our aim was to identify anti-inflammatory phenolic compounds from South American plants on mammalian glial cells, which play a central role in the neuro-immune regulation.

Methods: Phenolic compounds were extracted from Lantana grisebachii (LG), Aspidosperma quebracho-blanco (AQB), and Ilex paraguariensis (IP) teas and identified by HPLC-DAD-MS. Different extract concentrations (0-200 μg/mL) were tested in human T98-G and rat C6 cell lines of glioma. Cellular viability (by the resazurin assay), fatty acid profile (by gas chromatography) and pro-inflammatory interleukin-6 release (IL-6 by ELISA) were determined. Data were analysed by partial least square regression, to discriminate bioactive phenolic compounds as predictor variables and to correlate cellular responses.

Results: Twenty-one compounds, which were mainly iridoids, were determined in LG. Their geniposidic derivatives (3.3%) were significantly linked to lipid polyunsaturation, but not to IL-6 release. Thirty-one compounds were found in AQB, mostly hydroxybenzoic derivatives, of which only isorhamnetin-3-O-rutinoside (0.9%) was positively related to IL-6 release. Twenty-three compounds were identified in IP, including several caffeoylquinic derivatives. Chlorogenic (24.4%) and 1-caffeoylquinic (15.0%) acids modified glial lipids increasing ω-7 palmitoleic fatty acid, which was related to IL-6 decrease.

Conclusions: This work enhances phytochemical knowledge of three widely distributed plants, which have not been thoroughly studied as sources of bioactive phenols. Our results suggest that the 1-caffeoylquinic and chlorogenic acids provided by I. paraguariensis tea can exert anti-inflammatory effects, which would be significant for human nutrition and health given its high intake by South American populations.

Keywords: Chlorogenic acid. 1-caffeoylquinic acid. Iridoid. Isorhamnetin. Neuroinflammation. Ilex paraguariensis.

Conflict of Interest Disclosure: We confirm that there are no known conflicts of interest associated with this presentation and there has been no significant financial support for this work that could have influenced its outcome.

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QUANTIFICATION OF BIOACTIVE COMPOUNDS IN CUPUAÇU ALMONDS (THEOBROMA GRANDIFLORUM)

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Background and objectives: The fruit of cupuaçu is used in Brazilian cuisine to prepare juices, ice creams, liquors, creams,

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puddings, cakes, sweets and sweets, due to the aroma and the accentuated acidity, much appreciated by consumers. Through the feeding we obtain macro and micronutrients and also bioactive compounds, health promoters, as the antioxidant, anti-inflammatory and hypocholesterolemic action of some of these compounds. The antioxidant activity may be related to the presence of vitamins and phenolic compounds. The objectives of this work were to characterize cupuaçu almonds in relation to pH and total acidity and to quantify bioactive compounds, such as vitamin C determination, phenolic compounds and antioxidant activity for the preparation of food products.

Methods: The cupuaçu almonds were separated from the fruit pulp and dried in an oven with air circulation at 60°C for 48 hours. The pH values were determined by digital potentiometer, titratable total acidity, vitamin C by the titration method according to the Adolfo Lutz Institute's analytical standards (2005), phenolic compounds by the Follin Ciocauteau method (Bucic-Kojic et al., 2007) Of the curve performed with gallic acid (200, 400, 600, 1000 and 1400 mg/L), and antioxidant activities by the capture of free radical DPPH (2,2-Diphenyl-1-picryl-hydrazyl) (Mensor et al., 2001).

Results: The pH value of the dehydrated almond was 4.44. The total acidity resulted in 0.029 g/100g. The vitamin C content was 272.73 mg/100g. The content of phenolic compounds obtained was 364.50 mg equivalent of gallic acid/100 g, 60% higher than that reported in the literature for fresh almonds (Pugliese, 2010), difference due to the process of dehydration concentrate the nutrients. The antioxidant activity resulted in 95.86%. The results show that the cupuaçu almond presents high content of vitamin C, phenolic compounds with significant antioxidant activity.

Conclusions: From the cupuaçu almond can be elaborated several food products with high nutrient content with a health action of vitamin C and phenolic componds, such as antioxidant activity.

Keywords: Theobroma grandiflorum, Almonds, Vitamin C, Phenolic compounds, Antioxidant activity.

blood glucose levels by increasing muscle glucose uptake in an insulin-independent manner. Insulin stimulates glucose uptake in muscle via translocation of glucose transporter 4 (GLUT4) vesicles to the plasma membrane. GLUT4 translocation involves the PI3K/Akt pathway. There are a few reports that show that isoleucine promotes GLUT4 translocation, but the details of the mechanism by which isoleucine increases glucose uptake in skeletal muscle are not yet fully understood. The purpose of this study was to clarify the mechanism of glucose uptake into skeletal muscle by isoleucine.

Methods: Male Wistar rats were food deprived for 18 h and then administered 1.35 g L-isoleucine/kg body weight (prepared as 54.0 g/L of the L-amino acid in distilled water) by oral gavage. GLUT4 translocation in skeletal muscle (gastrocnemius, soleus and EDL) was detected by immunofluorescent staining. We also evaluated the phosphorylation status of Akt and AMPK involved in glucose uptake evoked by insulin using C2C12 myotubes treated with isoleucine. Prior to the experiments, differentiated C2C12 myotubes were starved for 3 h in a Krebs–Henseleit–Hepes buffer and then treated with 1–10mM isoleucine for 30 min.

Results: The administration of isoleucine stimulated translocation of GLUT4 vesicles to the plasma membrane in all examined skeletal muscles. At the site of the plasma membrane, GLUT4 was more abundantly expressed in EDL of isoleucine administered rats as compared to other muscles. The phosphorylation of Akt was increased by isoleucine in C2C12 myotubes. On the other hand, there was no change in phosphorylation of AMPK.

Conclusions: EDL (fast twitch muscle) is more sensitive to the effect of isoleucine as compared to other muscles. Isoleucine seems to stimulate translocation of GLUT4 in skeletal muscle through a mechanism distinct from that of insulin.

Keywords: Isoleucine, Skeletal muscle, Glucose uptake, GLUT4, PI3K.

144/1715

ANALYSIS OF THE MECHANISM OF ISOLEUCINE INDUCED GLUCOSE UPTAKE INTO SKELETAL MUSCLE

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Background and objectives: Branched-chain amino acids (leucine, isoleucine, and valine) are essential amino acids and necessary for proper muscle function. Isoleucine is known to lower

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A POLYPHENOL-RICH CALAFATE EXTRACT REVERTS INSULIN RESISTANCE IN MICE FED WITH CAFETERIA DIET

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Background and objectives: Insulin resistance is a worldwide high prevalent disease accompanied usually by a chronic

low-degree inflammatory state. Calafate is a Chilean native berry with a high polyphenol content. Polyphenols have been shown to possess anti-inflammatory properties. We aim to determine the effect of a Calafate extract on the development of insulin resistance in mice fed on cafeteria diet.

Methods: By using of an Amberlite XAD7HP column a purified and polyphenol-rich calafate extract was prepared. Total polyphenols, total anthocyanins and antioxidant activity were determined. Male C57BL/6 mice were fed on cafeteria or standard diet for 14 weeks. From week 10th, mice received the calafate extract in water (daily doses of 50mg [total polyphenols] /Kg). Body weight, food and water intake were registered. IPGTT were performed at 9 and 13 weeks and p-AKT was evaluated to determine insulin signaling pathway activity. Also, insulin concentration in serum samples was measured.

Results: The purified calafate extract presented a total polyphenol content, anthocyanin content and antioxidant capacity of 2242.3 mg GAE/100g DW, 66.1 mg C-3-G/100g DW and 38.43 mmol $Fe+2$/100g DW, respectively. No differences were observed in the insulin concentration between groups. The IPGTT performed at week 9th showed that mice fed on cafeteria diet developed insulin resistance. Interestingly, calafate extract improved the glucose tolerance at week 13th. Western blotting revealed that calafate extract increased p-AKT content, suggesting enhanced insulin signaling.

Conclusions: Our results show for the first time a beneficial effect of a calafate extract over insulin resistance in an in vivo model.

Keywords: Calafate. Polyphenols. Diabetes.

Further collaborators:

EFFECT OF THE CONSUMPTION OF HAMBURGERS PREPARED WITH ADDITION OF WINE GRAPE POMACE FLOUR, RICH IN FIBER AND ANTIOXIDANTS, ON OXIDATIVE DAMAGE MARKERS

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Background and objectives: Healthy eating is one of the pillars of a healthy lifestyle, leading to the prevention of chronic non-communicable diseases. Antioxidants and fiber are two bioactive components with proven beneficial health properties. Currently, in Chile and the world, fiber and antioxidants intake is less than that recommended by the WHO.

Our objective was to develop a functional food, enriching a high consumption meat-based food with wine grape pomace flour (WGPF), rich in fiber and antioxidants, and to study the effect of its consumption on oxidative damage markers in an intervention study.

Methods: A beef hamburger (100 g) was formulated with 7% of WGPF, containing 3.5% of fiber and 1.2 mg EAG/g of polyphenols (WGPF-hamburger). WGPF is a byproduct of vinification (Cabernet sauvignon). A 3-month controlled intervention study was completed in 27 male volunteers with at least one component of the metabolic syndrome. Volunteers daily consumed one WGPF-hamburger during the first month, interrupted by a month washout period, and followed by a control month period where they daily consumed a hamburger without WGPF (control-hamburger). At the beginning and at the end of each intervention period we evaluated oxidative damage markers: Advanced Oxidation Protein Products (AOPP), carbonyls in proteins, oxidized LDL y malondialdehyde (MDA).

Results: Intake of WGPF-hamburger significantly decreased AOPP (p=0.005) and oxidized LDL (p=0.048) compared with control-hamburger consumption. No significant effect was observed in carbonyl groups in proteins and MDA levels between WGPF-hamburger and control-hamburger periods.

Conclusions: The consumption of a beef hamburger elaborated with 7% WGPF protected from oxidative damage when comparing to control-hamburger, showing its potential to prevent chronic diseases, and its functional properties. Supported by FONDEF (grant #IT14I10011) and Agrosuper.

Keywords: Oxidative damage, Fiber, Functional food.

144/1900

ANTI-OBESITY EFFECTS OF KAEMPFEROL BY INHIBITING EARLY ADIPOGENESIS IN 3T3-L1 CELLS

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Background and objectives: Obesity is a chronic metabolic disorder defined as an abnormal or excessive fat accumulation with a health risk. Several scientific investigations are focused on search and identify different bioactive compounds that may be used as a treatment for obesity. Kaempferol is a natural flavonoid, found in fruits, vegetables and teas. Recent studies have suggested that it has anti-oxidant, anti-inflammatory and anti-obesity effects. In this context, the present study aimed to assess the anti-obesity properties of kaempferol on the anti-adipogenic and lipolytic effects and the expression of genes involved in the metabolic pathways.

Methods: 3T3-L1 cells were cultured in DMEM supplemented with 10% FBS and 1% antibiotics (initiation medium). At 24 hours, the differentiation was induced (day 0) with DMEM + 1 μL/mL dexamethasone, IBMX and insulin (differentiation medium (DM)), and 2 days after, the medium was replaced for fresh medium containing DMEM + 1 μL/mL insulin (post-DM). This medium was switched every 2 days. Preadipocytes (day 0) and mature adipocytes (day 12) were treated with 60 μM of kaempferol until the finishing of the treatment (day 21). At this point, cells were stained with Oil Red O to measure the lipid accumulation. Furthermore, the expression of genes involved in the adipogenesis, lipolysis and inflammation processes was evaluated with RT-qPCR.

Results: Kaempferol has a potential effect on adipogenesis by reducing 62% of lipid accumulation in relation to the positive control (p < 0.001). Moreover, the intracellular lipid content were diminished (39%) after treatment with kaempferol in mature adipocytes (p = 0.256). Regarding the molecular mechanisms, the treatment with kaempferol downregulated the mRNA expression of C/EBPα (p < 0.05) in comparison with the control cells. On the other hand, the expression levels of PNPLA2 (p < 0.01) and LIPE (p < 0.05), which are associated with hydrolysis of tri- and diglycerides, significantly increased in the presence of kaempferol.

Conclusions: These data indicate that kaempferol has anti-adipogenic effects in 3T3-L1 cells by suppressing the mRNA expression of C/EBPα and stimulating the expression of genes involved in lipid metabolism.

Keywords: Kaempferol, Obesity, Adipogenesis, Lipolysis, Nutrigenomic.

Further collaborators:
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144/1905

EFFECT OF THE LYOPHILIZATION PROCESS ON THE CONTENT OF BIOACTIVE COMPOUNDS FROM FRUIT PULPS OF BRAZILIAN PANTANAL

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Background and objectives: The Pantanal is a biome situated in the state of Mato Grosso and Mato Grosso do Sul, Brazil. The vegetation of the Pantanal presents diverse diversity due to the influences provinces located to its surroundings, like Forest Amazon, Cerrado and others. Fruits are plentiful, but recently they are in focus by the research community. Thus, cupuaçu (Theobroma grandiflorum), noni (Morinda citrifolia) and cajá-manga (Spondias dulcis) can be classified as food with potential use in nutrition, providing several nutrients and bioactive compounds that can Assist in the prevention of degenerative diseases. The drying process by freeze drying helps to increase shelf life. The objective of this work was to evaluate and compare the levels of organic acids present and bioactive compounds, antioxidant capacity of fruit pulps of cupuaçu, noni and cajá-manga.

Methods: The pulps of the fruits of cupuaçu, noni and cajá-manga were analyzed. The pulps were lyophilization the pulps were frozen, at -40 ° C for 24 hours in ultrafreezer, and left under lyophilization for 48 hours in the absence of light. The values of pH, total acidity, determination of phenolic compounds by the Follin-Ciocauteau method, total flavonoids and antioxidant activities were determined by the DPPH (2,2-Diphenyl-1-picryl-hydrazyl) free radical.

Results: For cupuaçu pulp the results were: pH of 3.26; Acidity of 0.182 g / 100g; Content of phenolic compounds obtained was 130.80 mg equivalent of gallic acid / 100 g; Flavonoid content was 14.06 mg / 100g, with antioxidant activity 96.50%. Noni: pH 3.95; Acidity of 0.119 g / 100g; Phenolic compounds was 43.30

mg equivalent of gallic acid/100 g; 9.38 mg / 100g of flavonoids; 97.14% antioxidant activity. For cajá-manga: pH of 3.44; Total acidity 0.068 g / 100g; Content of phenolic compounds obtained was 160 mg equivalent of gallic acid / 100 g; Flavonoids content was 2.35 mg / 100 g, with antioxidant activity 95.23%. For cajá-manga pulp presents a higher content of phenolic compounds, but the cupuaçu pulp had a higher content of flavonoids.

Conclusions: Fruit pulps were shown to have high levels of phenolic compounds, such as flavonoids and high potential for antioxidant activity.

Keywords: Cupuaçu, Noni, Cajá-manga, Lyophilization, Antioxidant.

144/1922

EXPLORING THE FUNCTIONAL PROPERTIES OF ELEPHANT FOOT YAM (AMORPHOPHALLUS PAEONIIFOLIOUS) TO AMELIORATE PERIMENO-PAUSAL SYMPTOMS

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Background and objectives: Background: Phytoestrogens are natural compounds present in the food, with structural similarity to human estrogen. These compounds have been considered to compete effectively with endogenous estrogens which bind to the ER and stimulate estrogen like effects. They help in ameliorating the perimenopausal and menopausal symptoms in women. Elephant foot yam contains phytoestrogens – isoflavones, coumestans and lignans. A limited research has look at these functional properties of elephant foot yam.   It has both nutritional and medicinal value.

Objective: To evaluate and promote the functional properties of Elephant Foot Yam (Amorphophallus paeoniifolious) to ameliorate perimenopausal systems and improve the quality of life in middle age women.

Methods: Women (n=100; 50 for experimental group and 50 for control group) between age group of 35-60 years who fulfilled the inclusion and exclusion criteria and given their consent were enrolled. The experimental group (EG) was supplemented with fine powder of yam and control group (CG) was provided nutrition health education for 45 days. Anthropometric measurements and menopause related symptoms score (MRS - using a standard questionnaire from the Professor Heinemann from Center of Epidemiology and Health Studies, Berlin, Germany) of study subjects were obtained before and after supplementation.

Results: Mean±SD for weight in EG and CG were 62±7.4and 63.2±7.4 respectively before intervention; which were reduced significantly to 60.6±6.9 (p<0.001) in EG and non-significantly to 63.1±7.5 (p=0.6) in CG. Similarly for BMI, EG showed a sig-

nificant reduction from 25.9±3.4 to 25.3±3.2 (p<0.001) and no specific change was observed for BMI in control group. Waist circumference was significantly reduced in EG – from 89.67±4.7 to 88.65±5 (p<0.01).

Mean±SD of MRS in EG was 11.9±2.5, which reduced to 6.3±3 after supplementation (p<0.001). A reduction in mean±SD of MRS was also observed in CG group where 11.2±1.52 was reduced to 9.0±1.7. Mean value showed a marked reduction for all three dimensions in both groups as well.

Conclusions: The study supports acceptability and effectiveness of elephant foot yam to improve quality of life in women. Detailed studies on underutilized crops, such as yams, and their health benefits are needed if food security and nutrition security are to be assured.

Keywords: Elephant Foot Yam, Menopause Rating Scale (MRS), Phytoestrogen.

144/1928

HYDROLYSED PEA PROTEINS MITIGATE IN VITRO WHEAT STARCH DIGESTIBILITY

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Background and objectives: Isolated pea proteins and their hydrolysates show potential to reduce blood glucose levels. An in vitro amylase digestibility study of cooked wheat starch in the presence of pea protein isolate in their native, heat-denatured and protease-hydrolysed counterparts was conducted in our lab. The results revealed that protein denaturation and protein hydrolysis enhanced starch-protein interaction that may have reduced the rapidly digestible starch content. Nevertheless, prior to a clinical trial, a more realistic in vitro digestibility technique that simulates the human gastrointestinal tract was needed to better understand this effect.

Objectives: Determine amylolysis of cooked wheat starch in the presence of native and hydrolysed pea protein by measuring the glucose release, in an in vitro static digestion model.

Determine starch amylolysis of extruded snacks prepared with blends of wheat flour and native or protease hydrolysed proteins at 12%, by measuring glucose release in an in vitro gastrointestinal dynamic model.

Methods: In vitro static digestion: Cooked wheat starch (control) and blends with native or hydrolysed pea protein, were mixed with simulated salivary fluid at pH6.9 and incubated (37°C-5min-170rpm). Samples were mixed with simulated gastric fluid pH2 for 2h in the presence of pepsin. Then, simulated intestinal fluid pH7 was added in the presence of bile salts and pancreatin. Samples were collected for glucose determination every 20min for 2h.

In vitro dynamic digestion: Extruded samples of wheat flour+native/hydrolysed pea proteins were mixed with human saliva and poured in a fundus resembling the stomach. Acid and pepsin were added gradually. Samples were collected every 7min and mixed in a vessel containing intestinal fluid. After the addition of the last sample from the fundus to the static intestinal digestion, samples were collected every 20min for 2h for glucose release determination.

Results: Native and protease-hydrolysed proteins when cooked with starch showed significant reduction in glucose release compared to the control at 40, 60 and 120min.

The addition of hydrolysed-protein to a extruded wheat snack reduced significantly the glucose release at 5, 20, 40 and 90min.

Conclusions: The study suggests a possible novel natural protein ingredient to formulate low glycemic food products.

Keywords: Pea proteins, Protein-hydrolysis, Starch, In vitro digestibility.

144/1943

AMARANTH PROTEIN ACTS AS A PROTECTIVE FACTOR IN LIVER OF HAMSTERS FED WITH HIGH CONCENTRATIONS OF SATURATED FATTY ACIDS AND CHOLESTEROL

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Background and objectives: Incidence of cardiovascular disease (CVD) in Western countries is elevated and related to high cholesterol levels, and is evident the role of diet in the control of cholesterol and dyslipidemia. Although studies suggest amaranth protein has a hypocholesterolemic effect, the biological pathways by which the protein acts are still not fully known. Thus the objective of this study was to evaluate the effect of ingestion of amaranth protein over lipid profile in liver of hamsters fed with high concentrations of saturated fatty acids (SAFA) and cholesterol.

Methods: Amaranth protein was isolated according to the isoelectric precipitation method, obtaining 89% of purity. The assay was performed with twenty-four hamsters divided into three groups with diets distinguished by protein source and fat profile. Experimental group (I) were fed a diet with 23% amaranth protein, high in SAFA and with 0.1% cholesterol. The control groups received a diet with 23% casein and fat profile according to AIN-93 (N), or 23% casein, high in SAFA and with 0.1% cholesterol (H). The total lipid content of livers was measured by gravimetric method, cholesterol concentration was analyzed by HPLC-DAD and fatty acids profile was performed by GC.

Results: Group I presented lower total lipid concentration (24%) compared to group H and did not differ from N group. The same occurred to cholesterol concentration in liver (65% lower than H group and similar to N group). Fatty acids profile for I group presented about 53% SAFA, H group presented 52% and N group presented 41%. Monounsaturated fatty acids (MUFA) was 16% for I group, 24% for H group and 9% for N group, furthermore polyunsaturated fatty acids (PUFA) was 32% for I group, 24% for H group and 50% for N group.

Conclusions: The use of amaranth protein demonstrated positive changes in liver lipid profile even including high-saturated fat acids in diet. Possibly amaranth peptides are absorbed and achieve liver cells, and/or amaranth protein act in intestine by signaling pathways. Therefore, stimuli on the consumption of amaranth represent an alternative to diversify the diet and promote a reduction of the risk of CVD.

Keywords: Amaranth protein, Lipids metabolism, Hypocholesterolemic effect.

144/1949

EFFECT OF ANTIOXIDANT DIETARY FIBER FROM SPENT COFFEE (COFFEA ARABICA L.) GROUNDS ON GASTROINTESTINAL HEALTH OF ADULTS

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Background and objectives: Spent coffee grounds (SCG), the residue obtained after brewing, is rich in dietary fiber, compound that imparts several health benefits such as prevention or reduction of bowel disorders, and decrease risk of coronary heart disease and type 2 diabetes. Previously a novelty antioxidant dietary fiber rich extract was obtainedfrom SCG (ADFSCG). Moreover, with higher dietary fiber intake stool weight tends to be higher and transit time enhances which may contribute to the prevention of large bowel disorders such as constipation, diverticulitis and large bowel cancers. Thus, the objective of this study was to evalu-

ate the effect of ADFSCG (5g/day) consumption (21 days), as part of a cookie, on gastrointestinal health (43 adults) in a randomized and parallel to a control group (cookie without fiber) trial.

Methods: The intestinal habits and stool consistency were determined by Bristol scale, and the severity and frequency of 18 gastrointestinal symptoms were also evaluated (FDA). The enzymatic activity of β-glucosidase, β-glucuronidase, tryptophanase and urease as well as the antioxidant capacity (DPPH) were determined in faeces.

Results: None of the cookies significantly modified the anthropometric parameters. After ADFSCG cookies intake, total cholesterol increased significantly (within normal values). This group showed a decrease in the general discomfort, with significantly impact on inflammation. On the other hand, allthe18 gastrointestinal evaluated symptoms were improved afterADFSCG cookiesintake,showing a significantlydecreasein the frequency of diarrhea; while, a lower retrosternal burningwas reported after-control cookie intake. A decrease in β-glucosidase and β-glucuronidase was observed in the ADFSCGgroup, with no statistical difference in feaces antioxidant capacity (DPPH).

Conclusions: The ADFSCGcan serve as a source of dietary fiber by improving the bowel's well-being.Additional studies are needed to extend the knowledge of ADFSCG effects on gastrointestinal health.

Keywords: Spent coffee grounds, Antioxidant dietary fiber, Gastrointestinal health.

Further collaborators:
R. Campos-Vega PhD

ENDOSPERM OF TARA SEED (CAESALPINEA SPINOSA) AND AMERICAN AGAVE LEAVES POWDER REGULATE BODY WEIGHT GAIN AND INTESTINAL HEALTH IN HOLTZMAN RATS

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Background and objectives: There is scientific evidence about dietary fiber intake in prevention and treatment of non-transmissible diseases, which effects depend on type and fiber proportion. On this basis, the present study aimed to investigate the effect of different proportions of endosperm of tara seed (ETS), powder of the Agave americana leafs (AAL) and cellulose (pattern) on the physiological properties related to body weight gain and intestinal health.

Methods: Holtzman rats were feed with different proportions of ETS:AAL (6:0, 3:3, 0:6, 10:0, 5:5, 0:10 % respectively) and measure of feed intake, gain body weight, fat apparent digestibility, volume and fecal pH.

Results: Lower feed intake, decreased body weight gains, fecal mass and pH were showed in ETS (soluble fiber) diets in comparison to control diet. Indeed, higher values in fecal fat content and lower fat apparent digestibility were found to ETS. On the other hand, an increase in fecal volume and decrease in gut transit time were showed in animals feed with AAL (insoluble fiber).

Conclusions: These findings demonstrated that ETS reduce body weight gain due to hydration capacity and to the formation of viscous solutions of soluble fiber (75%) in the intestinal lumen that avoid contact between the digestive enzymes and nutrients. AAL powder with higher fiber insoluble content (80%) may play a role in the prevention and treatment of constipation due to its water retention capacity, low viscous solution formation and increase fecal volume.

Keywords: Dietary fiber. Soluble fiber. Insoluble fiber. Physiological properties.

Further collaborators:

GPETAFLR, A PEPTIDE ISOLATED FROM LUPINUS ANGUSTIFOLIUS L. PROTEIN HYDROLYSATE, EXERTS ANTI-INFLAMMATORY EFFECTS IN HUMAN PRIMARY MONOCYTES

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Background and objectives: Recent studies have shown that lupine protein hydrolysates (LPH) could be an important source of bioactive peptides, especially showing anti-inflammatory activity. The present study aimed to test whether peptide GPETAFLR released from the enzymatic hydrolysis of lupine protein may modulate the inflammatory response in human primary monocytes.

Methods: Freshly human monocytes were used to analyze the effects of GPETAFLR, after 24 hours of treatment at 50-100 μg/mL, on LPS-induced inflammatory response using FACS analysis, RT-qPCR, and ELISA procedures.

Results: We report that GPETAFLR from LPH possesses anti-inflammatory properties in human monocytes. GPETAFLR skewed the monocyte plasticity towards the anti-inflammatory non-classical CD14+CD16++ monocytes and reduced the inflammatory competence of LPS-treated human monocytes diminishing IL-1β, IL-6, and TNF-α production and gene expression. Results: **Conclusions:** Taken together, our results show that

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GPETAFLR has the potential to impair the activation of human primary monocytes and the derived inflammatory conditions, and suggest a new role for Lupinus angustifolius L. protein hydrolysate in the regulation of the pathogenesis of health disorders in which monocytes play a key role, including atherosclerosis and several chronic diseases.

Keywords: Lupine, Bioactive peptide, Protein hydrolysates, Monocyte, Inflammation.

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144/2070

THE ANTIOXIDANT DIETARY FIBER FROM SPENT COFFEE (COFFEA ARABICA L.) GROUNDS IMPROVE CIRCADIAN LOCOMOTOR ACTIVITY AND ANTHROPOMETRIC PARAMETERS IN ADULTS WITH NORMAL WEIGHT AND OVERWEIGHT

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Background and objectives: All organisms present processes in their physiological functions that occur in a periodic and predictable way called "biological rhythms", including circadian rhythms (CR). Disruption of these rhythms (chronodisruption) is associated with an increased risk to develop non-communicable diseases such cancer, overweight and obesity, specially in the evening chronotype, for which reason the establishment of appropriate circadian rhytms is a priority. Recently, foods have been proposed as a powerful modular of the CR, however there is no evidence of the effect of fiber consumption on chronodisruption parameters like locomotor activity. The aim of this study was to evaluate the effects of the consumption (21 days) of antioxidant dietary fiber (ADFSCG, 5g/day), extracted from spent coffee grounds (SCG), as part of a cookie (C-ADFSCG), on the circadian locomotor activity, plasma antioxidant capacity as well as biochemical parameters of adults with normal weight and overweight.

Methods: The study was randomized and parallel to a control group (cookie without fiber).

Results: Caloric intake decreased in subjects who consumed the C-ADFSCG, reflected on the decrease of waist circumference and body fat percentage, in relation to baseline values and to the control group (p <0.05). In addition, plasma antioxidant capacity increased significantly (p <0.05) after C-ADFSCG consumption. Normal weight subjects (36%, from both treatments) increased their sleep quality and physical activity. At the beginning of the study, morningness chronotypes in subjects with normal weight, and eveningness chronotype in subjects with overweight, were identified. Interestingly, a significant increase in morningness chronotypes was observed in the 62.5% of overweight subjects and 45.4% on the normal weight subjects (63% of this group population) after C-ADFSCF consumption.

Conclusions: This study informs, for the first time, the potential of antioxidant dietary fiber, particularly ADFSCG, to modulate circadian locomotor activity, plasma antioxidant capacity and body fat.

Keywords: Spent coffee grounds, Antioxidant dietary fiber, Circadian rhythms, Plasma antioxidant capacity.

Further collaborators:

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144/2093

NUTRITIONAL, BIOACTIVE, AND BOTANICAL CHARACTERIZATION OF BEE POLLEN HARVESTED IN THE COLORADO RIVER VALLEY, ARGENTINA

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Background and objectives: Honey bees (Apis mellifera L.) collects pollen from flowers as pollen loads to get proteins for sustaining the colony. Due to its protein content (macronutrient) bee pollen is consumed as a nutritional supplement. Additionally the presence of bioactive compounds like polyphenols (micronutrients) provides biological function reason why this bee product is considered a natural functional food. Bee pollen composition depends strongly on the botanical and geographical origin (even though post-harvested processing). The aim of this study is to characterize bee pollen collected in the Buenos Aires Valley of Colorado River (BAVCR) zone.

Methods: During the beekeeping season 2013-2014, twelve samples were harvested to quantify total proteins and total polyphenols and to evaluate the botanical origin. Total protein content was estimated by Kjeldahl method with a conversion factor of 6.25 as the Argentine Food Code indicates (Chapter X, art.

785) and the mean value obtained was 22% ± 2%. Total polyphenols was determinate by the reference method of Folin-Ciocalteu and the average content was 13.1 ± 3.3 mg gallic acid/g pollen.

Results: The values obtained are comparable to those reported in the literature. The botanical origin was established by acetolysis method (Erdtman-1960) and subsequently the pollen grains were identified and counted using light microscope. Main represented taxa in the samples were Brassicaceae, Lotus and Eucalyptus.

Conclusions: Both protein and polyphenols obtained values allow us to conclude that bee pollen collected in the BAVCR can be considered an excellent dietary supplement as well as a natural functional food. The vegetation availability of mentioned botanical taxa will enable beekeepers of this geographical area to obtain very good quality bee pollen.

Keywords: Functional food, Dietary supplement, Total protein, Polyphenols, Botanical origin.

144/2109

PROPOLIS ETHANOLIC EXTRACT AS NATURAL BEE POLLEN LOAD PRESERVATIVE

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Background and objectives: Bee-products are recognized worldwide as natural functional foods mainly owing to their polyphenols content. Additionally there are many scientific reports about the use of propolis ethanolic extracts (PEE) for food conservation. In Argentina bee pollen (BP) is used as a dietary supplement and quality parameters are regulated in the Argentine Alimentary Code (Chapter X, art. 785). The drying process prior to commercialization is critical to prevent microbiological development and therefore increase larger shelf life. However, the temperature of this step must be controlled to avoid the loss of the phenolic components. The aim of this work was to determine the antimicrobial activity of PEE application over BP loads.

Methods: The antimicrobial effect against bacteria and yeast/mould was tested separately using the percentage of contaminated pollen loads method. For this in vitro trial, 20 Petri plates (20 BP loads per plate) were divided in four treatments with five repetitions: one control with BP loads (T1); another control with BP loads soaked with 7.50 μL of ethanol (T2), and BP loads soaked with 5.00 μL (PEE5) and 7.50 μL (PEE7.5) of PEE respectively. The number of pollen loads with bacteria was studied at 35°C in Plate

Count agar + nistatina while the count of mould/yeast was done in Sabouraud dextrose agar at 26°C.

Results: Fifty percent of BP loads from both controls showed fungal growth after 48 hours of incubation while treatments with PEE developed growth after 168 hours (seven days). The same results were obtained when antibacterial activity was measured on BP loads from PEE treatments. The total of the BP loads from controls were contaminated by bacteria and fungus after 72 hs. In contrast, PEE5 and PEE7.5 never reached this percentage during the whole trial.

Conclusions: This study allowed us to conclude that PEE present antimicrobial activity against bacteria and mould/yeast from fresh BP loads. Thus, PEE becomes a new alternative that offers a preservation method for BP intended for human consumption. Further investigations may reveal extra nutritional power conferred by PEE.

Keywords: Functional food, Nutritional supplement, Microbiological food preservation.

144/2132

POLYPHENOLS CONSUMPTION AND EXPRESSION OF GENES RELATED TO ENDOPLASMIC RETICULUM STRESS IN VASCULAR ENDOTHELIUM

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Background and objectives: There is a relationship between Metabolic Syndrome (MetS), and expression of genes related to endoplasmic reticulum stress. This condition alter the homeostasis of the endoplasmic reticulum in a chronic manner, which affects normal cellular response. OBJECTIVE: to evaluate the expression of the XBP1, CALR, CANX, HSPA5 and GSTP1 genes after the consumption of a breakfast with virgin olive oil (VOO) rich in phenolic compounds (FC) in HUVEC cells as an in vitro model of vascular endothelium.

Methods: Two breakfasts were administered with VOO with high (398 ppm) and low (70 ppm) FC content to 20 patients with MetS in a double-blind, randomized and crossover design. The HUVEC were treated with serum obtained at 0,2 and 4 hours after the consumption of the breakfasts. Gene expression was performed with OpenArray (Applied Biosystem).

Results: In comparison to serum obtained in the fasting state, treatment of HUVEC with serum obtained after consumption of VOO low in FC, decreased expression of XBP1, HSPA5 and CANX genes (p= 0.03, p=0.02 and p=0.01 respectively) at 2 hours

post-breakfast intake and increased expression of CALR gene (p = 0.03) at 4 hours post-breakfast intake. The treatment of HUVEC with serum obtained after consumption of the VOO-prepared breakfast with high FC content, on the other hand, decreased the expression of XBP1, CALR and GSTP1 genes (p=0.02, p=0.01, and p=0.05 respectively) at 4 hours post-breakfast intake. The comparison between treatments showed a significantly lower expression of XBP1, CALR and GSTP1 genes (p <0.001, p<0.001 and p=0.03 respectively) after the intake of the breakfast prepared with VOO with high content of FC at 4 hours in the postprandial state.

Conclusions: VOO rich in FC intake, regulates the expression of genes related to endoplasmic reticulum stress in patients with MetS in the postprandial state, which contributes to a less activation of cellular stress signaling.

Keywords: Phenolic compounds, Metabolic syndrome, Vascular endothelium, Endoplasmic reticulum stress.

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APPLICATION OF PEAR ORANGE CITRUS FOOD FIBER (CITRUS SINENSIS OSBECK) IN THE PRODUCTION OF PRODUCTS FUNCTIONAL FOODS

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Background and objectives: Consumers often despise parts of fibers of the vegetables. The use of by-products of fruits adds value to new food products. OBJECTIVE: Develop cakes with flour of flavedo, albedo and pear orange pulp (FAP) and characterize them sensorially.

Methods: At the Laboratory of Food of Plant Origin of the Federal University of Rio de Janeiro the pear orange was submitted to the hygiene and extraction of the juice. The residue was dehydrated and crushed to obtain the citric flour. Four cakes were prepared, 3 of which were added with 1.5; 3.0 and 5% of citrus flour, respectively, and 1 cake without citrus flour. Common ingredients of cakes: vegetable oil, demerara sugar, egg, baking powder, wheat flour and orange juice. The cakes were submitted to an Acceptance Test by Order of Preference in a scale of preference, preferably in level 4, and the least in level 1. The statistical test was based on Friedman's Order Sum Test at 1% probability. The research was submitted to the Research Ethics Committee and its approval protocol is 954,908 with application to the Free and Informed Consent Form.

Results: 49 volunteers between 18 and 53 years old accomplish the Preference Ordination Test. There was no significant difference between the cakes of 0; 1.5; 3.0 and 5% of citrus flour at the 1% probability level, demonstrating that the tasters did not measure

the distinction between these samples. Among the 0% and 5% samples, there was a statistical difference at the 1% probability level. The cake with 5% of citrus flour was the less preferred, which can be explained by the higher percentage of citric fiber, which may interfere with the taste and texture of food products.

Conclusions: Citrus flour in cakes seems to be good for the use of pear orange by-products due to their good acceptance, who did not present significant differences in the sensory acceptance test and can be consumed by the general population.

Keywords: Dietary fiber, Citric fiber, Orange-pear, Soluble fiber, By-products.

Conflict of Interest Disclosure: The authors below declare that they participated in the conception, analysis of results and contributed effectively to the accomplishment of the Scientific Summary: " Application of pear orange citrus food fiber (Citris sinensis Osbeck) in the production of products functional foods". They make public the responsability for its content, that no links or financing agreements between authors and companies that may have interest in the publication of this Scientific Summary have been omitted. They affirm that they have no conflict of interest with the topic addressed in the article, nor with the products cited. We declare that the above Scientific Summary is original and that the work, in part or in full, or any other work with substantially similar content, has not been submitted to and will not be submitted to the other Scientific Congress as long as its publication is being considered. List of authors: Simone Silveira van Boekel Alexandre Marques van Boekel (CPF 69984930700). Lais Buriti de Barros (CPF 00489553702).Déborah Carolina Martins de Jesus (CPF 14685199723). Priscila Vieira Pontes (CPF 08307924731). Larissa Ribeiro Barreta Matheus (CPF 13532972760). Nicolly Ridolphy Basilio Rodrigues (CPF 135019958716).

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ANTIOXIDANT ACTIVITY AND SENSORY ANALYSIS OF FROZEN KALE PULP (BRASSICA OLERACEA L. VAR. ACEPHALA)

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Background and objectives: Kale (Brassica oleracea L. var. Acephala) is a vegetable whose consumption has increased due to researchs on its nutraceutical properties. This vegetable is rich on natural antioxidant compounds and have high levels of carotenoids, ascorbic acid, flavonoids, tocopherols, phenolic compounds

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and glycosinolates, substances that act as antioxidants and that protect the human body against reactive oxygen species. Most perishable foods can be preserved by refrigeration and freezing for a limited time, with the benefits of retarding microbial activities and retaining their nutrients. The objective of this research was to elaborate kale pulp and evaluate its antioxidant activity and sensory acceptability after different periods of freezing.

Methods: Samples (6 kg of organic kale leaves) were cleaned, sanitized and processed in order to obtain as final product the kale pulp. Samples were frozen (-18ºC) and analyses were performed after 5, 30, 60 and 75 days of storage under freezing. An affective (hedonic) sensory test was performed on each test day by untrained assessors. For the affective test the taste was investigated on a 5-point hedonic scale. Antioxidant capacity of the products were evaluated according to the method of Prieto et al. (1999). Antioxidant capacity of the pulps were expressed as relative antioxidant activity (RAA%) to ascorbic acid. Results were analyzed using analysis of variance (ANOVA), and mean values were compared using Tukey's test. Values of $p \leq 0.05$ were considered statistically significant. The data were analyzed using Statistica 8.0 (Statsoft Inc., Tulsa, OK, USA).

Results: Results indicated that freezing the kale pulp up to 30 days did not affect the product acceptability by assessors regarding the parameter analyzed (taste). No difference (p<0.05) was found on RAA% during the tested period, and values ranged from 9.37% (Day 5) to 8.87% (Day 75), showing a good retention of the original antioxidant activity at the end of storage time.

Conclusions: Freezing of kale pulp can be seen as a good alternative for preserving the vegetable quality for a period of 30 to 60 days, without significant losses in the antioxidant activity and sensory profile.

Keywords: Brassica oleracea L. var. acephala, Kale pulp, Hedonic scale, Antioxidant activity.

Conflict of Interest Disclosure: Brassica oleracea L. var. acephala, kale pulp, hedonic scale, antioxidant activity.

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ANALYSIS OF BIOACTIVE COMPOUNDS OF NONI SEEDS (MORINDA CITRIFOLIA L.)

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Background and objectives: The noni (Morinda citrifolia L.) is a plant that has a fruit that has aroused the interest of the researchers for its therapeutic and nutritional properties. Prepared as fruit pulp juice has great demand in alternative medicine for the treatment of diseases and there are many works that prove its pharmacological properties. However, there are few scientific studies on the seeds of the fruits (Barros, 2009). The most common bioactive compounds determined in all parts of plants are the phenolic substances, which are formed in the secondary metabolism of plants. These compounds can be found in free form or linked to sugars and proteins, having several functions (Liu, 2007). The objective of this work was to analyze the content of bioactive compounds, vitamin C, titratable acidity and antioxidant activity of noni seeds.

Methods: The noni seeds were separated from the fruit pulp and dried in an oven at 60 ° C for 12 hours. Vitamin C analysis by titration with 2,6-dichlorophenolindofenol sodium solution, determination of phenolic compounds by the Follin-Ciocauteau method, carotenoids, total flavonoids and antioxidant activities by free radical capture DPPH (2,2-Diphenyl-1 -pyryl-hydrazyl).

Results: The pH value of the dried seed was 4.97. The total acidity resulted in 0.006 g / 100g. The vitamin C content was 303.03 mg / 100g. The content of phenolic compounds obtained was 297.00 mg equivalent of gallic acid / 100 g. The flavonoid content was 25.04 mg / 100 g and carotenoids 15.16 mg / 100 g. The antioxidant activity resulted in 90.96%. With these results we can highlight the high content of vitamin C and great potential of antioxidant activity. According to Costa et al. (2013) noni is a representative fruit with significant amounts of vitamin C.

Conclusions: The noni seed presented low content of organic acids, content of phenolic compounds such as flavonoids and carotenoids, high content of vitamin C and with great potential of antioxidant action.

Keywords: Morinda citrifolia L., Seeds, Bioactive compounds, Antioxidant.

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EFFECT OF LACTOBACILLUS FERMENTUM CRL1446 ON IMMUNE-METABOLIC PARAMETERS AND INTESTINAL MICROBIOTA COMPOSITION IN OBESITY IN HIGH-FAT DIET FED MICE

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Background and objectives: Dietary strategies, including the use of probiotics as preventive agents that handle the intestinal microbiota and/or modulate the function of adipose tissue, would be suitable tools for the prevention or treatment of different condi-

tions associated with obesity. In this context, our aim was to evaluate the effect of Lactobacillus fermentum CRL1446 (CRL1446) on metabolic and immunological parameters and on the composition of intestinal microbiota in a model of obesity induced by a high-fat diet (HFD).

Methods: Balb/c mice were separated into the following groups: 1) SD: Standard diet, 2) HFD: High-fat diet, 3) HFD+CRL1446: mice receiving a HFD and a daily dose of 1 x 108 CFU of L. fermentum CRL1446 (CRL1446) in the drinking water. The dietary intervention was maintained for 6 weeks. Weight and food intake were monitored daily. It were determined at 20 and 45 days of experimental period: fat tissue weight (histologic studies), metabolic parameters (triglyceride (TG), total cholesterol (TC), glucose (Glu) and leptin (Lep)), seric immunologic parameters (TNF-alpha, IL-6, IL10 and MCP-1), macrophage and adipocyte functionality (ex vivo studies) and the gut microbiota composition (evaluated by high-throughput sequencing of 16S rRNA gene amplicons).

Results: CRL1446 strain induces a decrease in body and adipose tissue weights and the size of adipocytes. A decrease in plasmatic glucose, cholesterol, triglycerides, leptin, TNF-alpha and IL-6 levels and an increase of IL-10 were observed. Ex vivo studies showed a minor secretion of leptin by adipocytes. In macrophages, CRL1446 induced lower levels of MCP-1, TNF-alpha, IL-6 and higher levels of IL-10. Regarding intestinal microbiota, an increase in Lactobacillus and a decrease in Firmicutes/Bacteroidetes (F/B) index were observed.

Conclusions: The supplementation with L. fermentum CRL1446 produce changes in intestinal microbiota structure and metabolic and immunologic parameters. CRL1446 could potentially be a probiotic strain useful to correct the immuno-metabolic alterations associated with obesity through its adipomodulatory capacity.

Keywords: Obesity, Lactobacillus fermentum, Probiotics, Intestinal microbiota.

144/2162

INHIBITION OF ACTIVITY OF CARBOHY-DRATE-HYDROLYSING ENZYMES BY POLYPHE-NOLS OF JATOBÁ-DO-CERRADO (HYMENAEA STIGONOCARPA MART.)

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Background and objectives: Nutritional management of blood glucose levels is a strategy for the prevention and control of diabetes. Inhibitors of the carbohydrate-hydrolysing enzymes such as acarbose decrease post-prandial hyperglycaemia. However, this drug has certain adverse effects such as diarrhoea and nausea. Therefore, natural inhibitors from foods could be a good strategy to control glycaemic. The Brazilian Savannah has an extensive biodiversity, but it is underexplored. The jatobá-do- cerrado (Hymenaea stigonocarpa Mart.) is a native legume of Brazilian Savannah with great potential for exploration because it's an excellent source of dietary fiber and polyphenols. The objective of this study was to evaluate the potential inhibitory activity of jatobá extracts after digestion in vitro on α-amylase and α-glucosidase enzymes.

Methods: The phenolic extract was obtained by sequential extraction with 80% acetone and 60% ethanol. The digested extract was done using enzyme solutions (α-amilase, pepsin and pancreatin) at physiological pH. The total phenolic content (TPC) was evaluated by Folin reagent. Different concentrations of extracts were tested.

Results: The extract of jatobá after digestion in vitro presents 10 mg GAE.g-1 of sample. Our study have showed that the phenolic extracts greatly inhibited the α-amylase in a positive dose-dependence way (76 and 91% for 9 and 15 mg. mL-1, respectively). On the other hand, the extract showed a high α-glucosidase inhibitory activity (77 and 53%) but this activity is not positively related to concentration of extract (3 and 6 mg. mL-1, respectively).

Conclusions: The results of this present study indicate that polyphenols from jatobá are effective α- amylase and α- glucosidase inhibitors, which may modulate the postprandial glucose levels. Thus, the jatobá can be helpful in the management of type 2 diabetes.

Keywords: Jatobá-do-cerrado, Type 2 diabetes, α-amylase, α-glucosidase.

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EVALUATION OF THE ABILITY OF FERMENTED CACTUS PEAR JUICE TO IMPROVE OXIDATIVE STRESS TOLERANCE IN YEAST

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Background and objectives: Cactus pears from Opuntia ficus-indica are strongly recommended in the human diet since

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their nutritional and health-promoting features. Scientific evidence has demonstrated the benefits from cactus pear ingestion with special consideration about potentially active antioxidant phytochemicals. However, long-term storage represents the main drawback to the commercialization of this fruit. Since in many places cactus pears are consumed as juice, different procedures were developed to prevent its spoilage. Lactic acid fermentation of cactus pear juice (CPJ) using autochthonous bacteria constitutes an important biotechnology for the exploitation of this fruit. The aim of this study was to evaluate the effect of fermented CPJ (F-CPJ) on oxidative stress tolerance of Saccharomyces cerevisiae.

Methods: Lactobacillus plantarum S-811, an autochthonous lactic acid bacteria strain isolated from O. ficus-indica fruits from Northwest Argentina was used to fermented the juice. To evaluate the antioxidant response induced by CPJ and F-CPJ, cultures of S. cerevisiae were incubated with the juices (amounts equivalent to 50, 250 and 500 mg/L of phenolics) during 18 h at 28 °C. Cells were then exposed to sub-lethal oxidative stress, using 0.5 or 4 mM H_2O_2. After stress treatments, cells were cultured in YPD medium and incubated for 18 h at 28 °C. To evaluate the oxidant effect in each culture, growth-ratio curves (GRC) and effect curves (EC) were constructed as follows: RC = quotient between the growth curve (GC) of the culture exposed to oxidant and the GC of the non-exposed culture; EC = GRC for the culture pre-incubated with the juice was divided by the GRC for the culture pre-incubated without juice.

Results: Against a final concentration of 0.5 mM H_2O_2 there was not observed a significant protective effect by any of the evaluated juices. However, against 4 mM H_2O_2, CPJ and F-CPJ showed a significant protective effect, that was much higher with the F-CPJ (up to 15 times protection) than CPJ (up to 4 times protection).

Conclusions: These results suggest that F-CPJ with L. plantarum S-811 could be a suitable choice for the development of a CPJ with improved functional properties.

Keywords: Opuntia ficus-indica, Lactobacillus plantarum, Cactus pear juice.

144/2188

ELABORATION AND ACCEPTANCE OF CEREAL BAR WITH FLOUR OF FLAVEDO, ALBEDO AND ORANGE-PEAR PULP (CITRUS SINENSIS OSBECK): OPTIONS OF FOOD PRODUCTS SOURCES OF FOOD FIBER

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Background and objectives: Food fiber prevent chronic diseases and has therapeutic evidence. The parts of the orange pear with the highest concentrations of fiber are flavedo, albedo and pulp most despised. Avoiding waste is sustainability and it is necessary to encourage the full use of fruits, which benefits human beings and the environment. OBJECTIVE. The objective of the present work will be to elaborate cereal bars with flavedo flour, albedo and pulp of orange-pear (FAP) and to evaluate their acceptance through affective sensorial methods.

Methods: In the Laboratory of Food of UFRJ, the oranges were sanitized, and then the seeds and the juice were despised. The FAP residue was dehydrated and crushed to obtain the citrus flour. After, were preparation 2 cereal bars of which were added with 3.0 and 5% of citrus flour, respectively. The sensorial analysis of the elaborated bars, was through Acceptance and Preference Tests of 50 non-trained adults participated, after consent in the research that was approved by the Research Ethics Committee.

Results: For cereal bars at 3.0 and 5.0% with FAP flour, the note indicated by the non-trained adults in the appearance attributes (25%, respectively); Aroma (45 and 40%, respectively); Texture (20%, respectively); Sweet taste (30%, respectively) and orange flavour (30 and 35%, respectively) was 8.0 indicating a similarity of acceptance between the different attributes. It was stated that up from 30% of non-trained adults buy cereal bars. The t-test with p-value 5% indicated for all attributes, averages very close and p value above 0.05, demonstrating that there was no significant difference between acceptance of samples for all attributes.

Conclusions: The sensorial tests showed good acceptance and purchase intention for the two bars with 3 and 5% of FAP flour of orange-pear. In this way, cereal bars may be nutritionally suitable food product options, since they are made with the orange parts that concentrate the dietary fibers.

Keywords: Food fiber, Citric fiber, Orange residue, Flavedo, Albedo.

144/2195

CYTOPROTECTIVE ACTION AGAINST OXIDATIVE STRESS IN ASTROCYTES BY BACTRIS GUINEENSIS-L.H.E. MOORE (ARECACEAE) AND POUROUMA CECROPIIFOLIA ANTHOCYANIN EXTRACTS

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Background and objectives: Neurodegenerative diseases such Alzheimer, Parkinson and Huntington are characterized by protein aggregates, mitochondrial impairment, and oxidative stress that can lead to neuronal and astrocytic cell death. Epidemiological studies suggest that consumption of fruits rich in anthocyanins may reduce the risk or delay the development of some neurodegenerative diseases. Bactris guineensis (Corozo) and Pourouma cecropiifolia (Uva caimarona) are endemic plants from the Caribbean and Amazon regions whose fruits are consumed in juices and jellies. Previous studies have reported that these fruits are rich in antioxidants molecules like anthocyanins that may have therapeutical potential. In this study, we investigated whether fruit extracts from Bactris guineensis and Pourouma cecropiifolia suppress the toxic effects of hydrogen peroxide on astrocytes.

Methods: Anthocyanins rich extracts [ARE] from Bactris guineensis and Pourouma cecropiifolia fruits were isolated by high-speed countercurrent chromatography (HSCCC) and preparative HPLC, and their chemical structures were elucidated by using spectroscopic methods.

Once the extracts were obtained, astrocytes were cultured in 96 plate-wells and then treated with different doses of Bactris guineensis and Pourouma cecropiifolia extracts to evaluate their toxicity. Afterwards, to evaluate the protective effect of ARE, astrocytes were pre-treated with non-toxic doses of extracts for 24 hours and then were exposed to hydrogen peroxide for 1 hour. Protective effect was assessed by evaluating changes in cell survival, mitochondrial membrane potential and free radical production by resarzurin test and flow cytometry.

Results: Our result showed that Bactris guineensis and Pourouma cecropiifolia extracts were not toxic to any of the concentrations evaluated, exhibited a great protective activity, and rescued astrocytes from oxidative peroxide-induced stress by maintaining the mitochondrial membrane potential .

Conclusions: These findings suggest that anthocyanins extracts rich in delphinidin-3-O-β-glucopyranoside, cyanidin-3-O-β- glucopyranoside, and cyanidin-3-O-(600-malonyl) glucopyranoside from Bactris guineensis and Pourouma cecropii-

folia can regulate reactive oxygen species via enhancement of mitochondrial function, protecting astrocytes from cell death.

Keywords: Antioxidants, Neurodegenerative diseases, Astrocytes, Bactris guineensis , Pourouma cecropiifolia.

144/2207

ELABORATION OF AN ADDED DIETARY ICE CREAM WITH INULIN

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Background and objectives: Inulin is stored in many plant species. Research indicates that inulin would have positive effects on the treatment of diabetes. The objectives of this research were to elaborate a low calorie ice cream added with inulin, to determine its chemical composition, sensorial and acceptability, and to compare the variation of pre and post consumption levels of traditional and modified ice cream.

Methods: From an experimental study, an ice cream with 10% inulin and 40% of peach pulp, added with sucralose, was made. Its chemical composition was determined and its sensorial properties and acceptability were evaluated in 50 people between 40 and 60 years old of both sexes residing in Tucumán, through tasting and hedonic scale.

Results: The prepared ice cream has a caloric value of 49 Kcal / 204 KJ per serving, carbohydrate 3.8 g, protein 0.9 g, total fat 3.3 g, saturated fat 2.2 g, fiber 1 g, and sodium 24 mg. 82% (41) detected a strong, shiny orange hue. 18% (9) did not observe differences between the two ice creams. 90% (45) detected peach aroma and Chantilly cream. 90% (45) reported feeling sweet taste. 88% (44) said that the modified ice cream was creamier than the average. To 84% (42) he liked the modified ice cream. Of the remaining. Regarding the variation in blood glucose levels, people who consumed the common ice cream had 100% normal blood glucose levels (70-110), with a mean of 67.5 μ. While in the post-iced common ice creams 100% had values above 110 mg with a μ of 142.54. In all cases, the glycemia before the modified ice cream was normal (70-110) with a μ of 66.1 and the post-consumption blood glucose levels were 94% normal with a μ of 101.7 and 6% of Values above normal with a μ of 117.3.

Conclusions: According to previous scientific evidence, inulin has positive effects on chronic noncommunicable diseases, and according to the data provided by this research, it does not produce significant variations in post-consumption levels of glycemias, therefore, it is proposed to insert in the Market this ice cream to contribute to healthy eating strategies.

Keywords: Modified ice cream, Inulin, Low calories.
Further collaborators:
Dra. Ing. María Julia Barrionuevo

A SYSTEMATIC REVIEW EXAMINING THE RELATIONSHIP BETWEEN ANIMAL SOURCE FOOD INTAKE AND GROWTH IN CHILDREN 6 TO 60 MONTHS IN LOW- AND MIDDLE-INCOME COUNTRIES

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Background and objectives: Adequate nutrition is a critical factor in reducing the burden of growth faltering that affects millions of children in low- and middle-income countries (LMIC). This systematic review aimed to examine the association between animal source food (ASF) intake and length/height outcomes in LMIC children aged 6 to 60 months. Secondary outcomes were weight, head circumference (HC), hemoglobin (Hb) concentration, and anemia prevalence.

Methods: Databases searched were CINAHL, Embase, Global Index Medicus, PubMed, and Web of Science. Grey literature was searched in International Food Policy Research Institute publications, New York Academy of Medicine Grey Literature Report, OpenGrey, and Proquest Dissertations. Randomized controlled trials (RCT) and longitudinal and cross-sectional observational studies that quantified ASF consumption by frequency, quantity, or both in children 6 to 60 months in LMIC were included.

Results: There were 13,431 titles, 205 abstracts, and 89 full texts reviewed. Fourteen articles were included: 4 RCTs, 4 observational cohorts, and 6 cross-sectional. Three RCTs used a plant-based food (PBF) as the comparator, the results showed no differences in height (n=3) or Hb (n=1), mixed positive and null associations for weight (n=1), and higher HC for PBF (n=1). One RCT with a usual diet control resulted in higher Hb, lower anemia prevalence, and no difference in height or weight. In observational cohorts, ASF intake and height had a positive association (n=1), mixed positive/null (n=1), and negative (n=1). ASF and HC had a positive association (n=1), mixed positive/null (n=1), and no association (n=1); Hb and anemia were not examined. For cross-sectional studies, ASF and height had positive associations (n=1), mixed positive/null (n=3), and no association (n=2). ASF and weight had mixed positive/null associations (n=3); HC, Hb, and anemia were not examined. Positive or mixed positive/null associations were found in 6 of 13 (6/13) studies for height, 4/9 for weight, 1/2 for HC, and 1/2 for Hb; 1/2 studies had a negative association for ASF and anemia prevalence.

Conclusions: The variation in associations may be explained by the heterogeneous quantification of ASF intake. Our results suggest that increased access to ASF in LMIC may support reducing the burden of growth faltering in early childhood.

TOTAL ANTIOXIDANT CAPACITY AND ITS DIETARY SOURCES IN DIETS OF STUDENTS WITH DIFFERENT PHYSICAL ACTIVITY LEVEL

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Background and objectives: Introduction: Physical activity, determine dietary patterns. Information about dietary sources of antioxidants in daily diet of students is limited.

Objectives: The aim of this study was to compare antioxidant capacity of diets students with different physical activity level and their dietary sources of antioxidants.

Methods: Method/Design: The study involved 47 subjects aged 19-25 years. The quantitative FFQ questionnaire administered by reviewer was collected and analyzed. Dietary recalls regarding the consumption of dietary sources of antioxidants, socioeconomic data and physical activity were collected. The antioxidant density of daily diet (Q-ORAC; µmolTE/1000 kcal), the share of food groups in total ORAC was evaluated. Daily physical activity of studies group was evaluated according to subject's declaration.

Results: Total daily antioxidant density in studied group was 7 056 µmolTE/1000kcal. Sources of total antioxidant capacity in daily students diet come from fruits (52%), vegetables (22%) and spices (25%). Students who were less active consumed less dietary sources of antioxidants, presented lower levels of diet antioxidant capacity. Dietary sources of antioxidants were fruits (52%), vegetables (22%) and spices 25%).

Conclusions: We found correlation between dietary sources of antioxidants and physical activity level. Dietary sources of antioxidants should be included in epidemiologic studies and analysed in aspects of physical activity.

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EVALUATION OF PHYSICO-CHEMICAL CHARACTERISTICS AND ANTIOXIDANT ACTIVITY OF FLOUR JABOTICABA (MYRCIARIA CAULIFLORA) RESIDUE

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Background and objectives: The jaboticaba Myrciaria cauliflora (Mart.) is a native Brazilian fruit with high antioxidant potential, but still has a low commercialization and consumption, because of its high perishability and waste generation. The physico-chemical characterization and analysis of the antioxidant activity of the jaboticaba residue provide subsidies to the development of by-products with healthy and sustainable value, to allow greater accessibility to this fruit. The objective of the present study was to evaluate the physical-chemical characteristics and antioxidant activity of jabuticaba flour residue (Myrciaria cauliflora) to be an alternative in food preparation or enrichment.

Methods: The jabuticabas were purchased from the Center of Supply of the City of Rio de Janeiro (CADEG) in November 2014, respecting the seasonality of the fruit. The jaboticaba flour residue was obtained by drying the residue resulting from the jaboticaba juice formulation. The physical and chemical characterization was performed through pH, fixed mineral residue, lipid extraction, protein analysis, total sugars, fiber determination and total titratable acidity. In vitro antioxidant activity studies were carried out, the antioxidant compounds and phenolic compounds were extracted, the TEAC assay and the FRAP assay. Quantification of phenolic compounds was determined by the Folin-Ciocalteau spectrophotometric method.

Results: The flour jaboticaba residue showed a yield of 18%. The moisture (11.29%), ash (3.5%) Acidity (1.8%) and pH (3.5) in accordance with legal standards and the percentage of total sugar (62.43%) , lipids (0.6%), protein (12.13%) and fibers (9.35%) were adequate. The total antioxidant activity and phenolic of the flour jaboticaba residue showed: 1419.8 micromole Fe 2+ / g (FRAP) and 2505.53 micromole Trolox / g (ABTS) and 5410,3mg GAE / 100g.

Conclusions: These results are expressed over various other fruit flour documented in the literature. Therefore the flour jaboticaba residue is a viable way to provide this fruit in a sustainable manner, and to present itself as an alternative source of antioxidants to be used in the preparation of healthy products.

Keywords: Flour, Myrciaria cauliflora, Antioxidant , Phenolic acid.

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THE COMBINATION OF MEAL IMPROVEMENT AND PROTEIN-ENRICHED FOOD FOR INCREASING MUSCLE MASS OF THE ATHLETE

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Background and objectives: Most athletes aim to improve performance by increasing muscle mass without increasing body fat mass. In this study, in order to establish the ideal weight-increasing method, we examined a diet improvement method using protein-enriched foods and performed a 3-week intervention test.

Methods: The subjects were five male shot-put players and eight soccer players in the university students. The intervention period is 3 weeks, and the subjects daily took Lumilan 200 ml (Kewpie Co., Ltd.) containing 84 kcal of energy, 8 g of protein and 0 g of lipid, and took foods containing 2 g of protein per 1 kg body weight, which were based on the high protein food table. Measurements of body composition and meal survey were conducted for 1 week before and after the intervention, and changes in nutrient and amount of food intake were measured.

Results: In shot-put players the body composition did not change, but in soccer plyers the body fat mass significantly decreased. Regarding meal intake, the amounts of lipid and dairy products were significantly increased, and cereals intake was significantly decreased in shot-put players. Meanwhile in soccer plyers, the intake amounts of protein, vitamin C, beans, fish and shellfish, and milk were significantly increased. Compared among both athletes, the increments of muscle, fat and body weight were significantly higher in shot-put players than in soccer plyers. Furthermore, increase in intake of protein and lipid was significantly higher in shot-put players. Both players were unable to achieve intake of 2 g protein per 1 kg body weight, so it was thought to be difficult to voluntarily improve diet habit for college student athletes. In addition, it was suggested that 8 g of protein-enriched foods per day were insufficient to achieve increments in 3 weeks.

Conclusions: When comparing features of the competition, the shot-put players have to take higher amount of meal for increments than the soccer players, then shot-put players could not achieve necessary intake amount of protein because of the increase of lipid intake accompanied by increased meal intake.

Keywords: Soccer, Increment, Protein, Shot-put, Muscle mass

COMPLEX LIPID COMPOSITION IN HUMAN MILK SAMPLES FROM DIFFERENT ETHNIC GROUPS

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Background and objectives: Complex lipids, such as gangliosides and phospholipids, play important roles in intra- and inter-cellular signalling, migration, proliferation, neurological development, and inflammatory and immune responses. These lipids are found in biological fluids, including human milk in the milk fat globule membrane.

Growing evidence shows that complex lipids play an important role in infant development, which has led to studies of human milk composition. Furthermore, it has been suggested that human milk composition may be influenced by diet and ethnicity.

The objective of this study was to use modern techniques to determine gangliosides and phospholipids in human milk throughout lactation from a cross section of women of different cultures and ethnicities including Chinese, Malay and the Middle East.

Methods: The human milk samples were analysed for gangliosides and phospholipids using a validated high-performance liquid chromatography-mass spectrometry (HPLC-MS) method to determine the ganglioside and phospholipid classes and concentrations.

Results: Human milk consisted of both GM3 and GD3. GD3 was the dominant ganglioside in colostrum and transitional milk, while GM3 was the major ganglioside class in mature milk. Total ganglioside concentration was highest in colostrum and transition milk before decreasing in mature milk. Over the mature milk period, there was a gradual increase in average total ganglioside (GD3 +GM3) concentration from around 14 mg/L to high of around 25 mg/L.

Total phospholipid (SM, PC, PE, PI and PS) concentrations were highest in colostrum, before dropping to lower levels at the start of the mature milk period. However the pattern of changes for total phospholipid concentrations over the lactational period differed between ethnic groups.

Conclusions: Using modern HPLC-MS techniques, we measured the ganglioside and phospholipid concentrations in breast milk from a number of different ethnic populations across the lactation periods. There were similarities in average total ganglioside and phospholipid concentrations in the mature milk.

These components may be important for normal growth and development of the infant immune system, visual performance and cognitive performance. Data from this study may support the development of human milk replacers for use in situations where mothers are unable to breastfeed.

Keywords: Human milk, Gangliosides, Phospholipids

COMPOSITION OF FATTY ACIDS AND CHARACTERIZATION OF BIOACTIVE COMPOUNDS IN THE TUCUMÃ FRUIT (ASTROCARYUM HUAIMI MART.)

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Background and objectives: The Brazilian Cerrado has a large variation of fruits with different nutritional and physico-chemical properties that have not been studied. The purpose of this study is to analyze the antioxidant properties and quantify the fatty acids of the tucumã fruit (Astrocaryum huaimi Mart.) found in the Brazilian state of Minas Gerais.

Methods: Total phenols, tannin, and antioxidant activity were analyzed using the Folin-Ciocalteu, Folin-Denis and the DPPH (1,1-diphenyl-2-picryl hydrazyl) stable free radical assay methods, respectively, in the extracts: aqueous, acetone, and ethanolic. For determining fatty acids from tucumã oil Gas-liquid chromatography Varian (model CP-3800) was used. The data was analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 22.0 and reported as average ± standard deviation. The comparisons were done using analysis of variance (ANOVA), followed by Tukey post hoc analysis. The values were statistically significant when $p < 0.05$.

Results: The present study indicated a significant difference (p<0.0001) in the concentration of bioactive compounds in the different extracts. The tannins in the acetone extract resulted in 90.77 ± 1.13 mg EAT.100g-1, greater than in the ethanolic (63.57 ± 1.52) and aqueous (31.10 ± 0.34) extracts. The phenolic compounds were best extracted in ethanol (101.78 ± 1.88 mg EAG.100g-1) when compared to acetone (87.80 ± 2.48) and aqueous (62.17 ± 0.96). Among the analyzed extracts, the aqueous presented the least antioxidant potential with a confidence interval (CI50) equal to 259.95 ± 0.75, followed by the ethanolic (138.49 ± 0.89) and acetone (115.76 ± 5.67). The nutritional composition of the tucumã oil presented 29.4% of saturated fatty acids, 12.56% of polyunsaturated fatty acids and 46.2% of unsaturated fatty acids, with emphasis on oleic acid.

Conclusions: In the analysis of bioactive compounds, the acetone extract followed by the ethanolic had the best antioxidant potential and more phenolic compounds and tannins. The quantification of the fatty acids in the fruit presented more unsaturated fatty acids. Based on the results, the inclusion of tucumã pulp in the diet can prevent chronic diseases, as well as nutritional deficiencies, thus promoting health benefits.

Keywords: Cerrado, Fruit, Fatty acids, Antioxidants.

Further collaborators:
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ESTIMATION OF THE CURRENT POLYAMINE INTAKE IN THE SPANISH POPULATION

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Background and objectives: For many years, the interest of the study of polyamines (PA) content in foods has lied in the need to formulate low PA diets as part of the treatment of certain neoplastic processes. Currently, however, more attention has been paid on PA potential beneficial effects, both at intestinal and systemic levels. PA are involved in the maturation of the intestinal epithelium in new-borns and have also been postulated as potential protective agents in cardiovascular diseases and diabetes complications due to their anti-inflammatory and antioxidant properties. Moreover, PA have awakened a renewed interest after realising that its endogenous synthesis diminishes in the process of aging. It has been proven that the dietary enrichment in PA results in an increase of PA plasmatic levels.

The aim of this work was to estimate the PA intake of the Spanish population, mainly focusing in the comparison between elderly and young adult populations.

Methods: PA intake estimation was done taking into account the PA contents collected in the database of our research group and food consumption data from Spanish National dietary survey in adults, elderly and pregnant women (ENALIA 2, 2016).

Results: Mean PA intake was close to 170 μmol/day for the Spanish population, slightly lower than that estimated from previous surveys in Spain. In comparison with other countries, PA intake in Spain was lower than that previously reported in the United Kingdom and similar to that reported in Japan. The total estimated PA intake for the Spanish population aged 65-74 years (elderly) was higher than that estimated for young adults (18-39 years).

Conclusions: The eating habits of the elderly seem to guarantee a high PA intake, principally explained by a higher consumption of fruits and vegetables. This partially compensates the lower efficacy of the endogenous PA synthesis described in this population group.

Keywords: Polyamines, Bioactive compounds, Elderly.

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KIMCHI AND ITS BIOACTIVE COMPOUNDS IMPROVED COGNITIVE DEFICITS IN MICE INDUCED BY AMYLOID BETA

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Background and objectives: Malfunction of cognition is often noticed in the elderly person suffering the dementia wherein elevation in oxidative stress is recognized. Kimchi, Korean fermented vegetable dish, demonstrated numerous health benefits and bioactive compounds in kimchi with antioxidant activity are claimed for revealing these effects. In this study, effects of kimchi and its bioactive compounds on the improvement of cognitive deficits damaged by Aβ25-35 were examined in mice. For the study, permeability of blood-brain barrier (BBB) of kimchi and bioactive compounds were determined in vitro.

Methods: Kimchi was mixed with a brined cabbage and condiments prepared with red pepper, garlic, green onion, and ginger. Kimchi was fermented until pH was reached 4.3±0.1. Brain damage was induced by a single intracerebroventricular injection of

Aβ25-35. Following 14 days, mice were fed chow diet and a concomitant oral administration of kimchi methanol extract (KME, 200 mg/kg/day), 3-(4'-hydroxyl-3',5'-dimethoxyphenyl)propionic acid (HDMPPA, 50 mg/kg/day), quercetin (50 mg/kg/day), ascorbic acid (50 mg/kg/day), or capsaicin (10 mg/kg/day), respectively (n = 7 per group). PBS was injected to the mice as a vehicle. Behavior tests including water-maze test, T-maze test, and novel object recognition test were performed. BBB permeability was evaluated using PAMPA assay, in vitro.

Results: Compared with the control group, in the water-maze test, the latency time to reach the platform was shorter in the KME and bioactive compounds group (p<0.05). These groups showed a greater preference for the new route than old route in the T-maze test (p<0.05). In the novel object recognition test, KME and bioactive compounds groups spent more time around the novel object than familiar object (p<0.05). Plasma ROS and peroxynitrite level elevated by Aβ25-35 was decreased by KME or bioactive compounds (p<0.05). KME and other compounds except for ascorbic acid were successfully penetrated BBB. The permeability of BBB was high in capsaicin, quercetin, KME, and HDMPPA, in order.

Conclusions: Kimchi exerted a preventive effect against the cognitive deficits induced by Aβ25-35 via suppression of oxidative stress, suggesting that kimchi consumption might have benefits on dementia. Synergic effects of bioactive compounds in kimchi rather than a single compound would increase these effects.

Keywords: Amyloid beta protein; Blood-brain barrier; Cognitive deficits; Kimchi; Oxidative stress.

Further collaborators:

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KIMCHI DECREASED APOPTOSIS IN THE BRAIN OF MICE FED HIGH-CHOLESTEROL DIET THROUGH DECREASING LIPID ACCUMULATION, INFLAMMATION, AND OXIDATIVE STRESS

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Background and objectives: Oxidative stress in the brain might cause degenerative neuronal diseases by elevating apoptosis through lipid peroxidation. Hypercholesterolemia is one known fact to disturb the lipid metabolism in the brain. Kimchi, Korean fermented vegetable dish, has demonstrated antioxidative, lipid-lowering, anti-inflammation, and antiatherogenic activities where quercetin, capsaicin, vitamin, mineral, and lactic acid bacteria are present. In this study, beneficial effects of kimchi consumption on alleviating apoptosis mediated through lipid accumulation, oxidative stress, and inflammation in the brain were examined in HCD-fed mice.

Methods: Kimchi methanol extracts (KME) prepared from fermented kimchi (pH 4.3±0.1) was used. Animal groups were mice fed high-cholesterol diet (HCD having an oral administration of KME (200 mg/kg bw/day) or distilled water for 8 weeks. The level of oxidative stress and lipid peroxidation were determined in the brain tissue. Gene expressions were analysed by western blot assay to elucidate the related mechanisms.

Results: Compared with the control group, expression of lipogenic enzymes (SREBP-1, -2, ACCα, FAS, and HMGCR) in the kimchi group were downregulated with concomitant upregulation of genes involved in the fatty acid oxidation (PPAR-α, CPT1, and ACOX1) and cholesterol export (CYP7A1) (P < 0.05). Reactive oxygen species and lipid peroxidation levels in the brain were significantly reduced (P < 0.05) in the kimchi groups, in contrast, the glutathione level was increased (P < 0.05). Protein expressions such as SOD, CAT, and GPx regulated by Nrf2 were increased (P < 0.05). Moreover, NFκB and their related inflammatory gene expressions were significantly downregulated (P < 0.05). Additionally, expression for proapoptotic factors (Bax, caspase -3, and -9) was downregulated while those for anti-apoptotic factor (Bcl-2) were upregulated(P < 0.05).

Conclusions: Kimchi decreased apoptosis in the brain of mice fed HCD through decreasing lipid accumulation, inflammation, and oxidative stress, suggesting that kimchi consumption might improve the brain function.

Keywords: Brain; High-cholesterol diet; Kimchi; apoptosis; Oxidative stress; Inflammation.

Further collaborators:

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BENEFICIAL EFFECT OF RICE ENDOSPERM PROTEIN ON IGE PRODUCTION

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Background and objectives: Rice is a staple food and an important food not only as an energy source but also as a protein source especially in Asian countries. There are some unknown areas as for the physiological functions, especially immune system, of rice endosperm protein (REP) although the effect of formulae based on rice protein has been reported in the treatment with milk protein allergy. In our preliminary study, REP affected intestinal gene expressions related to immune system and also REP enhanced cellular immunity and deflected the balance of type I helper T cell (Th1)/type II helper T cell (Th2) to Th1 side in Lewis rats. Therefore, we attempted to clarify the effect of REP on the Th1/Th2 balance and IgE production.

Methods: Female BALB/c mice at 3 weeks of age were employed and were fed on an egg white protein (EWP) diet as a control group and an REP diet for 4 weeks. To assess the Th1/Th2 balance and IgE production, blood samples were collected from tail vein at 4 weeks, and IgG2a, a marker for Th1 type immune response, IgG1, a marker for Th2 type immune response, and IgE concentrations were measured by the ELISA method.

Results: At 4 weeks, the serum IgG1 concentration was significantly suppressed and IgG2a/IgG1 ratio was significantly increased by REP consumption although IgG2a concentration was not altered between two groups. This result suggests that REP deflected the Th1/Th2 balance to Th1 side. In addition, the serum IgE concentration in the REP group was significantly suppressed at 4 weeks compared with the EWP group.

Conclusions: REP deflected the balance of Th1/Th2 to Th1 side and suppressed the IgE production compared with EWP.

Keywords: Rice endosperm protein, Th1/Th2 balance, IgE

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BENEFICIAL EFFECTS OF RICE ENDOSPERM PROTEIN ON CHRONIC KIDNEY DISEASE-MINERAL AND BONE DISORDER (CKD-MBD) IN ZUCKER DIABETIC FATTY RATS

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Background and objectives: The increase of chronic kidney disease (CKD) is a serious problem worldwide. In Japan, CKD patients are estimated 13.3 million, about 13% of adults, and diabetic patients are 9.5 million. Diabetes and CKD are directly related, and CKD including diabetic nephropathy leads to CKD-mineral and bone disorder (CKD-MBD). Moreover, CKD-MBD is one of the major risk factors for cardiovascular disease as well as bone fractures. We have reported that rice endosperm protein (REP) had preventive effects on obese diabetes, fatty liver and diabetic nephropathy, compared with casein (C). This study is the advanced experiment and the aim is to clarify the effects of REP on the bone metabolism in Zucker Diabetic Fatty (ZDF) rats.

Methods: Seven week old male ZDF rats were fed 20% C and REP diets for 10 weeks. Fasting blood glucose levels and urinary albumin excretion (UAE) were monitored. At the end of the experimental period, some blood parameters related to the mineral metabolism (Ca, P, parathyroid hormone (PTH), and fibroblast growth factor-23 (FGF-23)) and a blood parameter related to the bone formation (osteocalcin) were determined to evaluate the progression of CKD-MBD. The femur bones were used for histomorphometric observation by μCT, and the bone strength was measured. In addition, the urinary metabolome measurements were conducted.

Results: Fasting blood glucose levels and UAE in the REP group were significantly suppressed compared with those in the C group. In the REP group, blood FGF-23 concentrations was significantly decreased although blood Ca and P concentration had no abnormal alteration in ZDF rats. Moreover, the osteocalcin level significantly increased in the REP group. The REP had no significant effects on bone mineral density but suppressed deterioration of bone microstracture parameters, and the bone strength was improved in the REP group. PCA analysis showed clearly different urinary metabolic profiles in the two groups.

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COLITIS IMPROVEMENT EFFECT OF PYRO-GLUTAMYL PEPTIDES-RICH FERMENTED RICE DRINK IN MICE

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Background and objectives: Three pyroglutamyl peptides with anti-colitic activity had been identified in Japanese rice wine, sake, by oral administration of a small dose (0.1–1.0 mg/kg body weight) in mice. Since the alcohol percentage of sake is approximately 15%, we developed a functional peptides-rich fermented rice drink with no alcohol, for human application. We also compared the anti-colitic activity of developed fermented rice drink with Japanese traditional drinks, including sake and amazake, a traditional sweet, low- or non-alcohol Japanese drink.

Methods: For preparation of fermented rice drink, steamed rice, koji, lactic acid, and water were fermented according as amazake, but at low temperter for 1 week. Acute colitis was induced by oral administration of dextran sulphate sodium dissolved in drinking water for 7 days in mice. 4 samples (fermented rice drink, amazake, 2 different types of sake) were dissolved in distilled water and administered by gavage in aliquots of 200 microL once a day during the entire induction. The mice were sacrificed on day 7 the entire colon was removed from the cecum to the anus. We evaluated the colitis severity on the basis of microscopic observations of stool consistency (0, normal; 1, mild loose; 2, loose; 3, mild diarrhea; and 4, diarrhea). The inner contents of the colon were collected for microbiota analysis. Population of Bacteroiditis and Firmicutes were quantified on the basis of amplification of genome DNA coding 16S rRNA by polymerase chain reaction by using group-specific primers.

Results: Fermented rice drink group had a tendency to improve diarrhea score (1.6 ± 0.2, p = 0.061) compared with colitis group (2.7 ± 0.4), while Japanese traditional drink (amazake and sake) did not improve. There were no significant difference in the population of Firmicutes/Bacteroidetes ratio between colitis and rice drink group.

Conclusions: We developed novel no-alcohol functional rice drink, and it suppressed diarrhea to a greater extent than did the Japanese traditional drinks in mice. Fermented rice drink might holds promise for human application.

Keywords: Pyroglutamyl peptides, Fermented foods, Gut microbiota, Colitis.

144/2662

EFFECTS OF BIOACCESSIBLE GARLIC COMPOUNDS ON CULTURED VASCULAR SMOOTH MUSCLE CELLS FROM SPONTANEOUSLY HYPERTENSIVE RATS

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Background and objectives: Several studies have associated a moderate consumption of garlic with improvements in health. The evidence suggests that its medicinal activities are mainly due to the organosulfur compounds (OSCs) garlic content. Garlic compounds have exhibited antioxidant activities and cardiovascular disease-protective properties. The remodeling of small arteries by excessive proliferation and migration of vascular smooth muscle cells (SMCs) is a phenomenon to consider, since it contributes to the development and complications of hypertension, one leading cause of morbidity and mortality globally. It seems that the mystery of OSCs and hypertension would be easy to elucidate; nevertheless, OSCs have shown to have different biological actions, potency and mechanisms in different cell lines and organ tissues. Moreover, only the bioavailable compounds would have bioefficacy. In this regard, previous works have identified a few OSCs in blood. For this study three bioaccessible OSCs, allyl mercaptan (AM), S-allyl cysteine (SAC) and 2-vinyl-4H-1,3-dithiin (2VD), were selected to evaluate their in-vitro effects on cultured SMCs isolated from mesenteric arteries of male spontaneously hypertensive rats.

Methods: Cell proliferation, cell migration and intracellular oxidative stress were evaluated after cell exposure to OSCs expected quantities in plasma, 10 µg/L of AM and 2VD and 50 µg/L of SAC.

Results: The results of the proliferation test by MTT assay showed that 2VD reduced by 20% the proliferation compared to the control, conversely SAC enhanced the proliferation by 15%. Scrape-wound migration assay showed that 2VD and AM reduced the cell migration in similar ratios (30%), whereas SAC increased the migration by 30% compared to the control. Concerning to the intracellular ROS levels, the compounds showed different behaviors at the studied concentrations. While AM was an intracellular antioxidant, 2VD and SAC increased the oxidative stress.

Conclusions: In conclusion, expected quantities of 2VD and AM in plasma, provided by garlic intake, were able to inhibit the migration of SMCs of spontaneously hypertensive rats. These compounds could help to protect the cardiovascular system from vascular remodeling produced by hypertension. Further studies will be needed to elucidate the specific mechanism of action to

inhibit the SMCs migration and the role of its different antioxidant effects.

Keywords: Organosulfur compounds, Garlic, Hypertension, Vascular remodeling.

144/2669

UTILITY OF DEWAXED BROWN RICE AS A FOOD STAPLE IN THE MAINTENANCE AND IMPROVEMENT OF NUTRITION AND HEALTH STATUS IN THE ELDERLY

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Background and objectives: A new type of brown rice with its wax layer removed (dewaxed brown rice) resulting quick-cooking and tasty product contains 100-times more LPS than polished white rice. It also improves weight loss and constipation in antibiotics administered mouse model. In this study, the health maintenance function of dewaxed brown rice was investigated its effects on physical and nutritional status, bowel movements, immune function, cognitive function and other factors in residents of special nursing homes for the elderly who continuously ingested dewaxed brown rice.

Methods: This study was a controlled crossover trial in 35 elderly men and women living in special nursing homes for the elderly who were sorted into two groups and ingested either dewaxed brown rice or polished white rice three times a day for six months. The subjects underwent body weight measurements once a month, were checked daily for any bowel movements, and underwent salivary sIgA and C-reactive protein (CRP) measurements once every three months and assessments of cognitive function (Hasegawa dementia scale) once every six months. (Ethics Committee of Nagoya University of Economics: receipt number 2016-1).

Results: An interim assessment was conducted six months after the study began. In terms of physical status, body weight and body mass index (BMI) tended to increase in emaciated subjects and were significantly greater (p<0.05) after three months of ingesting the test food compared with before the study began. The mean number of days per month without a bowel movement tended to decrease in the dewaxed brown rice group. Salivary sIgA levels in the dewaxed brown rice group showed an increasing trend compared with before the study began, while CRP levels showed a decreasing trend. Assessments of cognitive function in the de-

waxed brown rice group showed improvement compared with those in the polished white rice group.

Conclusions: The results of this study suggested that dewaxed brown rice improves constipation, weight loss and inflammation in the elderly, and if introduced as a food staple to residents of welfare facilities for the elderly, could help improve constipation and malnutrition and prevent infections and cognitive decline in the elderly.

Keywords: Dewaxed brown rice. Nutritional status. Constipation. Immune system. Elderly.

144/2670

PURIFICATION OF BIOACTIVE ANTIOXIDANT AND ANTIHYPERTENSIVE QUINOA (CHENOPODIUM QUINOA WILLD.) PEPTIDES

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Background and objectives: Quinoa is a pseudo Andean cereal known for its protein quality. Also, there are studies that had shown antioxidant and antihypertensive capacity of quinoa peptides. Thus, the aim of this work was to purify bioactive peptides from quinoa protein concentrate through ultrafiltration (10 and 3 kDa cut off) and low pressure chromatographic techniques (adsorption and gel filtration chromatography), in order to improve their antioxidant and antihypertensive capacity.

Methods: -Determination of 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid) (ABTS) antioxidant capacity (umol Trolox equivalent/g protein)

-Determination of antihypertensive capacity through concentration of quinoa peptide to inhibit the angiotensin converting enzyme (ACE) by fifty percent (IC50)

-Adsorption chromatography with ethanol as eluent in steps of 0, 25, 50 and 75 % aqueous solution of ethanol

-Gel filtration chromatography with Milli-Q water as isocratic eluent

Results: -It was found an antioxidant capacity of 1,667.38±9.55 μmol trolox equivalent (TE)/g protein and 0.3007 mg/mL of IC50 value in quinoa hydrolyzate.

-The fraction obtained from a 3 kDa ultrafiltration cut off got higher both, antioxidant and antihypertensive capacity than the quinoa hydrolyzate.

-When both (adsorption and gel filtration chromatography, in that order) separation techniques were used after 3 kDa ultrafiltration cut off, the highest antioxidant (3,784.85±17.06 μmol TE/g protein) and antihypertensive capacity (IC50 = 0.0391±0.01

mg/mL) were obtained, in comparison to only apply gel filtration chromatography.

-It was found a 82.05 percent of correlation between antioxidant and antihypertensive capactiy, showing that both functional properties are related to each other

Conclusions: -The fraction that presented the highest antioxidant and antihypertensive capacity in the first purification stage, corresponded to the permeate obtained with the cut off membrane 3 kDa

-In the adsorption chromatography, the highest antioxidant and antihypertensive capacity were attributed to the peptides eluted with a 25% aqueous solution of ethanol, indicating the slight hydrophobicity of said peptide sequence

-During the gel filtration chromatography, better results were obtained in peptides previously subjected to adsorption chromatography, which represent those with lower molecular weight and hydrophobic character

-Purification achieved the increase of both, antioxidant and antihypertensive capacity in bioactive quinoa peptides, with a high correlation between each other

Keywords: Quinoa, Antioxidant peptides, Antihypertensive peptides, Purification.

Further collaborators: Adelayda Pardo

144/2685

A HEALTHY POSSIBILITY: MALTED FLOUR FROM RYE GROWN IN ARGENTINA

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Background and objectives: Rye is the second most important winter forage cereal in Argentina. The flour made from rye has a greater proportion of dietay fiber than wheat flour.. Dietary fiber (DF) has beneficial physiological effects on the human organism. Increased intake of DF through foods is actually being recommended for good health because DF is likely to help reduce diabetes and intestinal diseases. Some components of soluble fiber called prebiotics, like beta glucans or aranbioxilans, are defined as non-digestible food ingredients that positively affect the host. The quality of DF varies according to the type of cereals and to the process that is carried out to obtain the flour. Rye grains for this work came from the INTA, Bordenave Púan. The production of flours, with functional properties implies the malting of the rye, and there are antecedents by which the malting process increases the amount of soluble fibers.

Methods: In the first instance, an evaluation of the quality of the seeds of the different varieties was carried out. The most efficient rye varietes after the malting process are Don Ewald and Camilo. In order to determinate their characteristics, we analyzed the composition of these varieties . The total, soluble and insoluble fiber content was determined by Method 991.43 AOAC, with flours obtained from the unmalted and malted cereal.

Results: The comparative results demonstrate a tendency to modify the amount of fiber in cereal flour after the malting process. Our results show a decrease in the insoluble fiber fraction and an increase in the soluble fiber fraction. The total fiber content of malted and unmalted rye flour was on average 18% . The insoluble fiber content of unmalted rye flour was 16% and malted rye flour was 14%, obtaining of soluble fiber content of 2 % in the unmalted flour and 4% in the malted flour. This functional property of bioactive ingredients is currently being evaluated in an animal model of Wistar rats.

Conclusions: Preliminary results are showing a functional activity of these ingredient.

Keywords: Rye flour, Malted rye, Dietary fiber.

144/2743

SYNERGISTIC EFFECT OF WALNUT AND BLACK CHOKEBERRY MIXTURE ON ANTI-LIPID PEROXIDATION IN D-GALACTOSE INDUCED AGING MODEL

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Background and objectives: Many studies mentioned the cellular damage caused by reactive oxygen species(ROS) could be aging. D-galactose causes aging-related changes and oxidative stress in the organism. Lipids are the first target of free radicals, and lipid peroxidation related the aging process. Walnut kernels (Juglans regia L.) contains antioxidant phenolic compounds. Many studies showed that walnut phenolics belong to ellagitannin, or hydrolyzable tannins related antioxidant activities. Chokeberry(Aronia melanocarpa) is one of the richest sources of polyphenols, especially anthocyanin among other fruits. Previous studies showed that polyphenols of chokeberry have antioxidant and anti-inflammatory activities. In this study, we mainly investigated that synergistic effect of walnut and chokeberry mixture on anti-lipid peroxidation of the serum and various tissues in D-galactose induced aging model.

Methods: Thirty-five Balb/c mice(8 weeks of age) were divided into five groups(n=7 for each group): the normal control group(NC), D-galactose control group(DC), D-galactose with chokeberry diet group(CHD), D-galactose with walnut diet(WD), and D-galactose with walnut and chokeberry mixture diet(WCH). All groups were intraperitoneally infected with D-galactose(120mg/kg) daily for eight weeks, except for NC group which was treated with saline. Levels of malondialdehyde(MDA) in serum, liver, brain, and kidney were determined by according assay kits in D-galactose treated mice.

Results: It was found that the serum, hepatic, and brain MDA level in DC groups were higher than the NC group(p<0.05). Compared to DC group, CHD, WD and WCH groups showed significantly decrease serum, hepatic, and kidney MDA level(p<0.05). Serum MDA level in WD group was the lowest concentration compared to other groups. Hepatic MDA level in CH group was the lowest concentration compared to other groups, and also hepatic MDA level in WCH group lower than WD group. There was the lowest MDA level in kidney than WD and CHD groups.

Conclusions: Walnut and chokeberry mixture had anti-lipid peroxidation and synergistic effect. Especially, walnut and chokeberry mixture had been decreased the lipid peroxidation product in kidney compared walnut and chokeberry, respectively. But results showed that walnut and chokeberry mixture had not anti-lipid peroxidation in serum, liver, and brain. Further studies are needed to the mechanism of the lipid peroxidation and synergistic effect of various tissues.

Keywords: Synergistic effect, Walnut, Chokeberry, Lipid peroxidation, Aging

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144/2750

EVALUATION OF THE ANTI-INFLAMMATORY/ ANTIOXIDANT EFFECT OF AQUEOUS LEAVES EXTRACT OF PASSIFLORA ALATA CURTIS AND CATECHIN, RUTIN, ISOORIENTIN, VITEXIN IN CO-CULTURE OF MIN6/LYMPHOCYTES FROM NOD MICE

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Background and objectives: Type 1 Diabetes leads to the increase of reactive oxygen species, promoting oxidative stress in the organism. This study aimed to evaluate the effects of the treatments with aqueous leaves extract of P. alata or isolated compounds catechin, rutin, isoorientin and vitexin in the inhibition of proliferation of TCD4+ and TCD8+ cells of NOD mice in co-cul-

ture with MIN6 cells and also the antioxidant effects in the supernatants of these cultures.

Methods: T cells (2,5x105) were submitted to co-culture with MIN6 cells (8x104) to determine the concentrations of aqueous extract of P. alata and isolated compounds in inhibition of T cell proliferation. After that, the supernatants were collected for antioxidant activity analyses by FRAP and ABTS protocols and oxidative stress by TBARS protocol.

Results: The concentration that promoted inhibition in the cell proliferation in approximately 50% (ID50) was 500ug/mL of P.alata; 50uM of catechin; 300uM of rutin; 5uM of isoorientin and 200uM of vitexin. The FRAP analysis showed higher antioxidant activity in the treatment with rutin, catechin and P. alata while in the ABTS analysis it was verified higher antioxidant activity in the treatment with rutin and vitexin. These both techniques (FRAP and ABTS) demonstrated an increase in capacity to reduce pre-forms oxidized ions in the groups treated with P. alata, rutin, catechin and vitexin. This activity is associated to antioxidant and anti-inflammatory action, enhancing the protective action in experimental model diabetes type 1. In TBARS analyses, the compound rutin showed a tendency in decrease lipid peroxidation levels when compared to cells that were not submitted to treatment.

Conclusions: All the treatments presented inhibition in T cells proliferation, suggesting an anti-inflammatory effect and P. alata and the isolated compounds rutin, catechin and vitexin have showed an antioxidant effect when analyzed the supernatants. The oxidative stress verified by TBARS suggest that rutin is the main isolated compound that decrease the lipid peroxidation. These antioxidant properties from P. alata and compounds can indicate a protection against cell damage from oxidative stress observed in type 1 diabetes evolution.

Keywords: Oxidative stress, Lipid peroxidation, Passiflora alata Curtis, Anti-inflammatory effect; NOD mice.

144/2781

NEUROPROTECTIVE EFFECT OF SALVIA HISPANICA I (CHIA) OIL AGAINST PESTICIDES IN RATS

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Background and objectives: Salvia hispanica (chia) oil has considerable amounts of polyunsaturated fatty acids (PUFAs), similar to linseed oil. The oil could be used as a potential source of high functional ingredients in omega-3 fatty acids. On the other hand toxicological studies on exposure to neurotoxic substances in humans have shown that the central nervous system (CNS) is

one of the main target organs for its toxicity. The objective of this research was to evaluate the neuroprotective effect of Salvia hispanica oil (chia) on the neurotoxicity induced by pesticides in rats.

Methods: G1: Control, G2: pesticide substance, G3: chia oil 4ml / Kg day, G4 pesticide substance + chia oil 2ml / kg day, G5: pesticide substance + chia oil 4ml / kg day, four animals per group randomly assigned. After six weeks of treatment the animals were sacrificed and the brain was removed from the occipital part of the skull, part of the cerebellum was fixed in formalin solution and the other part of the brain was washed with Sodium Chloride solution 0.9 %. A 10% homogenate of brain was prepared in 0.05M phosphate buffer solution pH 7.4, centrifuged and the supernatant was used for the biochemical assays: Levels of: Malonaldehyde by lipoperoxidation (TBARs) and quantification of protein. Ethics of animals was respected

Results: Variation of weight: G1: 30.45%, G2: 28.9%, G3: 40.2%, G4 31%, G5: 37.7%; TBAR umol / L, proteins mg%: G1: 14.6 ± 2.3, 193.1 ± 5.9; G2: 19.1 ± 1.9, 197.7 ± 14.9; G3: 17.0 ± 1.8, 197.5 ± 6.0; G4: 17.2 ± 1.0, 199.5 ± 16.3; G5: 15.2 ± 1.4, 200.6 ± 12.2. Histological: G2 group there was an effacement of nuclear and cytoplasmic membranes in the brain compared to G1 and G5, there was a slight recovery of the nuclear and cytoplasmic contours.

Conclusions: The weight gain was influenced by the pesticide substance; G2 presented greater oxidative stress than the other groups; G5 presented TBARS value very close to G1, which was corroborated in the histological section.

Keywords: Chia oil, Neuroprotection, Pesticides.

144/2784

INFLUENCE OF REGULAR CONSUMPTION OF GREEN BANANA FLOUR ON THE INTESTINAL FUNCTIONING IN SERVERS OF A FEDERAL UNIVERSITY

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Background and objectives: Green banana flour, considered a food with functional properties, stands out as a source of resistant starch and fibers, providing energy for intestinal cells and homeostasis of the gastrointestinal tract. The objective of the presente study was to evaluate the influence of regular consumption of green banana flour on the intestinal functioning of healthy adults.

Methods: The group studied was composed of 44 servers from a federal university, of which 23 are components of the Green Banana Flour Group and 21 of the Control Group. The volunteers from the Green Banana Flour Group consumed two tablespoons of green banana flour per day, and those from the Control Group consumed two tablespoons of cassava flour per day in the main meals, for eight weeks. Fecal consistency was assessed by the Bristol scale ranging from hard feces or cymbals (type 1) to totally aqueous and without solid pieces (type 7). The participants' diet was evaluated through the fat and fiber score. Both the Bristol scale and the fat and fiber score were applied before and after the consumption of the flours. Statistical analysis was performed using Student's t-test and paired t-test, with a significance level of 5%. The project was approved by the Research Ethics Committee of the Federal University of Grande Douradas, protocol number 1.074.863, 06/11/2015.

Results: After the consumption of green banana flour, it was observed that there was a significant change in feces consistency, verified by the Bristol scale. After the consumption of the flours, the individuals of the Green Banana Flour Group had a higher fiber score than the individuals of the Control Group. It was verified that 70% of the individuals who consumed the green banana flour reported improvement in intestinal functioning.

Conclusions: Green banana flour may have helped increase fiber intake and improved feces consistency and intestinal functioning of individuals who participated in the research, making a contribution to prevent intestinal diseases.

Keywords: Green banana flour, Intestinal functioning, Feces consistency, Fiber.

Further collaborators: This project was financed by Fundect.

144/2790

THE EFFECT OF GREEN BANANA BIOMASS IN THE LIPID AND GLYCEMIC PROFILE IN SWISS MICE ON HYPERCALORIC DIET

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Background and objectives: The green banana is rich in resistant starch, which has the similar effect of fiber in the prevention of chronic diseases. This study aimed to analyze the effects of the biomass of green bananas in the lipid profile and glucose in Swiss mice.

Methods: Twelve male Swiss mice were followed for 60 days, divided into three groups: (1) control (DC) normocaloric commercial diet, (2) DHC, cafeteria diet and (3) DHCB, cafeteria diet supplemented with biomass. The animals were heart puncture blood for measurement of plasma lipids and glucose. The assessment of total body fat was performed by summing the individual deposits. The lipids present in the fecal mass and liver were determined by the method of Bligh-Dyer.

Results: The group presented DHCB BMI values lower than those in DC and CLD. The content of liver fat group was higher than DHC DHCB. In addition, the DHC group also had more total body fat compared with DHCB. Plasma levels of total cholesterol, LDL-C, triglycerides and glucose, the DHC group presented

higher levels than the group DHCB. In addition, the DHC group presented a higher glucose intolerance compared with DHCB and control. The fecal lipid excretion was higher in group DHCB.

Conclusions: The biomass of green bananas to a high calorie diet supplemented gives a protection to changes caused by this diet on lipid profile and glucose Swiss mice, probably by increasing the fecal excretion of lipids.

Keywords: Green Banana, Resistant starch, Swiss mice, Hypercaloric diet.

Conflict of Interest Disclosure: The authors certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this abstract

Further collaborators: This study was supported by Scientific Program of Redentor University

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144/2796

INTAKE OF RED WINE GRAPE POMACE FLOUR INCREASES ANTIOXIDANT FUNCTION OF HIGH DENSITY LIPOPROTEINS (HDL) IN HUMANS

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Background and objectives: In recent years, new antiatherogenic mechanisms have been attributed to high density lipoproteins (HDL), including their ability to prevent lipid peroxidation, a key pathogenic process underlying a wide variety of chronic diseases. Natural antioxidant components present in certain foods are able to prevent this oxidative process. Thus, the food industry is leading a major effort to develop and increase consumption of antioxidant-enriched products for improving health and preventing disease in the general population. In Chile, approximately 10 mill. hectoliters of wine are produced per year, a process by which 20% of the total grape weight is lost as pomace waste. Red wine grape pomace (RWGP), a by-product derived from winemaking, is composed mainly of grape skin and seeds. This pomace is a valuable resource for production of fiber and antioxidant-rich flour that can be used as ingredient in the development of functional foods.

To evaluate the effect of RWGP flour consumption on the antioxidant capacity of HDL in humans.

Methods: While one group of subjects added 20 g RWGP flour/day to their usual diet for 4 months (treated group, n=12), another group consumed their usual diet during the same time (control group, n=12). Blood samples were taken from all volunteers, before and after the intervention. Plasma was used to evaluate total cholesterol content and lipoprotein cholesterol profile. In addition, antioxidant capacity of total plasma and gel filtration-purified HDL particles was determined through an in vitro fluorescence-based assay.

Results: Compared with controls, subjects who consumed a diet supplemented with RWGP flour during 4 months showed an increase in the antioxidant capacity of total plasma and purified HDL, without significant changes in total cholesterol or lipoprotein cholesterol levels.

Conclusions: Intake of RWGP flour -presumably due to its content of biologically active components- exhibits a favorable effect in vivo by improving the antioxidative functionality of HDL in humans. Thus, widespread use of this functional ingredient may be beneficial in the prevention and treatment of atherosclerotic cardiovascular disease.

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Keywords: Wine grape pomace flour. HDL. Antioxidant function.

144/2810

EFFECT OF THE CONSUMPTION OF MORINGA OLEIFERA IN DIABETIC RATS

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Background and objectives: The use of Moringa oleifera (Mo) has been evaluated in diseases such as Diabetes mellitus for its possible ability to lower glucose concentration as it contains

polyphenols (quercetin, kaempferol, glucosides). However, most studies have been done with the extract of the plant, which does not reflect the actual way of consumption as the population consumes it in powder.

Evaluate Mo powder to study the effects on glucose, triglycerides, Cholesterol, body weight, toxicity, genotoxicity and predominance of microbiota in diabetic rats.

Methods: Four groups were established for the toxicity test: control and Mo with doses of 100, 200 and 500 mg/kg (Milligrams per kilogram of weight) respectively, which were used for the micronucleus count in erythrocytes. Another 5 groups were used for the diabetic model. In addition, glucose, body weight, triglycerides, cholesterol, HDL and LDL were measured. Histological sections of the liver, intestine and kidney were performed to observe any abnormalities. Finally, the number of enterobacteria before and after Mo consumption was monitored.

Results: No significant difference was found between the amount of micronucleus on control group with groups administered with Mo. There were no adverse effects at any of the doses, so no signs of toxicity were found. A slight tendency to decrease glucose was observed with the Mo groups. As well we observed weight gain in diabetic groups that were not treated with Mo. Similar results were obtained for measurements of triglycerides, cholesterol, LDL and HDL. In intestinal microbiota no differences were observed between the Mo groups and control group. Histologically, no abnormal change was observed in the administered groups with Mo in comparison with control group.

Conclusions: The consumption of Mo powder at high or low doses did not represent a risk in the experimental model. Previous studies have shown that consuming of Mo helps lower blood glucose. However, in the present study the decrease was not significant. The consumption of Mo powder could function as an adjuvant in lowering cholesterol and triglycerides. It is required to compare the consumption of Mo powder and the Mo extract to evaluate the hypoglycaemic properties.

Keywords: Moringa oleifera, Hypoglycemic, Genotoxicity.

144/2833

EFFECT OF REGULAR INGESTION OF GREEN BANANA FLOUR IN RISK FACTORS FOR METABOLIC SYNDROME IN SERVERS OF A FEDERAL UNIVERSITY

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Background and objectives: Some studies have reported the beneficial effects of green banana on diseases such as diabetes, dyslipidemia and cardiovascular disease. The objective of the present study was to evaluate the influence of regular consumption of green banana flour on risk factors associated with the metabolic syndrome.

Methods: The study group consisted of 44 servers from a federal university, of which 23 were from the Green Banana Flour Group and 21 from the Control Group. The individuals in the Green Banana Flour Group consumed two tablespoons per day of green banana flour, and those in the Control Group consumed two tablespoons per day of cassava flour in the main meals, for eight weeks. Nutritional assessment was performed with measures of weight, height and waist circumference, three 24-hour recalls, and biochemical tests of total cholesterol and fractions, triglycerides, fasting glucose, insulin, homocysteine and C-reactive protein, before and after consumption of flours. Systemic blood pressure was also measured. Statistical analysis was performed using Student's t-test and paired t-test, with a significance level of 5%. The research was approved by the Ethics Committee in Research of the Federal University of Grande Dourados, for the protocol nº 1.074.863, 06/11/2015.

Results: There was no significant difference between the baseline clinical characteristics of subjects in both groups. It was observed that after the consumption of green banana flour, individuals had a significant reduction of total cholesterol (-6.8%) and LDL cholesterol (-10.4%), and increased fiber intake (33.1%). There was no significant difference in the anthropometric variables and in the systemic blood pressure in both groups, after the consumption of the flours.

Conclusions: It was concluded that although green banana flour did not collaborate to reduce risk factors associated with the metabolic syndrome, it presented important contributions to the health of the individuals, such as reduction of plasma levels of total cholesterol and LDL cholesterol and increased consumption of fibers, and may play an important role in disease prevention, especially dyslipidemias and cardiovascular diseases.

Keywords: Green banana flour. Fibers. Dyslipidemias. Cardiovascular diseases.

Further collaborators: This research was financed by Fundect.

144/2845

RESEARCH IN ANALYTICAL CHEMISTRY APPLIED TO NUTRITION AS A TOOL IN TEACHING

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Background and objectives: The Faculty of Medical Sciences and Health of the Mariano Gálvez University of Guatemala provides the student with high quality laboratories with state-of-the-art technology that enables productive teaching and research development. Research provides the opportunity to develop competencies for the execution of research projects that seek the resolution of health and nutrition problems of the country.

The objective was to promote creativity as well as motivate the development of applied research in the field of nutrition.

Methods: The research developed during the course of Analytical Chemistry applied to Nutrition, are carried out with the equipment, reagents and supplies provided by the university. The laboratories have equipment to perform the following procedures: potentiometry, gas chromatography and high performance liquid chromatography, among others. Minor laboratory equipment and a variety of glassware including Soxhlet equipment are also used to develop these processes. The research is carried out in 3 stages, generating a preliminary project, followed by a protocol, and finally, the student has at his disposal the laboratory to develop the experimental part and final report.

Results: Six research projects were developed to determine important analytes in the selected foods taking care of the technical quality of the processes.

The students who have taken part in the Analytical Chemistry applied to Nutrition have excelled in different areas: 3 students have presented their results by means of posters at the scientific fair of the Faculty of Medical Sciences and Health of the university; a student has been involved as part of the scientific team of a co-financing project of the National Secretariat of Science and Technology and a student has been inclined to develop his ad gradum thesis on analytical chemistry topics.

Conclusions: The experiences in the course of Analytical Chemistry applied to Nutrition demonstrate the importance of promoting curiosity, as well as encouraging students to formulate research proposals, from the formulation of questions related to the subjects of the regular courses, which are taught in undergraduate medical science and health care.

Keywords: Analitic chemistry, Clinical nutrition, Investigation, Teaching

Conflict of Interest Disclosure: The authors whose names are listed immediately below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest (such as honoraria; educational grants; participation in speakers' bureaus; membership, employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

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144/2894

ADMINISTRATION OF THREE PROBIOTIC STRAINS MODIFIES THE INTESTINAL MICROBIOTA IN AN OBESITY RAT MODEL

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Background and objectives: Intestinal microbiota (IM) plays a central role in the host's health and, consequently, control of the IM is a priority to prevent a plethora of health issues. Probiotics are used in the treatment of diverse pathologies. However, evidences of their capacity to influence the IM is scarce. The aim of this work was to investigate the effects of Lactobacillus paracasei CNCM I-4034, Lactobacillus rhamnosus CNCM I-4036 and Bifidobacterium breve CNCM I-4035 on the IM of genetically obese rats.

Methods: Forty-eight obese Zucker-Leprfa/fa rats and 16 Zucker-lean+/fa rats were used. Eight obese and 8 lean rats were

sacrificed as baseline. The remaining 40 obese rats were randomly assigned to receive one of the 3 probiotic strains, a mixture of L. paracasei and B. breve, or a placebo by oral administration each day for 30 days. An additional group of 8 lean rats received placebo for 30 days. Fecal samples were taken to perform fluorescence in situ hybridization (FISH) and 16S rRNA gene pyrosequencing.

Results: FISH analysis showed significant increases in the Bacteroides genus in the rats treated with the mixture of B. breve and L. rhamnosus, and the Atopobium cluster in the B. breve group. Pyrosequencing analysis showed: 1) an increase in the Marinilabiaceae and Streptococcaceae families in the rats fed the mixture; 2) a decrease in the Lactobacillales order in the B. breve group; 3) a decrease in the Anaerostipes genus in the L. paracasei group; 4) a decrease in the Parabacteroides genus in the L. rhamnosus group. An increase in the relative abundance of the Parabacteroides and Lactobacillus genera together with a decrease in the Prevotella and Lactococcus genera were found in the obese rats fed the placebo.

Conclusions: These probiotic strains are capable of modifying the IM of genetically obese rats.

Keywords: Obesity, Probiotics, Intestinal microbiota

144/2927

PRENYLATION AT CARBON-6 RESULTS IN DECREASED TRANSEPITHELIAL TRANSPORT OF SELECTED FLAVONOIDS FROM HOPS (HUMULUS LUPULUS L.) IN CACO-2 CELLS

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Background and objectives: 6-Prenylnaringenin (6-PN) and 8-prenylnaringenin (8-PN) are prenylflavonoids predominantly found in hops (Humulus lupulus L.) and beer, with potential health-promoting properties. Their oral bioavailability in humans is low and limits their development for clinical applications. The aim of this study was to compare the apparent permeability coefficient (Papp) of both 6-PN and 8-PN using the transepithelial transport experiment with Caco-2 cells, a well described in vitro model of intestinal absorption, which can be correlated to in vivo absorption in humans.

Methods: Caco-2 cells were grown in permeable membrane inserts until enterocytic differentiation. The integrity of the epithelium was confirmed by testing the transepithelial electrical resistance and Lucifer Yellow permeability. The monolayers were incubated with 100 μmol/L 6-PN or 8-PN in the apical chamber, and the apical (lumen) to basolateral (systemic) transport of 6-PN and 8-PN was determined by HPLC. Prenylflavonoid concentrations in the apical chamber and inside the cells were also measured at the end of the experiment. Papp was calculated for both free and total (after deconjugation with β-glucuronidase/sulfatase) prenylflavonoid concentrations.

Results: The Papp of 8-PN was significantly higher than for 6-PN, but only when comparing the concentrations after enzymatic de-conjugation and not when comparing the free compound alone. Moreover, Papp of total 6-PN ($8.4\pm0.7\times10^{-6}$ cm/s) and total 8-PN ($2.4\pm0.4\times10^{-5}$ cm/s) were 12.7 and 38.7-fold higher than Papp of the free compound, respectively. Of the initial dose, only up to 8% total 6-PN and 25% total 8-PN were recovered in the basolateral chamber. Both compounds displayed evidence of considerable efflux of metabolites towards the apical chamber and abundant accumulation of the free substance in the enterocytes.

Conclusions: The prenylflavonoids 6-PN and 8-PN exhibited low intestinal permeability in vitro, with less than 1% transepithelial transport of the compounds in the free form. In addition, the significantly lower Papp for 6-PN suggests that prenylation at carbon-6 may result in decreased bioavailability of this compound in comparison to its positional isomer 8-PN. Further research should focus on the search for alternatives to improve the bioavailability of these bioactive prenylflavonoids.

Keywords: 6-prenylnaringenin, 8-prenylnaringenin, Humulus lupulus, Caco-2 cells, Apparent permeability.

Further collaborators:

144/2948

INFLUENCE OF THE CONSUMPTION OF THREE VARIETIES OF QUINOA (CHENOPODIUM QUINOA WILLD.) ON ADIPOSO TISSUE AND INTESTINAL HISTOMORPHOMETRY IN OBESES RATS

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Background and objectives: The presence of bioactive compounds in fruits and vegetables has been demonstrated and their effects in the treatment and prevention of diseases such as cancer, stroke, etc, has also been demonstrated. Compounds such as flavonoids and phenolic acids have been found in quinoa, however, its effects have not yet been studied in vivo tests. The aim of this study was to determine the effect of the inclusion of three varieties of quinoa (Chenopodium quinoa Willd.) in an obesogenic diets on the accumulation of adipose tissue and intestinal histomorphometry in obese rats.

Methods: 42 adult obese Holtzman male rats divided into seven groups, of six animals each, were used. With the exception of one group (Control), the others were fed - during 23 days – one of the six diets containing 20% of Altiplano, Pasankalla and Negra Collana quinoas, either boiled or roasted. At the end of the feeding period all the animals were sacrificed and the visceral (VF) and abdominal (AF) fats were weighed. Samples of liver and small intestine (SI) were taken and stored (-20°C) for further analysis of thiobarbituric acid reactive substances (TBARS), and histomorphometry of SI (height, width, area, crypt depth and goblet cells). Data were submitted to ANOVA using MLG under a completely randomized design with 2x2 factorial arrangement + Control; and comparison of means by Fisher test using the MINITAB statistical program.

Results: Visceral and abdominal fats, lipid peroxidation and histomorphometry of SI were not affected significantly (P>0.05) by dietary treatments; however, lipid peroxidation in liver tissues of rats that consumed quinoa-containing diets were significantly lower (P<0.05) than those of the control diet.

Conclusions: Feeding obese rats with diets containing different varieties of processed quinoa do not affect VF or AF accumulation and histomorphometry of SI; however, it affects lipid peroxidation (TBARS values), particularly in liver tissues.

Keywords: Quinoa, Lipid peroxidation, Adipose tissue, Histomorphometry.

Conflict of Interest Disclosure: The authors of this communication declare that they have no conflict of interest.

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144/2949

INFLUENCE OF THE INCLUSION OF PEEL OR FLESH OF TWO VARIETIES OF POTATO (SOLANUM TUBEROSUM SSP) ON FAT TISSUE AND OXIDATIVE STRESS IN OBESE RATS

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Background and objectives: Obesity is a chronic inflammatory disease trigger the release of non-esterified fatty acids and increases oxidative stress (OE), with the risk of developing cardiovascular diseases and atherosclerosis, among others, and to reduce the damage it is suggested to increase the consumption of antioxidants from functional foods, which possess bioactive compounds (BC) that exert protective effect against EO. The potato has BC and its content differs among varieties and part of the tubercle, with a higher concentration in the peel than in flesh. These findings show the need for studies using experimental animals. The aim was to determine the effect of the inclusion of peel or flesh of two varieties of potato, Yungay (Y) and Canchan (C) on the accumulation of adipose tissue and oxidative stress in obese rats.

Methods: 24 obese Holtzman male rats were divided into four groups of six rats each. Each group was fed - during 28 days - one of the four diets that contained 10% of peel or flesh of the Y or C variety. At the end of the feeding period, all the animals were sacrificed. The weights of visceral and abdominal fat were recorded; liver samples were taken to measure the antioxidant status by the SOD (superoxide dismutase) and CAT (catalase) activities. The data were subjected to ANOVA under a Completely Randomized Design with 2x2 factorial arrangements and the comparison of means by the Fisher Test using the MINITAB statistical program.

Results: Dietary treatments did not affect (P>0.05) visceral and abdominal fat tissue weights. The Yungay variety had a highly significant effect (P<0.01) on the enzymatic activity of CAT and it showed significant interaction (P<0.05) for the diet with flesh of Yungay. Also, the SOD variable presents a very significant interaction (P<0.01) between variety and part of potato, being higher in the diet with flesh of the variety Yungay.

Conclusions: Diets with peel or flesh of potato varieties do not decrease the accumulation of visceral or abdominal fat tissue in experimental animals. The flesh of the Yungay variety promotes better enzymatic activities of catalase and superoxide dismutase in the liver.

Keywords: Potatoes, Rats, Oxidative stress, Adipose tissue.

Conflict of Interest Disclosure: The authors of this communication declare that they have no conflict of interest.

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144/2959

FAST HISTAMINE QUANTIFICATION IN TILAPIA FILLETS USING INFRARED SPECTROSCOPY

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Background and objectives: Histamine is a biogenic amine synthetized by food spoiling bacteria that exhibit L-histamine decarboxylase activity. Within biogenic amines it is the one with the highest toxicity level, followed by: tyramine, tryptamine, phenethylamine and cadaverine, respectively. Its major incidence it's in fish and food with high contents of the amino acid histidine. It is known that when ingested in doses greater than 50mg/100g, it causes scombroid poisoning, a food borne illness with severe allergic-like symptoms. In order to detect it, chromatographic methods have been used but most of them are time consuming. In this work, we develop a fast method to detect and quantify histamine in tilapia fillets without sample extraction, derivatization nor chromatographic runs, using infrared spectroscopy (FT-IR).

Methods: The frozen tilapia fillets were purchased in the supermarket and immediately transferred to the laboratory in a cooler. They were thawed and washed using deionized water. The initial histamine concentration was determined by HPLC using a calibration curve from 1 to 1,000ppm (7 points, each point by triplicate). For the FT-IR analysis, 45 grams of fillet were doped with Histamine·2HCl as free base at: 1, 5, 10, 50, 100, 200, 500, 1000ppm and homogenized. The doped tilapia samples were deposited then on the ATR crystal and measured in the IR-medium region five times each. The quantification model was performed by partial least squares (PLS) using the 1484 to 1054 cm^{-1} and 909 cm^{-1} region which showed spectral variation according to histamine concentration.

Results: The most accurate model was the one that obtained a RMSEC = 2.17 and a r^2= 0.994, as well as a RMSEP = 4.89 and r^2 = 0.9983 (10 factors). The optimal range for histamine quantification was determined to be between 10 and 200 ppm, which is desirable because international regulations often allow a maximum of 100ppm for unprocessed fish and 200ppm for processed fish, respectively; excepting the US (50ppm). Using this technique, it is also possible to reduce the analysis time from several hours to only 10 minutes.

Conclusions: Infrared spectroscopy can be a fast and reliable technique to detect and quantify histamine in tilapia fillets.

Keywords: Histamine, Tilapia, Infrared spectroscopy, Partial-Least Squares regression.

144/2965

A HIGH GLYCEMIC INDEX PELLET-DIET INDUCES METABOLIC DISORDERS AND INCREASED ADIPOSE TISSUE PPARΓ EXPRESSION IN EXPERIMENTAL MODEL

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Background and objectives: Modern society food habits have caused an increase in the incidence of non communicable chronic diseases (NCD). Although these food habits present diversity, they are mostly associated with obesiogenic metabolic disorders. Growing consumption of industrialized foods with high glycemic index and caloric density has increased the incidence of obesity-related diseases, commonly a result of metabolic disorders induced by diet. Thus, the objective of this study is to investigate the effect of diet on the parameters involved in the genesis of these complex sets of metabolic alterations. In this study an experimental diet was produced and analyzed, evaluating its effect on markers of metabolic disorders.

Methods: Two groups of adult male Wistar rats (n = 5 for each group) were feed with a standard or experimental diet for 17 weeks. Centesimal composition, glycemic index and glycemic load were determined for the experimental diet. Animals were evaluated during the experiment using abdominal perimeter and Lee index. At the end of the experiment, biochemical metabolic analysis and PPARγ mRNA expression in retroperitoenal and gonadal adipose tissue were performed.

Results: The experimental diet group presented a high glycemic index and glycemic load, increasing Lee index and abdominal perimeter of animals from the 6th week of experiment. Fasting glycaemia, triglycerides, VLDL-C, retroperitoenal and gonadal adipose tissue PPARγ expression were significantly increased in the experimental diet group in comparison to standard diet group (p < 0.05).

Conclusions: Thus, the results indicate that this diet represents a new model to induce obesity and metabolic disorders and might contribute for further studies in the field.

Keywords: Metabolic disorders. Cafeteria diet. PPARγ.

144/2966

A ANTI-OBESITY AND ANTI-INFLAMMATORY TRYPSIN INHIBITOR FROM TAMARIND REDUCES FOOD INTAKE AND IMPROVES INFLAMMATORY STATUS IN RATS WITH METABOLIC SYNDROME

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Background and objectives: Metabolic syndrome (MetS) is an obesity-based condition characterized by the presence of insulin resistance (IR), high blood pressure and dyslipidemia. MetS clinical features include endothelial dysfunction and a pro-oxidant, pro-thrombotic, inflammatory condition. Trypsin inhibitors are studied in a variety of models for their anti-obesity and anti-inflammatory bioactive properties. Our group has previously demonstrated the satietogenic effect of tamarind seed trypsin inhibitors (TTI) in eutrophic rat models and anti-inflammatory effects of other trypsin inhibitors. In this study, the objective was to evaluate the effect of TTI on satiety and inflammatory parameters in an experimental model of metabolic syndrome (MetS).

Methods: Three groups of n=5 male Wistar rats with obesity-based MetS received for 10 days one of the following: 1) Cafeteria diet; 2) Cafeteria diet + TTI (25 mg/Kg); 3) Standard diet.

Results: TTI reduced food intake in animals with MetS. Nevertheless, weight gain was not different between studied groups. IL-6 production did not differ between groups. Interestingly, TNF-α was lower in animals receiving TTI.

Conclusions: Our results corroborate the satietogenic effect of TTI in a MetS model. Furthermore, we showed that TTI added to a cafeteria diet may decrease inflammation regardless of weight loss. This puts TTI as a candidate for studies to test its effectiveness as an adjuvant in MetS treatment.

Keywords: Obesity. Cafeteria diet. TNF-α. Glycemia.

144/2969

FORMULATION OF A MEAT ALTERNATIVE PRODUCT: VIENNA SAUSAGE, SOURCE OF FIBER AND HEALTHY FATS

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Background and objectives: There is a big demand of process foods rich in critical nutrients, just as saturated and trans fats, sodium, which is associated to the development of cardiovascular diseases, 90 % of meat food are composed by a big amount of these nutrients. The formulation of meat products can be modified by replacing traditional ingredients with healthy ones, without losing competitive or modifying organoleptic properties.

Our objective is to formulate a Viena sausage source of fiber, reduce in fats and replace saturated fats with fats rich in oleic acid. The Lanus National University is been developing several types of functional foods, with fats substitution and fortified in fiber.

Methods: Several fibers were evaluated (from carrot, wheat, citrics and inulin) regarding water retention and gelling. Afterwards two Viena saussages formulations were developed: A) "Standard": based on standard market formulation B) "Healthy alternative": with high oleic oil, and inulin with wheat fiber mix.

Pork and cow lean meat, pork fat, soybean isolate, starch, allowed stabilizers, preservatives, flavorings and colorings were used. In the second formula a mix of inulin and wheat fiber was added. The pork fat was replaced by high oleic sunflower oil.

The procedure was emulsifying the ingredients by chopping and mixing with a colloid mill, stuffed in cellulosic gut, cooking and pasteurized up to 72ºC, fast cooling, saussages peeling and vaccum packing in bags.

The bags were preserved at 8ºC during 8 weeks, every 15 days microbiological and stability tests were carried on. Finally a sensory evaluation took place with 25 judges

Results: The elaborated saussages were microbiologically suitable, with 6% of healthy fiber, 12 % of protein, 7% of total fat (5% were monounsaturated fats), the packaging did not pour, their organoleptic features were suitable and were accepted by the 90% of the judges.

Conclusions: It is suitable to use mix of vegetable fibers and specific oils for formuling healthy and competitive Viena saussages, without rising manufacturing costs too high, just $1,5 per each 6 units pack.

Keywords: Meat healthy products, Fatty acids, Saussages, Fiber.

144/2986

A QUERCETIN OXIDATION PRODUCT WITH EXTREMELY POTENT ANTIOXIDANT AND CYTOPROTECTIVE PROPERTIES

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Background and objectives: Within the frame of our studies on the redox consequences associated with the oxidation of polyphenols, we recently reported that the oxidation of quercetin leads to the formation of a mixture of metabolites whose ROS-scavenging properties are similar to those displayed by the non-oxidized flavonoid (Food Chem. 234:479–485, 2017). In the present work we established the identity of such metabolites, isolated them and investigated their antioxidant and cytoprotective properties in cultured cells.

Methods: The identification and isolation of the metabolites was done chromatographically by means of HPLC-DAD and HPLC-ESI-MS/MS. Each metabolite was added to Hs-68 and Caco2 cells that were exposed to indomethacin or to hydrogen peroxide as ROS-generating agents. The antioxidant and cytoprotective effects of these compounds were evaluated through their dichlorodihydrofluorescin oxidation-inhibiting and LDH leakage-preventing activities, respectively.

Results: Under the chromatographic conditions employed by us, twelve major metabolites were evident. Of these, only one, identified as 2,5,7,3',4'-pentahydroxy-3,4-flavandione (FD), was able to account for the antioxidant and cytoprotective effects afforded by the whole oxidized quercetin mixture. Notably, FD exerted such effects at low nanomolar concentrations (1-10 nM), revealing that its antioxidant and cytoprotective potency is three-to-four orders of magnitude greater than that of quercetin (which was effective only at near 10 μM concentrations). Almost identical results were seen in Hs-68 or Caco2 cells. The effects of the flavandione (5 nM) were equally seen regardless of whether this compound was added to the cells 40 min before the ROS-generating agents (namely, pre-incubated and washed-off after) or together with the latter (i.e., co-incubated during 40 min); thus, suggesting that the FD is able to early trigger antioxidant responses intracellularlly.

Conclusions: The present results demonstrate for first time that a product of quercetin oxidation is not only active in preventing cells from oxidation and lytic damage, but also reveal that in the case of the FD formed, this metabolite is three-to-four orders of magnitude more potent than quercetin. The present results strongly suggest that when it comes to the antioxidant actions of quercetin, our attention should be increasingly extended towards some of its oxidation products.

Keywords: Quercetin. Oxidation. Metabolites. Antioxidant. Cytoprotection.

Further collaborators:

144/3011

GLYCEMIC INDEX AND GLYCEMIC LOAD OF THREE COMMERCIAL WHEAT & FLAX FIBER PRODUCTS

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Background and objectives: There is a great interest of the industry on food components physiologically active in flaxseed, besides the hypoglycemic effect of soluble fiber. Most cereals contain a large amount of carbohydrates, among them wheat, wich is characterized by its massive consumption in many countries. With the aim of incorporating healthier consumption strategies, different technological processes have been used in order to reduce the glycemic index of these products, however, there is still controversy about the action of dietary fiber in the reduction of this indicator. In this study the glycemic index and glycemic load of three commercial wheat products were determined in healthy individuals

Methods: The glycemic index and glycemic load of three commercial wheat products were determined in 21 healthy individuals who randomly consumed 4 types of foods of 50 g of carbohydrates each: white bread (PH), whole wheat bread with flax fiber (PF), wheat tortilla without fiber (TS) and glucosed solution as reference product (SG). Fasting and post-prandial glycemia was measured at times 15, 30, 45, 60, 90 and 120 min. Insulin was measured at 0 minute and 120 min

Results: The area under the glycemia curve was lower for the three product types (PB) 13491 ± 1426 (PF) 12136 ± 1322 (TS) 13002 ± 1248 than for the reference product (SG) 14162 ± 1245. The glycemic index values PB 67.41 ± 1.2 (PF) 61.19 ± 1.4 and (TS) 66.99 ± 1.1 and glycemic load (PB) 16.31 ± 1.6; (TS) 15.11 ± 2.1 were lower for the product with fiber (PF)10.91 ± 1.1, with no difference in insulin concentration

Conclusions: This study suggests that the amount of carbohydrates and type of fiber contained in these products can be considered as intrinsic factors In their nutritional composition, capable of affecting post-ingestion glycemic response in healthy individuals.

Keywords: Glycemic index, Flax, Fiber, Wheat.

Further collaborators:

Track 7: Food Culture Practices and Nutritional Education

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DIETARY PATTERNS, SOCIO-DEMOGRAPHIC FACTORS AND ANTHROPOMETRIC MEASUREMENTS IN ADULT NEW ZEALANDERS

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Background and objectives: No studies have investigated the dietary patterns of a representative sample of NZ adults. This study investigated associations between dietary patterns, socio-demographic factors and anthropometric measurements in adult New Zealanders.

Methods: Dietary patterns were identified using factor analysis in adults 15 years plus (n=4657) using 24-hour diet recall data from the 2008/09 NZ Adult Nutrition Survey. Multivariate regression was used to investigate associations between dietary patterns and age, gender and ethnicity. After controlling for demographic factors, associations between dietary patterns and food insecurity, deprivation, education, and smoking were investigated. Associations between dietary patterns and BMI and waist circumference were examined adjusting for demographic factors, smoking and energy intake.

Results: Two dietary patterns were identified. Pattern one ('healthy') was characterised by breakfast cereal, low fat milk, soy and rice milk, soup and stock, yoghurt, bananas, apples, other fruit and tea, and low intakes of pies and pastries, potato chips, white bread, takeaway foods, soft drinks, beer and wine. Pattern two ('traditional') was characterised by beef, starchy vegetables, green vegetables, carrots, tomatoes, savoury sauces, regular milk, cream, sugar, tea and coffee, and was low in takeaway foods. The 'healthy' pattern was positively associated with age, female gender, NZ European or other ethnicity, and having a secondary school qualification, and inversely associated with smoking, food insecurity, area deprivation, BMI and waist circumference. The 'traditional' pattern was positively associated with age, male gender, smoking, food insecurity and inversely associated with having a secondary school qualification.

Conclusions: 'Healthy' and 'traditional' dietary patterns were associated with socio-demographic factors and anthropometric measurements. These findings could be used to inform future nutrition interventions in adult New Zealanders

Keywords: Dietary patterns, Factor analysis, Obesity, Socio-Economic Status.

144/243

KNOWLEDGE ON NUTRITION COMPONENT OF SAFE MOTHERHOOD INITIATIVE AMONG PRIMARY HEALTH CARE WORKERS IN IBADAN NIGERIA

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Background and objectives: Maternal and child health is frequently under threat due to multifaceted challenges. The safe motherhood initiative (SMI) was designed to lessen the burden of maternal and child mortality with the primary health care workers (PHCW) as important stakeholders. We hypothesise that PHCW in Nigeria has sufficient knowledge about the nutrition component (NC) of SMI. This study aims to evaluate the knowledge on NC of SMI among PHCW in Nigeria.

Methods: 153 PHCW (from 21 Primary Health Centres across 2 local government areas) in Ibadan Nigeria identified through multi-stage sampling completed validated semi-structured questionnaires on socio-demographic characteristics, and knowledge of PHCW was assessed using a validated 101-question knowledge scale (designed based on the NC of SMI by nutrition experts) measured on a 4-point Likert scale. Knowledge score (KS) was categories as poor (≤mean KS) and good (>mean KS) and χ2 test was used to evaluate the association between level education, years of experience and level of knowledge of PHCW at p<0.05.

Results: Most PHCW (98.5%) were females, 16.9% were trained certified nurse, 18.9% had a minimum of bachelor's degree education and 22.8% had over 20 years of experience. About 27.4% of PHCW were unable to adequately define the NC of SFI, 45.7% were unable to cite the benefits of breastfeeding, 29.4% was unable to provide at least four nutritionally-related information necessary for pre-natal care. Overall mean KS of PHCW was 58.8±5.9. While 38% of certified nurses and 37.9% with a minimum of bachelor's degree education had poor knowledge, percentage of PHCW with good knowledge of NC of SMI was significantly higher (p=0.025) among PHCW with > 20 years of experience (77.1%) compared with PHCW with <20 years of experience (36.4%)

Conclusions: Knowledge on NC of SMI among PHCW is low and the year of experience is likely to influence the level of knowledge of PHCW on NC of SMI. Continous nutrition education with an emphasis on NC of SMI is necessary for PHCW in this setting.

Keywords: Nutrition knowledge, Primary health care workers, Safe motherhood initiative, Maternal and child health, Nigeria.

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BASELINE KNOWLEDGE OF ANAEMIA AMONG IN-SCHOOL ADOLESCENTS IN DELTA STATE, NIGERIA

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Background and objectives: Anaemia is ubiquitous yet imperceptible among adolescents, especially in developing countries. It is associated with poor cognitive and learning ability and likely risk of morbidity and mortality. Furthermore, knowledge of anaemia among adolescent in sub-Saharan African countries especially Nigeria is often under-reported in literature. In this study, we assessed the knowledge of anaemia among in-school adolescents in Delta state, South-south Nigeria.

Methods: Using a multi-stage sampling technique, 498 in-school adolescents; selected after duly informed consent from secondary schools across Delta state, Nigeria completed validated semi-structured questionnaires on socio-demographic characteristics and knowledge of anaemia was evaluated using a validated 15-point knowledge scale. Respondents were categorised as early adolescent (EA) or late adolescent (LA) by their age; 10-14years and 15-19years respectively. Also, knowledge score (KS) was categories as poor (≤mean KS) and good (>mean KS). Independent sample t and χ^2 tests at $p<0.05$ was applied to assess the relationship between age, sex and KS of respondents

Results: Mean age of respondents was 15.4±2.0 years, 44.4% were females, and mean KS was 1.8±1.1. Though KS insignificantly differed (t=-0.8, p=0.430) between males (1.8±1.1) and females (1.9±1.1), 59.2% and 40.8% of males and females respectively had poor KS (χ^2= p=0.105). In addition, KS was significantly higher (t=-2.4 p=0.012) among LA (1.9±1.2) compared to EA (1.6±1.1).

Conclusions: Most adolescents had poor knowledge of anaemia, and a nutrition education intervention would be necessary to improve the poor knowledge about anaemia among adolescents in this setting.

Keywords: Adolescent. Nutrition knowledge. Anaemia. Delta state. Nigeria.

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PREDILECTION IN SELECTION OF GRUELS AS A GUIDE FOR THEIR POTENTIAL ROLE AS VEHICLES FOR NUTRIENT-SUPPLEMENTATION DURING PREGNANCY AND LACTATION IN THE WESTERN HIGHLANDS OF GUATEMALA

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Background and objectives: Previous studies on pregnant and lactating women's diets have shown deficits in protein and micronutrient intakes, raising the question of what dietary vehicle might be appropriate for nutrient-supplementation. Thin gruels have been shown to be the hot beverage of preference in pregnancy and lactation to increase energy intake and ostensibly improve human milk production. Our objective was to identify the most frequently-selected gruels in three demographic areas of Guatemala, as possible vehicles for supplementation.

Methods: We invited women between 17-70 years of age from rural, semi-urban and urban Quetzaltenango Province to participate by bringing gruels of their choice to a sensory-testing exercise. Study procedures and objectives were explained and participation was voluntary. Women provided oral consent and were gifted with thermos-bottles to bring a gruel sample of their spontaneous selection to the test site.

Results: 13 different gruel varieties were brought by 127 women: 52 rural; 33 semi-urban; and 42 urban. Gruels prepared were (in descending order): Incaparina® (27.6%), cracked-corn (15.7%), oatmeal (15.7%), wheat germ (9.4%), pinol (8.7%), corn-dough (5.5%), rice (3.9%), corn-soy blend (CBS) (3.9%), plantain (3.1%), cornstarch (3.1%), 13-Cereals® (1.6%), sweet corn (0.9%), and Bienestarina® (0.9%). Predominant gruels by area were: cracked-corn gruel in rural area (28.8%) and Incaparina® in semi-urban (30.3%) and urban (42.9%).

Conclusions: Local culture, as well as access to ingredients, may be a factor determining the type of gruel selected, meaning they were the "available" ones, but not strictly the "favorites". A predilection for unprocessed ingredients for gruels was noted in rural settings, whereas industrially-processed gruels tended to be preferred in urban and semi-urban areas.

Keywords: Gruels, Food preference, Variety, Guatemala.

HOMESTYLES: A RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Few interventions have aimed to enable and motivate parents to gain the skills and self-confidence needed to shape home environments and lifestyles to be protective against childhood obesity. Thus, HomeStyles, a parent-directed online intervention, was created to help parents better control factors associated with increased risk of obesity in their homes and lifestyles.

Methods: Parents completed the baseline survey and were randomly assigned to the experimental or attention control group. Both groups received instructional guides in a mini-magazine format. Guide content for the experimental group focused on diet, physical activity, and sleep. Content was home safety for the control group. After receiving 8 different guides (~1/month), parents completed the post survey. Surveys included an array of valid, reliable scales assessing cognitions and behaviors associated with childhood obesity prevention.

Results: The 172 participants (n=83 experimental; n=89 control) all had >1 child 2 to <6 years and most were female (93%), white (58%), had at least some post-secondary education (87%), and had middle-high family affluence (84%). Within group comparisons showed that between baseline and post surveys, parents and children in both study groups significantly (P<.01) increased physical activity; parents improved meal planning behaviors, meal preparation self-efficacy, healthy weight-related behaviors modeling; and decreased household availability of salty/fatty snacks. However, comparisons of baseline and post surveys revealed that only the experimental group significantly reduced total screen-time, increased family meal frequency, reduced frequency of eating meals in front of the television, increased frequency of eating meals at a dining table, reduced use of media devices and television while eating, improved self-efficacy for nearly all childhood obesity-protective behaviors, increased encouragement of children to be physically active, increased self-efficacy for getting children to be physically active, and improved values associated with modeling physical activity behaviors. ANCOVA revealed that the experimental group had better improvements in physical activity, screentime, family mealtime behaviors, self-efficacy for childhood obesity-protective behaviors, and values placed on not modeling sedentary behavior for children at post-survey than the control group.

Conclusions: The HomeStyles program for families with preschool children was effective in promoting improvements in an array of obesity-preventive cognitions and behaviors.

Keywords: Parent, Child, Obesity prevention, Nutrition education.

Conflict of Interest Disclosure: Funding. National Institute of Food and Agriculture in the United States Department of Agriculture (2011-68001-30170).

COMPARISON OF LIFESTYLE PATTERNS AND BODY WEIGHT MANAGEMENT PRACTICES BETWEEN NORMAL WEIGHT AND OBESE FEMALE UNIVERSITY STUDENTS (RIYADH – SAUDI ARABIA)

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Background and objectives: Introduction: The prevalence of overweight and obesity among Saudi women is reaching 44%. Instead of adopting healthy lifestyle, this population may adopt some weight management practices (WMP) which may be unhealthy and some may lead to serious health problem

Objectives: To compare lifestyle patterns and WMP adopted by obese and normal weight Saudi females by assessing the difference in energy and macronutrients intake, dietary habits, level of physical activity and WMP.

Methods: Cross sectional study among female students at Princess Nourah Bint Abdulrahman University (PNU) (Riyadh – KSA.), 200 participants were randomly selected, assigned in two groups in obese and normal weight (each group have 100 students) depending on BMI. Data collected through questionnaire and analysis was performed using SPSS program, Chi2 and T-test were used to assess the difference between the two groups.

Results: Uunhealthy WMP were high among obese students. Total calorie intake was not different, however fat intake was significantly higher in obese group (p<0.01). Level of moderate active was significantly higher in normal group than obese group (33% versus 19%, respectively). Food frequency consumption showed that fruit, date and dressing were higher in obese group compared to normal weight group (p-value = 0.02, 0.01 and 0.03).

Conclusions: Obese PNU female students adopt unhealthy WMP besides their nutritional intake and dietary habits are not healthy. Increasing awareness about the healthy lifestyle to manage weitht is urgently needed.

Keywords: Weight practice management, obesity, female University students, Saudi Arabia

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THE EFFECT OF NUTRITION EDUCATION PROGRAM ON DIET QUALITY SCORES IN POLISH ADOLESCENTS: 3- AND 9-MONTH FOLLOW-UP. ABC OF HEALTHY EATING PROJECT

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Background and objectives: The impact of nutrition education programs on adolescents' dietary patterns in short- and long-time perspective is weak known [1, 2]. Objective: Assessment of the effect of nutrition education program on diet quality scores after 3- and 9-moth follow-up in Polish adolescents.

Methods: The prospective study involved 464 adolescents aged 11-13 years at baseline. Based on frequency food consumption two diet quality scores (range: 0-100 points) were established: pro-Healthy Diet Index (pHDI) included dairy products, fish, vegetables and fruit; non-Healthy Diet Index (nHDI) included fast foods, sweetened beverages, energy drinks and sweets. After 3- and 9-month follow-up changes in pHDI and nHDI were compared between 'control' group (n=145) and 'educated' group (n=319) in which one-time nutrition education program was implemented.

Results: The mean pHDI was insignificantly higher in 'educated' than 'control' group after 3-month (28.0 vs 27.3 points) and 9-month follow-up (28.9 vs 26.4 points). The mean changes in pHDI were insignificant. The mean nHDI was significantly lower in 'educated' than 'control' group after 3 months (12.4 vs 15.7 points) and 9 months (14.0 vs 16.7 points). The mean changes in nHDI were significant. After 3 months nHDI was lower by 1.8 points in 'educated' but higher by 1.1 points in 'control' group, after 9 months lower by 0.2 points and higher by 2.1 points respectively.

Conclusions: One-time nutrition education episode can reduce unhealthy dietary habits in Polish adolescents but not improve pro-healthy dietary patterns, both in short- and long-time perspective.

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Keywords: Adolescent, Diet quality score, Dietary pattern, Education program.

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MATERNAL NUTRITION EDUCATION OFFERED DURING ANTENATAL, SELF-EFFICACY AND NEEDS OF MIDWIVES IN MULAGO HOSPITAL, KAMPALA, UGANDA

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Background and objectives: An adequate nutrition during gestation is an important environmental factor influencing pregnancy outcome. Maternal malnutrition during pregnancy affects the health of the mother and baby. Midwives are preferably well placed to offer nutrition education to pregnant women; however they may not be equipped with the knowledge, skills and confidence to deliver nutrition education. The aim of this study was to explore the maternal nutrition education (MNE) in a hospital setting, determine the perceived self-efficacy and identify the nutrition education needs of midwives in Mulago hospital antenatal care clinic.

Methods: The study employed an exploratory qualitative design. Six in depth interviews, 6 direct observations for group education, and 12 one on one observations of midwives and pregnant women interaction were conducted. The transcribed interviews and field observation notes were analyzed using the latent content analysis.

Results: Maternal nutrition education characteristics, self-efficacy and maternal nutrition education needs of the midwives were the emerging themes. The delivery of MNE was inadequate in scope and depth. Surprisingly, the MNE was offered to only preg-

nant women attending the first ANC visit. The routine antenatal education session lasts 45 minutes to 1 hour, covering a variety of topics but MNE is allotted minimal time (5-15 minutes). The MNE organization, mode of delivery, guidelines, materials/ resources and service environment were grossly deficient. The midwives demonstrated good communication/facilitation skills during the sessions, and highlighted the nutrient rich dietary sources, increased nutrient demand, as well as food safety and hygiene requirements. Overall midwives' MNE competences were limited and had moderate perceived nutrition education self-efficacy. Midwives were ignorant about the maternal nutrition guidelines. Relevance of appropriate weight gain during pregnancy, guidelines for healthy habits, avoidance of substance abuse and nutrition precautions in special circumstances were missing in MNE. Information, MNE resources, infrastructural, and health systems gaps were identified.

Conclusions: The scope and depth of MNE is inadequate. There are midwives, health systems related gaps for successful MNE conduct. There is need for alternative innovative MNE delivery models, and strengthening capacity of midwives in MNE.

Keywords: Maternal nutrition education, Midwives, Self-efficacy, Education needs.

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IMPACT OF AWARENESS CAMPAIGNS IN LOWERING SODIUM LEVELS IN COMMERCIAL WHITE BREAD IN MOROCCO

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Background and objectives: Sodium over-consumption is closely linked to hypertension, stroke and other cardiovascular diseases (CVD). According to the World Heath Organization's estimates, hypertension prevalence Morocco exceeds 30%, and could be responsible, with other CVD, of 34% mortalities in the country. Bread is one of the most important sources of sodium in several countries, including Morocco. This study aims to assess the impact of 5 years of awareness campaigns (2011 – 2016) in reducing the quantity of sodium chloride used in preparing commercial white bread, and in improving nutritional knowledge and practices related to sodium.

Methods: Nutritional knowledge, attitudes and practices (KAP) about sodium were assessed using a questionnaire in interviews with 418 bakeries in Casablanca, Morocco. The questionnaire covered topics on the consequences of sodium over-consumption and recommended daily intake. The quantity of sodium chloride in commercial white bread was measured using Mohr's titration method. Bread samples were collected and analyzed from 160 bakeries in 2011 and 2016.

Results: The KAP survey revealed that most professional bakers are not familiar with the campaign (73%) of salt reduction and do not have sufficient information about the recommendations (78%). Still, 72.8% were committed to start reducing added sodium during the preparation of bread. Among the bakers who are familiar with the campaign (27%), up to 14.5% reduced sodium chloride by 33% (from 15 to 10 grams of sodium chloride per kilogram of flour). Analysis of white bread revealed that added sodium chloride decreased from 17.8 g/kg in 2011 to 13.1 g/kg in 2016, which is equivalent to a decrease of more than 25% over five years (0.94 g per year). Still, sodium chloride levels are very different between bakeries (10.5 to 19.6 g/kg).

Conclusions: This study highlights the effectiveness of awareness campaigns and the importance of involving the targeted stakeholders and industry professionals. Although the campaign did not reach all the targeted audience, results show that it was effective among those it reached. More efforts should be invested in involving as much as possible in order to have a more balanced sodium intake.

Keywords: Sodium, Bread, Hypertension, Morocco.

Further collaborators:

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TO DESIGN AND TEST EFFICACY OF SCIENTIFICALLY AND CULTURALLY APPROPRIATE, COMPREHENSIVE NUTRITION AND HEALTH COMMUNICATION PACKAGE FOR RURAL NULLIPAROUS MARRIED WOMEN OF NORTHERN INDIA TO ADDRESS A W

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Background and objectives: Lot of work has been done to reduce LBW and IMR by giving nutritional supplements to pregnant females, but almost no work has been done to address the pre pregnancy issues to deal with this problem, which is more important from health point of view. The study is designed with objective to test an innovative evidence-based package to break the cycle of low birth weight, and high infant mortality. This study

is also innovative in being directed at a population sub-group that has not been targeted

Methods: Study was done at rural field practice area of AIIMS, New Delhi, India. All newly married nulliparous females in selected area were included. More than 700 hundred females were recruited for the study. Intervention and Control area was selected randomly. Intervention was given in form of health education, nutritional education, demonstration of preparation of low cost culturally appropriate food, involvement of grass root level workers, health functionaries, local volunteers etc. Data was collected after one year of follow up

Results: The results after intervention were found to be significant and there was increase in the overall knowledge of females of intervention group. There was observed difference in the knowledge attitude and practices of the females before and after intervention.

Conclusions: Such interventions will lead to better maternal and child health. It will help in breaking the cycle of poor maternal health and thus low birth weight which is a major cause for high infant mortality. We expect to have positive effect of this intervention on women itself and their babies. This is going to influence and will help mothers form a basis for good nutrition to be followed in later years.

Keywords: Low birth weight, nutrition package

Further collaborators:

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144/430
A STUDY OF CHANGES IN FOOD PREFERENCES

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Background and objectives: To identify effective nutrition education ("shokuiku" in Japanese) strategies for preventing picky eating, a survey was conducted to determine changes in food preferences.

Methods: A questionnaire survey to assess changes in food preferences was administered to 1,192 university students living in Tokyo between April and July 2016.

Results: The students' favorite foods were as follows: chicken, strawberries, eggs, beef, white rice and pork. The students' least favorite foods were as follows: tomatoes, green peppers, celery, carrots and liver. The foods that the students disliked as children but grew to like as they got older are as follows: green peppers, eggplants, tomatoes, natto (fermented soybeans) and carrots. The reasons for growing to like these disliked foods were as follows: i) natural with age (aging); ii) refused to eat it because they disliked the appearance (visual aversion); iii) enjoyed the taste once they tried (aversion without even trying); iv) disliked the texture but grew to like it once they forced themselves to eat it; and v) learned of the health and beauty benefits. The foods that the students liked as children but grew to dislike as they got older are as follows (in order of least preference): natto, tomatoes, carrots, raw fish and shrimp. The reasons for growing to dislike these foods were as follows: i) overeating; ii) unpleasant experiences such as diarrhea and vomiting after eating; and iii) decreased appreciation for fatty foods due to aging.

Conclusions: The results of the present study suggest that the following methods could effectively eliminate food dislikes: i) sit back and wait for growth; ii) prepare visually appealing and appetizing foods; iii) provide health information, and iv) encourage eating even if it is only a small amount (for continued consumption). In addition, to prevent people from developing aversions to foods they once liked, overeating should be avoided.

Keywords: Food Preferences, Aging, Overeating, Shokuiku.

Further collaborators: Special thanks to the students who answered to the questionnaires.

144/480
CONSUMPTION OF FOOD NOT SUPPLIED BY HOSPITAL IN A PEDIATRIC ONCOLOGY UNIT

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Background and objectives: The impact of a good or bad nutrition, allowing appropriate physical and cognitive development is already widely described in the literature. In the specific case of pediatric cancer patients, it is important not only for adequate physiological development but also for nutrition as a means of assisting in the maintenance of appropriate physical conditions to transcend the various phases of chemotherapy, surgery and/ or radiotherapy., As well as supply the demands of the disease itself. Based on this, the hospital diet is elaborated, not only with the purpose of providing the necessary nutrients to these patients, but also, an adequate microbiological condition, emphasizing hygienic-sanitary food quality. In view of the current lack of research on the subject, specifically with immunosuppressed patients, the present study aimed to evaluate the consumption of foods not provided by the hospital for patients of a Pediatric Oncology Unit.

Methods: It was an observational, cross-sectional study whose data collection instrument was applied between March and October 2016. This study included legal guardians of patients treated in this Pediatric Oncology Unit for at least seven days and with the oral feeding as the main route of feeding. Those legal guardians of patients receiving an exclusive palliative care or of patients in an exclusive breastfeeding were excluded from the study.

Results: Thirty-two responsible were interviewed, 26 (81.25%) of those reported that they had been advised about the risks of offering non hospital food to the patient; however, 31 (96.87%) reported that the patient for whom they were responsible had already consumed some food not provided by the hospital. Also, when asked

about the types of food offered to these patients, the category encompassing candies and/or snacks was the most cited (32.4%).

Conclusions: Thus, it is suggested that although they had receive guidance, there was not necessarily an appropriation and understanding, showing the necessity to implement effective practices of continued nutritional education, aiming the co-responsibility of patients and their families.

Keywords: Diet. Food Service. Hospital. Medical Oncology. Pediatrics.

144/516

ANALYSIS OF THE PRESENCE OF TERMS SUCH AS HOMEMADE, TRADITIONAL AND SIMILAR TERMS IN LABELS OF INDUSTRIALIZED FOOD PRODUCTS COMMERCIALIZED IN BRAZIL

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Background and objectives: Contemporary Western nutrition has been characterized, at the same time, by the increase in the consumption of industrialized food products and the increase in the consumers' interest in traditional food products. The presence of terms such as homemade, traditional, and others in food labels are not foreseen in the Brazilian legislation on food labeling, since such terms may mislead consumers in relation to the real nature or origin of the product. The present study aimed at identifying the use of terms such as homemade, traditional, original, and others in the labels of industrialized food products in Brazil.

Methods: For this purpose, food labels (front panel) of all the industrialized products available for purchase in a supermarket that belongs to one of the ten greatest supermarket chains in Brazil were analyzed. The total frequency of the terms by food groups according to the Collegiate Directive Resolution (RDC 359/2003) was observed.

Results: From the total of food products, 14.1% (N=778) presented terms in the labels. Terms related to brand age or product age, in different languages, were found with a frequency of 58.1% of labels (N=495), followed by the terms traditional with 20.1% (N=175) and original with 11.0% (N=94) of the labels analyzed. In relation to food groups, group I (bakery products) and II (vegetables and bottled vegetables) presented a higher relative frequency, both with 21.4%.

Conclusions: Findings indicate the frequent commercialization of industrialized products with terms that refer to a more traditional or homemade manufacturing method with local ingredients. In this respect, results highlight that the information contained in food labels ought to be clear and correct, so that the consumer is able to make his own conscious choice on food.

Keywords: Food labeling, Industrialized food products, Food legislation, Front-of package labeling, Nutrition.

144/530

SURVEY ON FOOD AND HEALTH OF JAPANESE BRAZILIAN (NIKKEIJIN)

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Background and objectives: It is generally known that the content of daily meal is greatly affect the human health. Today, the average life expectancy of the Japanese people is 83.7 years, which is the world's longest longevity. Those for Brazilian peoples are 75 years. Japanese migration to Brazil began in 1908. The main objective of this study is to determine the relationship between food and health in people of Japanese ancestry living in Brazil.

Methods: For this reason, 30 Nikkeijin living in Sao Paulo and 28 workers of Japanese descent that came from Brazil to Japan, residents of Ibaraki Prefecture, were interviewed, using questionnaire and surveyed for the content of daily meal.

Results: The average age of Nikkeijin residing in Brazil was 50 years, and the average age of Nikkei residents living in Japan was 33 years. There were many elderly Nikkeijin living alone in Brazil, and those who live in Japan were also lived alone.

For the both groups of Nikkeijin the rice was most commonly eating Japanese food.

Eating habit of the Nikkeijin living in Japan was the Brazilian style, but drinking miso soup was also high. The favorite Japanese food was Sushi and Ramen (Chinese noodles) for those living in Japan. It was characteristic that in comparison with Japanese, the diet of Japanese Brazilian people was that they eat more meat, use more oil and have less intake of fresh vegetables. Salt was mostly used for seasoning.

The amount of sugar ingested from sweets and drinks was high, and accordingly energy intake was also high. Residents in both regions had higher blood pressure and obesity.

Conclusions: There is a possibility that illnesses of Nikkeijin who migrated to Brazil and assimilated into a Brazilian style eating with fatty and meat-rich diet may indicate the future disease trend of Japanese.

Keywords: Japanese Brazilian, Nikkeijin, Japanese, Nutrition,Health.

144/553

FOOD CONSUMPTION PATTERNS IN ADULT WORKERS OF AN ELECTRONIC COMPANY IN ZAPOPAN, MEXICO

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Background and objectives: The study of food consumption patterns has advantages over the conventional dietary studies, since it allows a global evaluation of consumption of different type of diets and its effect on health. The objective was to describe the food consumption patterns identified in a group of adult workers of an electronic company.

Methods: A cross-sectional study was realized in 165 workers. Sociodemographic and clinical data were obtained through personal interviews. Weight, height and body mass index were measured. A food consumption frequency questionnaire was applied and blood samples were collected. Data were grouped by sex and BMI to obtain descriptive and analytical statistics. Principal component analysis was used to determine patterns of food consumption.

Results: 74.5% of the sample were women (25.5%, men) averaged on 39.9 years. 78.2% of participants were overweight or obese. Significant differences were observed between BMI (normal weight, overweight, obesity) and consumption of: ethanol (p=0.02); iron(p=0.01); very low-fat animal food (p=0.04); total sugars and fat-free sugars (p=<0.01) and alcoholic beverages (p=0.009). Four main patterns of food consumption were identified through principal component analysis: 1) healthy, 2) heterogeneous, 3) whole dairy food/sweet pastry, and 4) red meat/processed foods.

Conclusions: The diversity of patterns of food consumption identified shows different ways of eating and drinking of this group of workers, as they eat a wide variety of foods and beverages, sometimes healthier or less healthy, which would contribute to explain in part, their food behavior, which could have an impact on health.

Keywords: Food patterns, Workers, Food consumption.

144/587

IMPROVED COMPLEMENTARY FEEDING PRACTICES IN THE SELECTED AREA OF DHAKA CITY

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Background and objectives: According to Bangladesh DHS 2014, 23% children of 6-23 months properly feed complimentary food (minimum acceptable diet). The main objective of the study was to improve the complementary feeding (CF) practice through nutrition education and to see the effect of five selected improved homemade CF recipes on behavioral practice of CF.

Methods: A community based randomized controlled trial was conducted for 3 months among 130 children aged 6-23 months in two areas (Mirpur and Mohammadpur) of Dhaka city. Intervention group (n= 56) received 2 months nutrition education together with recipe trials demonstrating 5 recipes selected from the nationally approved manual titled 'Improved recipes for complementary feeding of children aged 6-23 month, 2013' and followed up for next one month. The control group (n=57) were only observed. Information on infant feeding practice including frequency, quantity, quality, diversity, hygiene practice and anthropometry were collected at baseline and endline in both groups but infant feeding practice and anthropometric data were collected two times more in intervention group.

Results: The feeding frequency had significantly increased 33% higher (4 Vs. 3 times) in the intervention group than the control group through nutrition education during the observation period (p<0.001). Weight gain of the children had increased 7% in intervention group (9.02 Vs. 8.42 Kg) compared to the control group after the intervention (p <0.001). The quantity of feeding items had increased 16% (17g vs. 9g) in the intervention group than control group. Feeding of commercially prepared infant food was decreased by 60% in the intervention group. At the end of the follow-up, the highest to lowest consumed recipes were khichuri (32.1%), fruit firni (23.2%), small fish chop (16.1%), chirar polao (14.3%) and Egg-Suzi (14.3%) in intervention group. Percentage of hand washing before feeding and cooking had increased from 33.9 to 80.4 in intervention group and 47.4 to 52.6 in control group.

Conclusions: Nutrition education together with introduction of improved recipes can effect positively towards behavioral changes and feeding practices on Complementary Feeding.

Keywords: Complementary feeding, Nutrition education, Recipe trial, Behavioral change.

SHORT-TERM SCHOOL BASED ORIENTATION PROGRAM CAN IMPACT TO CREATE AWARENESS ON NUTRITION AMONG ADOLESCENTS

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Background and objectives: Intervention on adolescent nutrition is recognized as a key intervention to break the intergenerational cycle of malnutrition. Although, The Government of Bangladesh has adopted supportive policies and operational plans, the nutrition scenario of adolescents are still far from optimal.

The aim of the project was to increase knowledge and awareness on nutrition among the adolescent girls through an extensive orientation program.

Methods: This orientation program aimed to cover importance of adolescent's growth and nutrition, physical and mental changes, healthy food choice, nutritional requirement, advantages and deficiency disorder of different food/food groups, personal hygiene and sanitation, discourage child marriage and early child bearing.

2-hours long orientation session including video, demonstration of an innovative IEC tool on adolescent's nutrition was conducted through interactive multimedia projection among the adolescent girls' who are studying between VI-XII grade of school/college/madrasa. The rounded double sided paper disk IEC tool contained information on ideal body weight, height, BMI, and recommended nutrient intake by age group (10-19 yrs). Other side of the tool included best nutrient sources, nutrient composition, benefits and deficiency disorders of 9 food/ food groups and food pyramid of Bangladesh. Demonstration to easily define age wise ideal body weight, height, BMI, energy and nutrient requirements and best food sources was performed as a part of the orientation session.

Results: More than 75,000 adolescent school girls aged between 10-19 years were oriented from 350 orientation seminars at the District level. Out of 10, over 95% of the adolescent girls scored full marks in the post test. 100% adolescent girls were able to answer the question about number of nutrient, symptoms of malnutrition and nutrition & hygiene that should maintain during adolescent. Little difference was found in scores by Division.

Conclusions: Highest interest and active participation was observed among the adolescent girls. Such orientation program on nutrition targeting adolescent girls should be held regularly as part of school health program of Bangladesh.

Keywords: Adolescent, Adolescent Nutrition, School health program, Nutrition, Nutrition education.

ENVIRONMENTAL EDUCATION AND NUTRITIONAL BEHAVIOR BASED ON TRADITIONAL MEDICINE: CASE OF INTERNALLY DISPLACED WOMEN IN THE 2010 POST-ELECTORAL CRISIS IN IVORY COAST

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Background and objectives: During the Ivorian crisis, population displacement has been observed across the country with a peak after the post-election crisis of November 2010; Thus, food system have been destroyed. In this case, green nutrition based on their pre-acquired environmental knowledge (Environmental education) was adopted, especially in their feeding behavior, in order to avoid a decline of calories and to allow food cure in such a difficult period. The objective of this scientific production is to understand the determinants and logics that underpin the appropriation of Green nutrition method derived from traditional medicine, based on knowledge of the environment, plants, by internally displaced women due to war from the region of Aboisso, near the border of Ghana, in Ivory Coast.

Methods: The data are collected from the International Organization for Migration (IOM) (2009) and from the town hall of Aboisso (2010) in Ivory coast on 213 internally displaced women. Non-probabilistic sampling was used . A questionnaire, an interview guide and the observation grid were also used to allow triangulation of information . Content analysis and statistical processing were carried out on Excel and the Sphinx Lexica V5 software.

Results: 73% of displaced women surveyed use traditional food practices due to the military crisis situation. On these, only 13% seek the advice of their spouse. The most used method at 86% is broth of crushed tree pods. The rest in leaf tea, they drink. 37% of women use the advice of a traditional practitioner (specialist in plant medicine), the rest is self-medication (55%) or advice from friends (8%) with a good knowledge of the contribution of Nature to diet and gain in calories. The choice of the traditional method, based on knowledge of environment, stems from the lack of money at 15%, the behavior of the family at 52% and the living conditions at 33%.

Conclusions: In times of crisis, traditional medicine based on a good knowledge of the environment (environmental education beforehand) nevertheless supports modern nutritional practices. These methods need to be examined in the different aid programs for displaced persons in order to support psychologically displaced women.

Keywords: Environmental education, Nutritional behavior, Traditional medicine, Internally Displaced Women, Ivory coast

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USE OF JOB AIDS TO IMPROVE MATERNAL KNOWLEDGE OF NUTRITION RELATED ANTENATAL MESSAGES IN MOTHER AND CHILD HOSPITALS, ONDO STATE

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Background and objectives: Nutrition education is essential to improve nutritional status of pregnant women, yet its delivery is often ineffective in Nigeria's antenatal clinics. Although job aids have been shown to improve delivery of education in health programmes, its use is limited in nutrition education. This study was designed to evaluate the effect of the use of job aids on nutrition knowledge of pregnant women in Ondo State, Nigeria.

Methods: This quasi-experimental study involved 200 pregnant mothers attending antenatal services at Mother/Child Hospitals in Akure (experimental-100) and Ondo (control-100). A semi-structured, interviewer-administered questionnaire was used to collect information on socio-demographic characteristics. Knowledge on general health, nutrition content of antenatal messages and nutrient-food association were assessed using a 40-point scale categorized as good ($\geq$23) or poor (<23) knowledge. Job aids was developed from nutrition component of antenatal booklet to support nutrition education in experimental group while control group used conventional nutrition education. Baseline and endline knowledge were assessed and compared using paired t-tests at $p<0.05$.

Results: Age of mothers in experimental (29.0 ± 3.9years) and control group (28.1 ± 4.5years) was similar while 93.0% (experimental) and 86.0% (control) groups had at least secondary education. At baseline, more experimental (34.0%) than control (30.0%) mothers considered colostrum 'poor' for a baby and more control (55.0%) than experimental mothers (47.0%) knew breastfeeding should be initiated within one-hour of birth. More control (44.0%) than experimental (37.0%) knew appropriate attachment during breastfeeding. At endline, fewer experimental (11.8%) than control (37.0%) mothers considered colostrum 'poor' and more experimental (92.9%) than control mothers (60.0%) knew breastfeeding should be initiated within one-hour of birth. More experimental (85.9%) than control (48.0%) knew appropriate attachment during breastfeeding. Knowledge score of control (23.1 ± 3.6) and experimental group (23.6 ± 4.9) was similar at baseline with 60.0% (control) and 57.0% (experimental) mothers having good knowledge. At endline, knowledge score was significantly higher in experimental (27.9 ± 4.3) than control group (23.0 ± 5.2) with 91.8% (experimental) and 61.0% (control) having good knowledge.

Conclusions: The use of job aids enhanced nutrition knowledge among pregnant mothers attending mother and child hospitals in Ondo State. The use of job aids for nutrition education during antenatal care visits is hereby recommended.

Keywords: Antenatal care, Intervention, Nutrition knowledge, Nutrition education.

144/699

THE FOOD-HEALTH-CULTURE INTERFACE: DIETARY PRACTICES OF SOUTH INDIAN MIGRANTS IN BRISBANE, AUSTRALIA

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Background and objectives: This paper discusses the relevance of considering the food-health nexus in the dietary practices of South Indian migrants in Brisbane, Australia. Studies of migrant health in Australia, as elsewhere, have shown an increased risk of diet-related non-communicable disease (NCD). Indian migrants in particular have a higher risk of developing conditions such as Type 2 diabetes. Food practices among migrant communities are shaped by many forces, as they seek to retain cultural practices while adopting food influences of the host-country.

Indian food traditions are rooted in medicinal discourses, which comprise food-based prescriptions and proscriptions for health. The aim of this paper is to examine the impact of culture-driven patterns of food choice in the food-health interface for this migrant community.

Methods: The findings presented in this paper are part of a larger study, a focused ethnographic exploration of dietary practices among South Indians in Brisbane. Qualitative methods, including in-depth semi-structured interviews, participant observation and photo-elicitation were used to collect data from 21 Indian families originating from the southern Indian states of Kerala and Tamil Nadu, representing diversity in terms of religious background, family size, and life-stages.

Results: Dietary practices and food-based remedies are an integral part of ethno-medicinal systems among this migrant community. The paper identifies that the community's understandings of the food-health nexus is strongly underpinned by culture; this in turn informs dietary practices. It describes how these understandings are interpreted and used in today's global food contexts, the use of traditional food-based techniques to ensure good nutrition, and remedies to prevent and treat common ailments and health conditions.

Conclusions: The paper provides insights into desirable healthful dietary practices that need to be encouraged, and misconceptions about practices that need to be addressed. The findings present an opportunity to develop culturally-tailored recommendations to promote dietary practices compatible with cultural practices and consistent with food-based dietary guidelines. This could in turn assist in the prevention and/or delay of the onset of diet-related NCDs among South Indian migrants.More broadly, the study identifies aspects to be considered while communicating culturally sensitive, context-based healthy eating messages to minority populations.

Keywords: Food, Health, Culture-specific dietary guidelines.

144/741

IS THAT 'KHAJA'? DEFINING SNACKS FOR YOUNG CHILDREN IN KATHMANDU VALLEY, NEPAL

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Background and objectives: Healthy snacks can be an important source of energy/nutrients and are recommended in most guidelines for young child feeding. While WHO/PAHO defines snacks as 'foods eaten between meals', recent reviews show a range of definitions for snacks, including: time of consumption, portion size, or food type. This qualitative study assessed how snacks are defined among caregivers of young children in Nepal.

Methods: Seven focus-group discussion (FGDs) among 32 primary caregivers of children 12-23 months and 10 structured-observations of children were conducted in Kathmandu Valley. FGDs included a guided discussion on caregivers' definitions of snacks (khaja) and participatory exercises based on behavior-centered design. For structured observations, children were observed for a 12-hour period, with details noted for feeding episodes.

Results: FGD participants defined khaja in comparison to main meals (khana), with caregivers describing snacks for young children as food/beverages given to 'keep something in the belly'. While khaja portion sizes for adults are smaller/lighter than meals, participants reported that portion sizes for children were often similar to meals. Observations of child feeding found that snacks were served in similar or larger portions than meals. Caregivers fed snacks frequently throughout the day, and not necessarily in accordance with typical Nepali meal patterns. Foods that were commonly identified as snack foods, including biscuits and instant noodles, were sometimes fed during khana, while other foods typical for meals, including rice/lentil porridges, were fed in-between meals.

Conclusions: While Nepali caregivers define snacks as foods/beverages fed between meals, this definition was inconsistent in practice and snack foods were fed during meals. Snack definitions commonly used in guidelines and research are not necessarily appropriate when considering diet quality for young children in Nepal, and possibly other contexts as well. Focusing on types of foods eaten by young children may be more appropriate than consideration of portion size or consumption time. Recommendations for snacks should consider child- and context-specific definitions, and further research is needed to understand how varying snack definitions relate to children's overall dietary adequacy.

Keywords: Snacks, IYCF, Nepal, Nutrition, Dietary assessment.

144/746

THE EFFECT OF EDUCATION PROGRAM ON NUTRITIONAL KNOWLEDGE IN POLISH ADOLESCENTS: 3- AND 9-MONTH FOLLOW-UP. ABC OF HEALTHY EATING PROJECT

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Background and objectives: Educators are still working to design nutrition education programs to improve health outcomes [1, 2]. Effect of nutrition education may decrease through time-span after one-time education episode. Objectives: Assessment of short- and long-term effect of education program on nutritional knowledge in Polish adolescents.

Methods: The prospective study involved 464 adolescents aged 11-13 years at baseline. Nutritional knowledge was expressed in points (range: 0-18) and compared between 'educated' group (n=319) and 'control' group (n=145) after 3 and 9 months. In 'educated' group one-time education program was implemented.

Results: At baseline the mean nutritional knowledge in 'educated' group was 6.1 points and in 'control' group 5.5 points. The mean nutritional knowledge in 'educated' group was 8.5 points after 3-month and 8.3 points after 9-month follow-up, in 'control' group 6.2 and 7.2 points, respectively. The mean increase in nutritional knowledge was higher in 'educated' than 'control' group: after 3-month follow-up by 1.8 points (p<0.0001), after 9-month by 0.4 points (p<0.05); after 3 and 9 months in rural subsample was higher by: 2.5 points (p<0.0001) and 2.2 points (p<0.0001), in urban subsample was higher by 1.4 points (p<0.0001) and lower by 0.5 poitns (p≥0.05), in boys higher by: 1.7 points (p<0.0001) and 0.6 points (p≥0.05), in girls higher by: 1.8 points (p<0.0001) and 0.3 points (p≥0.05).

Conclusions: One-time education episode improved the nutritional knowledge of adolescents, and the effect was still existing after 3 and 9 months. The strongest long-term effect of education was found in adolescents from rural area. References: [1] Dominguez Rodriguez AD et al. Online platforms to teach Nutrition Education to children: non-systematic review. Nutr Hosp, 2016, 33(6):1444-1451. [2] Davis EM et al. A Fresh Fruit and Vegetable Program improves high school students' consumption of fresh produce. J Am Diet Assoc, 2009, 109(7):1227-1231.

Keywords: Adolescent, Education program, Follow-up, Nutritional knowledge.

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144/831

BUILDING ON CULTURE: A GRANDMOTHER-INCLUSIVE STRATEGY YIELDS SIGNIFICANT RESULTS ON MATERNAL CHILD HEALTH AND NUTRITION (MCHN) OUTCOMES IN SOUTHERN SIERRA LEONE

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Background and objectives: In many African and Asian communities, grandmothers provide care for pregnant and lactating women (PLW), including influencing nutritional practices of PLWs and young children. To date they represent an untapped resource largely overlooked by MCHN programs. World Vision (WV) piloted an innovative grandmother-inclusive approach (GMA) to actively involve grandmothers to promote optimal maternal infant and young child nutrition (MIYCN) practices.

Methods: Mixed methods were used to understand family members' roles and establish baseline levels for MIYCN knowledge, attitudes and practices (KAP). The study conducted April 2013 - May 2016, assigned 15 communities to intervention and 7 to comparison groups. Comparison areas received standard Ministry of Health and WV nutrition interventions. In addition to standard interventions, the intervention communities received the GMA, which uses adult education methods to engage grandmothers, including praise sessions, participatory learning activities and intergenerational discussions. The end-line evaluation (May–June 2016), surveyed 291 mothers of children under two years of age, 101 PW and 219 grandmothers on MIYCN KAP, self-efficacy and birth weight. Analyses compared differences in MIYCN KAP between groups at baseline and end-line.

Results: Self-efficacy scores were much higher for grandmothers in intervention (19.6; max=20) than in comparison sites (14.8), paralleling higher nutritional attitudes and knowledge (Max=16 points; 12.0 + 1.7 vs. 9.8 + 3.1), better adequate maternal diet diversity (>5 food groups 95% vs. 65%) and greater meal frequency (2.6 ± 1.4 vs. 1.6 ± 1.3) in intervention versus comparison sites, respectively, at end-line (p<0.001 for all).

Significantly more children in intervention communities were exclusively breastfed in the first week of life (90% vs. 79%, p=0.01), achieved minimum dietary diversity (77% vs. 52%, p<0.001) and minimum acceptable diet at 6-23 months (52% vs. 23%, p<0.001). Pregnant women in intervention groups had better antenatal care attendance and improved food intake, contributing to higher mean birth weights (3.34 ± 0.47 kg vs. 3.08± 0.43 kg, p<0.001).

Conclusions: These overwhelmingly positive results support the conclusion that the grandmother-inclusive approach can contribute to substantive, community-wide improvements in MCHN. Collaboration with grandmothers, influential in their communities, appears to be key in bringing about optimal cultural changes.

Keywords: Breastfeeding, Diet, Maternal, Child, Grandmothers, Nutrition.

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ELEVATING THE QUALITY OF NUTRITION CARE IN VIP INTERNATIONAL MEDICAL PATIENTS

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Background and objectives: With the well-developed medical technology and rational price, Taiwan's medical service quality is above par, indicating that Taiwan has advantages in developing health care tourism. Taiwan Adventist Hospital constantly pushes itself to achieve Joint Commission International (JCI) accreditation, which is publicly known as the highest standard in healthcare quality and patient safety, and has been certified by the official institutions in the United States, Canada, Australia, New Zealand, Japan and Singapore nowadays; therefore, Taiwan Adventist Hospital has been recognized for international medical quality. However, with the increasing number of international medical patient, different dietary preference due to regional and cultural differences has become a great challenge, and thus we keep improving the quality of meals, hoping to elevate the VIP international medical patients' satisfaction with the meal to 90%.

Methods: Since the VIP ward was established in August 2015, there'd been twice as the satisfaction with the meal is only 66%

according to the survey by Quality Control Center. In order to improve the hospital stays of patients in VIP ward, Department of Nutrition has designed the Food Satisfaction Questionnaire, served the food with five-star tableware, implemented the nutrition consultation in 24 hours, and provided the customized meals according to personal preferences from May to December in 2016.

Results: 1.	Department of Nutrition designed the Food Satisfaction Questionnaire in both English and Japanese version.

2.	Results: **Conclusions:** The food supply can be personalized adjusted by the special dietitian according to patients' condition and eating habits based on food culture differences, therefore elevating international medical patients' satisfaction, improving the quality of nutrition care, and further bringing the patients back to health as soon as possible.

Keywords: Quality of nutrition care; International medical patients.

DESIGN OF WESTERN-STYLE VEGETARIAN DISHES FOR INTERNATIONAL MEDICAL PATIENTS

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Background and objectives: With the advancement of transportation technology, cross-border travel has become widespread. However, attaining medical treatment while abroad remains a challenge, especially for those who are unable to find suitable or familiar foods during hospitalization. Thus, expanding menu options to include Western vegetarian dishes would be optimal in order to improve the hospital stays of international patients.

Methods: Dietitians would collect and analyze western recipes, and review production methods with the chef. Part of the recipes that include animal products should then be replaced by vegetarian ingredients such as tofu, and any sauce in Western vegetarian dishes can be made with nuts, like almonds and cashews, in order to increase the flavor. Dietitians should visit the affected international patients during their hospitalization, introduce the meal, and provide health and diet advice. Depending on the patient's status and eating habits, the food content can be adjusted. Finally, the Food Satisfaction Questionnaire is designed for measuring satisfaction of the international medical patients with Western vegetarian dishes. Questionnaires will be scored by percentage numerically for each item; the higher the score, the more satisfied patients are.

Results: From July 2016 to March 2017, 40 food satisfaction questionnaires for the international meals were collected. We designed the 7-day Western Vegetarian Cycle menu. The food supply was adjusted according to eating habits based on food culture differences. For instance, we provided more fruit or salad for European and American patients, and soy sauce or miso for Japanese

patients. Results: **Conclusions:** Provide Western-style vegetarian food to international medical patients in order to improve satisfaction with food and with overall hospital care.

Keywords: Vegetarian dishes; International medical patients; Food Satisfaction Questionnaire.

DEVELOPMENTAL TRIAL OF NUTRITIONAL EDUCATION PROGRAM ON CALCIUM INTAKE FOR JUNIOR HIGH SCHOOL STUDENTS

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Background and objectives: School lunches are required to give consideration to actively ingest calcium, which is particularly needed during the growth period. However, the method of evaluating food education activities at present educational site has not been established. In this research, we aimed to develop and evaluate a food education program on calcium for junior high school students incorporating PDCA cycle.

Methods: Survey was conducted in July and December 2016, targeting all 251 students enrolled in F junior high school. Actual condition survey on food, questionnaire survey on dietary habits, mental health survey, and BDHQ 15y (Simple self-registered diet history questionnaire: brief-type self-administered diet history questionnaire) for junior high school students were examined. The effect of grade level on each item and the impact assessment by comparing before and after educational activities were examined using $\chi2$ test (effective response rate 94.8%). The intake of normal milk, low fat milk, yoghurt and cheese was divided into quartiles and a one-way analysis of variance was conducted on the mental health score and micronutrient deficiency score (effective response rate 88.4%).

Results: The micronutrient deficiency score and the mental health score both gained higher scores than adults. Significant correlation was found between mental health score and micronutrient deficiency score in yoghurt ingestion and dairy product intake, and in the group with low yoghurt intake, the score of mental health and micronutrient deficiency tends to be high in all students. In the group with low dairy intake, mental health scores in female students and mental health and micronutrient deficiency scores in all students tended to be higher. Students who can correctly select 5 kinds of calcium-rich foods which are particularly necessary for junior high school students was 39.1% before food education, but significantly increased after food education.

Conclusions: Development of nutritional education program on calcium accompanied with evaluation based on the concept of health promotion using the PDCA cycle is effective for improving the school's dietary education activity and motivation for student's

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CAREGIVERS' PERCEPTIONS OF SNACKS AND FACTORS INFLUENCING THEIR USE FOR YOUNG CHILD FEEDING IN URBAN NEPAL

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Background and objectives: Ensuring a nutritious diet during the complementary feeding period is vital for preventing childhood malnutrition. Prior research in Kathmandu Valley found high consumption rates of nutrient-poor snack foods among children 12-23 months of age. This qualitative study was conducted to elicit Nepali caregivers' perceptions of snack foods and beverages and factors influencing their feeding decisions to help understand why caregivers chose to feed their toddlers these foods.

Methods: Seven facilitated discussions and participatory exercises were conducted with 32 primary caregivers of children 12-23 months of age in purposively sampled areas of Kathmandu Valley. Focus groups were stratified by caregiver type (mother or grandmother) and socio-economic status (SES) (low or middle/high). Discussions were guided by a facilitator, and participatory exercises included: 1) free-listing of foods and beverages consumed by children as snacks, 2) categorization into similar food groups, and 3) ranking of snacks according to perceived healthiness, convenience, cost, and child preference.

Results: Perceived health and nutritional benefits of foods/beverages were the most common reasons for caregivers' choices of snacks for their young children. Fruits, eggs and milk were considered nutritious while 'market foods', such as instant noodles and chips, were considered 'junk foods' and not healthy for children. Despite this distinction, caregivers reported feeding these less healthy foods if their child demanded them. Certain commercial foods, such as chocolate and fruit drinks, were considered healthy by some caregivers; and biscuits/cookies were often categorized as healthy commercial foods. Commercial snack foods were consistently ranked high on convenience both because of minimal preparation and ease of feeding, as children 'gobbled them up'. Caregivers of lower SES reported that their financial situation influenced the choice of certain snacks for their children, while caregivers of higher SES reported feeding 'whatever the child wants'.

Conclusions: While caregivers reported health/nutrition benefits influencing their choices of snacks, a child's preferences and caregiver's economic status also guided their decisions. These findings suggest future research is needed to develop snack options that are nutrient-rich, inexpensive, and appealing to young children.

Keywords: Child feeding, Health, Nutrition, perception.

144/880

ADHERENCE TO THE MEDITERRANEAN DIET OF NUTRITION AND DIETETICS STUDENTS IN CYPRUS

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Background and objectives: Adherence to the Mediterranean diet is associated with significant improvements in health status. This study aimed to determine the adherence to Mediterranean diet in Nutrition and Dietetics students at Near East University in Cyprus.

Methods: The study was conducted on 174 Nutrition and Dietetics students, aged 18 to 31 years. The nutritional status and Mediterranean Diet Score (MDS) of individuals were determined by food-frequency questionnaire, and a 72-h dietary record. MDS focuses on the consumption of non-refined cereals, fruits, vegetables, legumes, potatoes, fish, red meat and meat products, poultry, full fat dairy products, olive oil and alcoholic beverages. MDS was calculated, and then classified into three groups: good (between 36-55 points), moderate (between 21-35 points), and poor (0-20 points). General characteristics, anthropometrical measurements and physical activity levels (International physical activity questionnaire (IPAQ) short form) of participants were also determined. The study protocol was approved by the Ethics Committee at Near East University.

Results: According to study results 30.8% of students were found out to have low adherence, while 67.7% of students had moderate adherence and 1.5% of students had high adherence to Mediterranean diet. The results showed that MDS decreased as the students were approaching to senior year. There was significant difference between the first year and the senior year students. There was no significant difference (p=0.609) between the male and female students in terms of adherence to Mediterranean diet. Physical activity evaluation results showed that most of the students (40.2%) were minimally active. Male students were significantly more active than female students (p=0.007).

Conclusions: The Mediterranean diet is considered as a dietary pattern that contributes to better health and quality of life. The findings indicate that the eating habits of the Nutrition and Dietetics students, even those studying nutrition, are in need of improvement.

Keywords: Mediterranean diet, Mediterranean Diet Score, Nutrition and Dietetics Students.

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MAJOR DIETARY PATTERNS OF TWO ETHNIC GROUPS LIVING IN NORTH-WEST OF IRAN BASED ON AGE, GENDER AND ECONOMIC STATUS

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Background and objectives: The aim of this study was to determine major dietary patterns of two major(Azeri) and minor(Kurd) ethnicities living in Urmia, West Azerbaijan, Iran based on age, gender and economic status

Methods: In this cross-sectional study, 723participants (427 women and 296 men) aged 20–64 year old, from two ethnic groups (445 Azeri and 278Kurd) were selected through a multi stage cluster systematic sampling. Economic status (ES) was collected by questionnaire and dietary information was collected by a valid semi-quantitative F.F.Q through interviews. Dietary patterns (DPs) were determined using principal component analysis. Data was analyzed by one-way ANOVA and Chi-square analysis.

Results: Three major DPs were extracted including "Traditional High SES (THS)" (high in fruit and vegetables, dairy products, olives, nuts, herbal infusions, traditional Pancake, dolma, thick soup and pickles); "Transitional" (high in fast foods, red and visceral meat, kebab, salty snacks, sauces, sweetened drinks, sweets, poultry, fish, seeds and coffee); and "Traditional Low SES (TLS)" (high in tea, refined grains, potatoes, whole grains, vegetable& hydrogenated oils and animal fat, traditional stew, salt, eggs and legumes). THS and TLS was highly consumed in Azeris and Kurds, respectively. There weren't any significant differences between two groups in consumption of Transitional DP. A greater percentage of Azeri women and those living in middle &high ES households were at the highest tertile of the THS DP. In Kurds, those categorized in the highest tertile of THS had higher per capita income and expenses than those in lower tertiles. Azeris and Kurds who were in the highest tertile of the transitional DP, were younger and kurds had higher income/capita and cost of living / capita. Among Azeri Turks, more men and among Kurds higher percentage of those with lower per capita income and costs were at the highest tertile of TLS DP.

Conclusions: Findings suggest that ethnic background, gender and economic status associated with extracted dietary patterns in the studied ethnic groups. Also, age was an important determinant in adhering to a modern or traditional pattern. Therefore, such characteristics should be considered in planning and formulating diet related policies and programs.

Keywords: Dietary patterns, Economic status, Gender, Ethnicity, Iran.

144/907

ADVERTISING, MARKETING, SCHOOL AND FAMILY: CO-RESPONSIBLES OF NUTRITIONAL STATUS, FOOD PRACTICES AND HABITS OF CHILDREN AND ADOLESCENTS OF COSTA RICA

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Background and objectives: Health promotion is a systematic, continuous, integrated and complex strategy for the development of articulated and sustainable procedures that are in permanent transformation. This strategy contributes to the construction of welfare and quality of life of the educational community, especially students, by coordinating different settings (family, community and school) who are called to protect their overall health. This study aims to know if schools and high schools are good or not health promoters in Costa Rica.

Methods: A two-stage mixed multimethod (quantitative and qualitative) design was used. A total of 2667 students of both genders from 40 schools and 24 high schools in the seven provinces of Costa Rica was studied. Weight and height were used to obtain BMI (kg / m2). Social determinants related to food and nutritional security of students in their homes, schools and high schools were explored using a validated questionnaire. All children over 12 years old read and signed the Informed Consent Form to participate in the study. Children under the age of 12 signed the Informed Assent Formula and also had parental permission to participate.

Results: In the student population prevails the excess and the deficit weight (26.4% and 8.7%, respectively). The availability of sweets and soft drinks in homes and schools is greater than the intake of fruits. A 57.7% of young people are not happy with their body image and 38.1% are "on diet". The 42.2% of parents do not control the consumption of unhealthy food in their children; such as, fast foods and processed and prepared products with high content of salt/sodium, sugar and fat.

Conclusions: There is an upward trend in the malnutrition (excess and deficit weight) in the student population. Risk feeding practices were detected in youth that could enhance the development of eating behavior disorders (anorexia and bulimia). Advertising, marketing, school and family are co-responsible environments for customs, practices and habits of children and young people, related to availability, access, consumption and biological utilization of food.

Keywords: Environments, Food, Malnutrition, Children, Adolescents.

144/929

FOOD CONSUMPTION AND PHYSICAL ACTIVITY IN RESIDENTS OF INTEGRAL GENERAL MEDICINE OF THE MUNICIPALITY PLAZA DE LA REVOLUTION. 2017

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Background and objectives: Introduction: The eating habits of a population are a decisive factor in their level of health. Inadequate food consumption and low physical activity are directly or indirectly associated with diseases of high prevalence and mortality in developed and developing countries.

Objectives: To identify the food consumption and physical activity in residents of integral general medicine of the Municipality Plaza de la Revolution. 2017

Methods: Material and Methods: **Results:** The 5.3% never ate breakfast, 36.8% ate fruits less than 1 time per day, 26.3% reported consuming ½ portions of vegetables per day, 47.4% reported consuming 3 or more servings of legumes a week, 36.8% Reported consuming 2 servings of legumes a week, 15.8% reported not consuming fish, 31.6% reported consuming 2 servings per day of sugary drinks, 57.9% reported not consuming alcoholic beverages, 47.4% consumed fried foods occasionally, 68.4% Does not add salt to food, 36.8% perform physical exercises and 79.1% have an acceptable Body Mass Index.

Conclusions: Food consumption shows an acceptable behavior, but not physical activity; Taking into account that the study groups are health professionals.

Keywords: Food consumption, Physical activity, Health professionals.

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INTERNET AS A TOOL FOR DISSEMINATION RELIABLE INFORMATION ABOUT NUTRITION

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Background and objectives: Internet, different forums, social media have become a source of information on health, prevention or even treatments. Massive amounts of information about nutrition, dietetics, diets or supplements can be found easily, but this amount of information is not correlated with its quality. That is why it is especially crucial to disseminate dietetic information of high quality in social media. Cochrane reviews are high quality source of reliable information on the effects of healthcare intervention. The aim of presented work is to present results and concerns about dissemination of high quality information about nutrition in social media.

Methods: Using data from Cochrane Poland Facebook fanpage and Cochrane Poland Tweeter account we analyzed results of dissemination of information about nutrition. On each social media profile posts based on plain language summaries of Cochrane reviews are published in Polish regularly 3 times a week, since March 2016 (Facebook) and November 2016 (Tweeter).

Results: 55 posts being connected with dietetics, supplements and lifestyle were published on Facebook fanpage. 25% were focused solely on vitamins supplementation: on average those posts reached more than 500 individuals, while those focusing on pro-healthy influence of particular food products were more popular (more than 700). The most popular were post about coffee and its properties and interventions to reduce cholesterol level. In comparison to Facebook fanpage, Tweeter posts connected with lifestyle and supplements were the most often displayed topics. Since both profiles were launched the popularity is slowly but constantly growing. The largest groups of the receivers of our information represent young adults (25-34 years old).

Conclusions: Raising number of fans and followers shows the need for reliable information, especially among young people. Diversification of dissemination ways allow to reach different people with different interests as it is depicted by different top-topics on both social media profiles.

Keywords: Information, Dissemination, Social media, Plain language summaries.

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ASSESSMENT OF CONSUMER'S AWARENESS OF FOOD FORTIFICATION IN TANZANIA

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Background and objectives: The Government of Tanzania recognises that food fortification is a cost-effective mechanism for preventing and alleviating micronutrient deficiencies and its effects, particularly anaemia (prevalence of 39.6% among adult

Tanzanian women). Fortification of salt, wheat flour, maize flour and oil is currently mandatory in Tanzania, with voluntary fortification also permitted. To help increase consumer demand for fortified foods, the government introduced a fortification logo in 2013, which was supported by a public awareness campaign. Little is known about public awareness and understanding of food fortification, which are both direct demand drivers for fortified foods.

The objective of this research was to understand the level of consumer awareness and knowledge of food fortification in Tanzania.

Methods: A quantitative market research survey, consisting of 23 questions relating to participant's demographic characteristics, food purchasing behaviours, and awareness of and attitudes towards nutrition and food fortification, including awareness of the national food fortification logo. 1087 participants, (18-55 years, 57% female, 80% low socio-economic class) took part in the survey.

Results: 53% of survey participants reported a level of awareness of food fortification. Of these 19% correctly defined food fortification, while 34% incorrectly believed that food fortification was the combining of various foods. 217 survey participants (20%) reported prior awareness of the fortification logo rising to 34% (n=371) when shown the logo. For those who were aware of the logo, 70% felt it positively influenced food purchase decisions and 51% trusted the logo. Once provided with a definition of food fortification, 34% agreed that fortification increased the nutritional value of a food; however, 30% believed that fortified foods were for the rich and are expensive.

Conclusions: Despite low awareness of fortification and the logo, consumers understood the nutritional benefits of food fortification when provided with a definition. Reported spontaneous awareness of Tanzania's food fortification was consistent with findings of a larger national survey, where 13.3% of respondents reported ever seeing the logo. Further awareness raising campaigns on the role of food fortification and of the national logo are warranted, in order to support increased consumer demand for fortified foods and consequently nutrient intakes.

Keywords: Food fortification, Consumer awareness, Logo.

Conflict of Interest Disclosure: Conflict of interest disclosure: HT, JS, JT, EM work for the SUN Business Network, one of the four support networks of the Scaling Up Nutrition Movement. The SUN Business Network works to encourage private sector action on nutrition and is made up of more than 350 business members. The SUN Business Network does not receive any fees from business members.

EVALUATING USUAL SERVING SIZES OF COMMONLY CONSUMED STAPLE FOODS IN RELATION TO OBESITY: A CASE STUDY OF ADULT WOMEN IN KAWEMPE DIVISION, KAMPALA DISTRICT, UGANDA

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Background and objectives: The prevalence of obesity and overweight among women in Uganda is rapidly increasing. Worldwide, one of the major causes of obesity is consumption of excess food servings. In Uganda little research has been conducted in regards to factors associated with obesity hence less knowledge is known. This study was conducted to fill this gap and to chiefly determine if excess staple servings are consumed, knowledge and attitudes toward food servings and to quantify the carbohydrate content in these servings.

Methods: A survey of 118 women (15-45 yrs) living in the suburbs of Kampala, Uganda. Semi-structured questionnaire was used to collect dietary and socio-cultural data. Data for nutritional status was collected by taking weight, height, Waist Circumference, Hip Circumference and MUAC using standard WHO procedures. The number of food servings consumed was derived by measuring the usual amounts of staple foods each woman considered a serving and then comparing these amounts to standard serving sizes. Harvest Plus Food Composition tables for Uganda was used to determine the carbohydrate composition of these servings.

Results: Based on the WHR, 38.2% were overweight and 32.7% obese. Using BMI, 47.3% had normal body weight while 32.7% were overweight and 20% obese.

Only 17.3% of the women had heard about the term food serving before. Of these 3.6% knew what a food serving is.

Regarding attitude, even after respondents were explained to what a food serving is, 33% insisted it was not important to count food servings due to cultural reasons such as bad food habit to measure food and beliefs like only money should limit food serving size.

The food servings for all the staples usually consumed and considered to be one serving size by the respondents was at least two times higher than the standard serving size.

The highest average carbohydrate content consumed was 439.64 grams found in the presumed one serving of maize porridge.

Conclusions: Excess servings of the staple foods were consumed which were the likely cause of overweight individuals. The knowledge and attitudes about food servings were poor. Thus educating individuals about what counts as a serving can be of great strategy in reducing obesity.

Keywords: Food serving, Staple foods, Carbohydrate content, Obesity, Standard serving size.

144/1086

EFFECT OF SHORT-TERM NUTRITION EDUCATION ON PERCEIVED KNOWLEDGE OF URBAN ADOLESCENT GIRLS UTILIZING 'BBF'S ADOLESCENT NUTRITION CYCLE & DIETARY ADVICE TOOL'

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Background and objectives: There is significant malnutrition among adolescent girls in Bangladesh. A program to improve nutrition is not in place.

The aim of the study was to determine how much short-term nutrition education can increases level of perceived knowledge of urban adolescent girls on health & nutrition.

Methods: It was an intervention study with a control group. This study was conducted among adolescent girls aged (11-19) years. The study areas were Azimpur, Mirpur, Dhanmondi & Shaheedbag. Investigators were trained by BBF. Total 384 adolescent girls were selected. Nutrition education was given utilizing 'Bangladesh Breastfeeding Foundation's Adolescent Nutrition Cycle & Dietary Advice Tool'.

Results: This study shows that at baseline the knowledge about the definition of nutrition was found 24% in intervention and 23.8% in controls. After education 70.8% increased in intervention group and 24.9% in control group. This study also shows that, among intervention group 44.8% adolescent knows about balanced diet whether from control group it was 30.2%. Knowledge about sources of protein was increased from 29.1% to 66.7% in intervention group & 26.5% to 34.2% in control group. At baseline both fast food and beverage in intervention and control group was 19.3% & 17.9% but after nutrition education it increases up to 45.8% & 18.5% respectively. About 10.4% & 10.3 adolescent knew about prevention of anemia in baseline where as in end line it was 28.1% & 10.8% respectively. Significant (P<0.001) improvement were seen in nutritional knowledge after intervention.

Conclusions: BBF's Adolescent Nutrition Cycle & Dietary Advice Tool' which was used in nutrition education was fruitful to improve the knowledge of adolescent girl's nutrition and health.

Keywords: Adolescent Nutrition, Nutrition Education, Nutrition Cycle, Adolescent, Bangladesh.

144/1108

PATRIMONIALISATION OF THE QUEBRADA DE HUAMAHUACA: EFFECTS ON HEALTH AND DIET OF TILCARA NATIVES

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Background and objectives: Background:Tilcara, a town located in the Quebrada de Humahuaca, Jujuy, Argentina, was named in 2003 as a World Heritage Site. The pattern of food consumption of the local population may have been affected as a result of the patrimonialisation of the region.

Objective: To assess the prevalence of cardiovascular risk factors, dietary pattern, nutritional status and social representation on the addition of new foods and forms of preparation into the traditional diet of adults aged 35 to 65 living in Tilcara in 2015.

Methods: Quali-quantitative, descriptive cross-sectional study. The data collection was done through interviews and surveys. A non-probability convenience sampling was used based on 31 Tilcara natives aged 35 to 65.

Results: The gender ratio is 55 percent female and 45 percent male. More than half of the individuals have cardiovascular risk factors. The main ones are overweight, obesity and higher-than-normal cholesterol levels. There was a high frequency of consumption of legumes, green leafy vegetables, tomatoes and carrots, rice, noodles, bread, sugar, artificial juices and soda. It is worth mentioning that the consumption of quinoa and amaranth was close to none. The sample has knowledge about a large number of regional dishes although they are not frequently prepared. With regard to non-traditional foods awareness rice was not identified as a food belonging to them although it is not a traditional food. As far as beliefs are concerned, most of the sample associates the consumption of foods and preparations outside their traditional diet with negative effects on health. Finally, it was possible to identify that the sample considers the regional meals as important.

Conclusions: Foods outside the Andean diet and traditional preparations coexist in the diet of individuals. In this way, they gradually move away from ancestral food mandates and approach the diet of populations living in urban centers. However, they are not completely identified with any of them. Instead, they form a new group characterized by a mix of both having own food identity.

Keywords: Tilcara, Nutritional Status, Consumption Pattern, Social Representations, New Foods

Further collaborators:

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IMPACT OF NUTRITION EDUCATION ON REDUCING OF OVERWEIGHT IN 6-12 YEARS OLD CHILDREN OF AFFLUENT SOCIETY IN DHAKA CITY

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Background and objectives: Nowadays childhood obesity is an emerging problem worldwide, even it is a serious paucity of developing countries. In Bangladesh childhood obesity is rising rapidly in recent age and has emerged as a major public health threat. To the author's knowledge there was no intervention study was done on this issue in this country among this 6-12 years old children. The aim was to see the impact of nutrition education aimed at improving dietary practice to reduce overweight in children at affluent society.

Methods: A longitudinal intervention study consisting of an intervention (n=150) and a control group (n=150) was carried out among the children aged between 6-12 years in selected affluent areas of Dhaka city during June-Dec 2012. Intervention group received 3 months nutrition education on avoiding fast food and watching TV while eating (which tends to much more eating), emphasizing on appropriate dietary guideline, physical exercise, participating school sports, eating diversified food and hygiene practice. Education was provided to the parents from intervention group about fortnightly for the 1st month and once for the next 2 months. We collected data from the children and their parents of both groups including both Anthropometric (Height, weight, MUAC of the children) and Dietary intake (using 24 hours recall method) records of the children. Control group was observed only. The results were compared between two groups using student's paired t-test and Chisquired test using SPSS/Window's version 11.5.

Results: Background characteristics of both groups were comparable. 6-12 years school going overweight children's mean body weight reduction was 1.51kg in intervention group while in control group, body weight was increased to 3.05 kg (p < 0.01) after nutrition intervention. Respondent's mean BMI reduction was 1.49 in intervention group while in control group BMI raised up to 0.58 in control group (p < 0.01). After intervention, the total calorie intake was reduced to 1823 from 2265 kcal in intervention group while in control group total calorie intake elevated from 2143 to 2160 kcal in control group.

Conclusions: Comprehensive nutrition education was effective for reducing overweight. This education should be scaled up for all affluent society of Bangladesh.

Keywords: Overweight, Improved dietary practice, Affluent society

EVIDENCE-BASE LEARNING ALTERNATIVE EDUCATION COLLABORATION SYNERGY EDUCATION-POLICY-IMPLEMENTING PROGRAM (CASE STUDY IN DEPARTMENT OF NUTRITION SCIENCE, HASANUDDIN OF UNIVERSITY, INDONESIA)

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Background and objectives: Evidence-based learning model is a learning process that was developed to encourage the contribution of synergistic collaboration between education, policies and implementing programs as learning outcomes. Purpose: To develop evidence-based learning model in Department of Nutrition Science, Hasanuddin of University

Methods: Through the process of review, evaluation, workshops, and a review panel of experts, be continued round table task force, formulated the graduate profile, learning outcomes, matrix courses and great SCU, the structure of the curriculum and learning strategies for competence of undergraduate science of nutrition through a learning process based on evidence in Department of Nutrition Science, Hasanuddin of University.

Results: It has been in repositioning and restructuring the curriculum based on problem-solving cycle into evidence-based learning curriculum where family-based sentinel surveillance is used as a reference proof Accelerate learning and scaling-up nutrition is used as a learning theme. In the learning process of each student H will assist and learn at 40-50 HH for 6 semesters learning phase. Each course was served eight classroom sessions, 2 sessions of discussions 10 cases, 4 family field study sessions, 2 sessions of the seminar. Teaching materials have been prepared and 10 cases for discussion on all subjects. This model has been applied since 2016

Conclusions: Evidence-based learning will gain convergence and connectivity between educational institutions and stakeholders who will use the results of their students, and ensure the quality of graduates

Keywords: Evidence Base Learning; H-H Surveillance; Collaboration–Synergy; Scaling-up Nutrition

Further collaborators:

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CHILDREN'S INDUSTRIALIZED FOOD CONSUMPTION AND THE FACTORS THAT LEADS TO THEIR ACQUISITION

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Background and objectives: Nowadays, the daily routine favors the consumption of processed food due his practicality. The Media is one of the elements that incite his consumption, reaching, mostly the children. Therefore, the present study aims to identify the main factors that may be leading to the acquisition of processed food, and the media influence on the child's nutritional state.

Methods: The main audience were 18 students, aged 6 to 10 years, in a private school, located in Franca, São Paulo. To the parents, a questionnaire with questions about the children's eating habit, and how the Television may be influencing the purchasing of processed food. For the Nutritional state evaluation, the Body mass index (BMI) was calculated, and analyzed according to the 2007 growth curves. And was classified according to the Health Ministry (2009), based on the growth curves of the World Health Organization (WHO).

Results: As a result of this research, 22,2% of the childrens who go along with their parents at the supermarket were overweight. 75% of the parents said that they bought what the child wanted, just to avoid tantrums. The offering of gifts is one of the elements that influence the acquisition of processed food, this variant was verified in 38,8 % of the cases. The parents must know how to identify this kind of strategies, in order to avoid them, ensuring to their kids a proper nutrition. 94,4% of the parents affirmed that practicity is the main factor to buy this kind of food. 44,4% of the researched childrens watched 1-2 hours per day, 5,5% were overweight. 17% watched 3-4 per day, 11% were overweight and 5,5%, 5-6 hours per day, all of them were overweight.

Conclusions: The media know of the vulnerabilities of their target audience and in the case of children, the gift offerings are one of the trickery that influence the purchase. Parents should realize these artifacts and avoid them, guiding children early on about such stratagems and the importance of healthy eating. Often these parents, to avoid tantrums and crying, fulfill all the wishes of their children, regardless of the fact that they may be damaging the child's health in the future.

Keywords: Food acquisition, media, nutritional state

FOLLOW IN MY GREEN FOOD STEPS: CHANGING COOKING BEHAVIOURS IN NIGERIA FOR IMPROVED IRON INTAKE

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Background and objectives: In Central and West Africa, approximately 50% of women of reproductive age have anaemia. This study assessed whether a theory-based, branded school- and community-based behaviour change programme called "Follow in My Green Food Steps" increased intake of green leafy vegetables and Knorr iron-fortified bouillon cubes in South-West Nigeria in order to improve iron intake.

Methods: 603 pairs of mothers and daughters (aged 12-18 years) participated in a field experiment in Ile-Ife (intervention) and Osogbo (control), of which 519 participated in the post-intervention assessment. Determinants were measured based on the Theory of Planned Behaviour and use of iron-fortified cubes and green leafy vegetables were measured as part of an adapted Food Frequency Questionnaire focusing on stews and soups.

Results: The intervention positively influenced awareness of anaemia and the determinants of behaviour. It also resulted in a 41% increase in respondents adding the recommended bunch of green leafy vegetables to their stews compared to a 5% increase in the control group. There was also a significant increase of 0.5 cube per soup on average in the amount of iron-fortified cubes added to soups vs. the control group (0.1 cube per stew).

Conclusions: The intervention had a positive impact on awareness of anaemia, determinants of behaviour, self-reported intake of Knorr iron-fortified bouillon cubes and intake of green leafy vegetables.

Keywords: Behaviour change, dietary intake, iron fortification
Conflict of Interest Disclosure: RL, BG, MS, DS, KvhH and AJ are employees and OA and TM received funding of Unilever, a manufacturer of Food and Beverages products (including Knorr bouillon cubes).

SOCIODEMOGRAPHIC CONTEXT AND THE EFFECT OF NUTRITION EDUCATION PROGRAM ON UNHEALTHY DIETARY PATTERN IN POLISH ADOLESCENTS: 9-MONTH FOLLOW-UP. ABC OF HEALTHY EATING PROJECT

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Background and objectives: Sociodemographic characteristics influence on effectiveness of adolescents' nutrition education [1]. It is weak known how sociodemographic characteristics act on unhealthy dietary patterns in long-time perspective. Objective: Assessment of the effect of nutrition education program on unhealthy dietary pattern in sociodemographic context after 9-month follow-up in Polish adolescents.

Methods: The prospective study involved 464 adolescents aged 11-13 years at baseline. Eating habits were assessed based on frequency food consumption. A non-healthy diet quality index (nHDI) including 4 foods (fast foods, sweetened beverages, energy drinks, sweets) was analysed (range: 0-100 points). After 9-month follow-up changes in nHDI were compared between 'educated' (n=319) and 'control' (n=145) groups and analysed in subgroups: boys/girls, rural/urban residence, bottom/middle/upper tertile of family affluence scale (FAS) [2].

Results: After 9 months the mean changes in nHDI between 'educated' and 'control' groups were significant in boys and urban subsample. In boys the mean nHDI was lower by 0.9 points in 'educated' and higher by 2.0 points in 'control' group. In girls the mean increase in nHDI was insignificantly lower in 'educated' than 'control' group (by 0.4 and 2.3 points, respectively); in rural subsample the mean decrease was insignificantly higher (by 0.9 and 0.5 points, respectively); in urban subsample the mean increase in nHDI was significantly lower in 'educated' than 'control' group (by 0.2 and 4.0 points, respectively); in bottom FAS tertile the mean increase in nHDI was insignificantly lower in 'educated' than 'control' group (by 2.1 and 4.6 points, respectively); in upper FAS tertile the mean decrease in nHDI was insignificantly higher in 'educated' than 'control' group (by 2.1 and 0.1 points, respectively).

Conclusions: The strong effect of one-time nutrition education episode in reducing unhealthy dietary pattern in Polish adolescents in long-time perspective was shown in boys. For girls a special attention should be paid in designing nutrition education.

References: [1] Gubbels JS et al. Physical activity, sedentary behavior, and dietary patterns among children. Curr Nutr Rep, 2013, 2(2):105-112. [2] Mazur J. Family Affluence Scale – validation study and suggested modification. Hygeia Public Health, 2013, 48(2):211-217.

Keywords: Adolescent, diet quality score, dietary pattern, education program, unhealthy diet

Conflict of Interest Disclosure: Project was funded by Carrefour Foundation. Scientists Team was responsible for all stages of project.

Further collaborators:

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CULTIVATING NUTRITION-SENSITIVE CROPS TO IMPROVE NUTRITIONAL PRACTICES OF WOMEN AND CHILDREN IN NORTHERN GHANA

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Background and objectives: Dietary diversity is a challenge for improving nutrition outcomes of women and children in Northern Ghana. According to the 2014 Demographic and Health Survey, only 14.1 percent of children ages 6 – 23 months in Northern Ghana were fed the minimal acceptable diet. The United States Agency for International Development (USAID)-funded Resiliency in Northern Ghana (RING) Project works with local women farmers to promote the cultivation and utilization of nutrition-sensitive crops such as soybeans, green leafy vegetables, and orange-fleshed sweet potatoes to improve nutritional practices through food production and income generation pathways. Training on food utilization is done through engagement of community groups with participatory cooking demonstrations as a key component of the activity. The RING Project conducted a household survey to identify the consumption and sale patterns of the three crops post-harvest.

Methods: Multi-stage sampling method was employed to select beneficiaries for the survey at the interventions levels. The sample size was weighted by district. A total of 2,517 participants' households benefitting from at least one of the agricultural interventions were interviewed. Data analysis was done using SPSS

software version 20 and Microsoft Excel 2013 for cleaning the data prior to analyses. Categorical variables were summarized into frequencies and percentages whereas continuous variables were summarized into ratios, means, minimum, maximum and standard deviations to infer themes and meanings.

Results: Participants reported setting aside portions for household consumption, and reported high level of consumption for all three crops by pregnant and lactating women and children 6 – 59 months. The non-consumed foods were sold by women in local markets and provided additional incomes for the families. Using their new knowledge gained in good agricultural and nutrition practices, most of the farmers reported their intention to continue to cultivate and consume the nutrition-sensitive crops without project support

Conclusions: Farmers are incorporating nutrient-dense crops into their local dishes. We will show evidence on how training on crop utilization and cooking demonstrations enabled households to enrich local dishes with nutrient-dense products for complementary feeding and women's diet. We will also discuss the household consumption and sale patterns of the three crops.

Keywords: Dietary diversity, nutrition-sensitive agriculture, household consumption, first 1,000 days period

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144/1219

IMPACT OF NUTRITION EDUCATION ON OVERWEIGHT ADOLESCENT GIRLS (10-19YEARS) IN THE SELECTED SCHOOLS OF DHAKA CITY

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Background and objectives: Overweight among adolescents (10-19 years) is an emerging public health concern alongside under-nutrition in developing countries, like Bangladesh. Overweight adolescents are more likely to become obese in adulthood as well as the consequences associated risk for cardiovascular disease, hypertension, diabetes mellitus type II, osteoarthritis, some types of cancer (colon, breast, kidney) and complication during pregnancy. So it is essential to develop public policies aimed at preventing overweight and reducing overweight rates in the pediatric population. The aim of the study was to see the impact of nutrition education on reducing body weight of the adolescents.

Methods: An experimental randomized study containing an intervention (n= 35) and a control group (n=35) was conducted for 4 months among 70 adolescent girls aged 10-19 years in two schools of Dhaka city. At first, screening was carried out through anthropometry (height, weight) to identify 'overweight' following standards of BMI cutoff and enrolled as subjects in both groups. The intervention group received nutrition education of 40-45 minutes long sessions fortnightly for 2 months following a leaflet containing information on healthy life style including food based dietary guidelines, foods to avoid, healthy food choice, demonstration of physical activity, personal hygiene, ideal growth chart, risks and consequence of overweight. The control group was only observed. Data on anthropometry, knowledge, physical activities and food frequency were collected at baseline and end line in both groups.

Results: The mean body weight significantly reduced by 910 g in the intervention group while an increase of 160 g was found in the control group (p< 0.05).The percentage of subjects doing physical activities increased almost by 3 fold at the end of intervention compared to baseline.

Conclusions: Nutrition education on healthy food habit and life style has a positive impact on overweight prevention among the adolescent girls.

Keywords: Overweight, nutrition education, healthy food habit, Physical activities.

144/1220

PERCEPTION AND FAMILIARITY OF FOOD PRODUCTS INCLUDING FRUITS AND VEGETABLES BY ADOLESCENTS. DECLARATION BASED ON EXPERIENCE AND PREFERENCES: ABC OF HEALTHY EATING PROJECT

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Background and objectives: Adolescents have various expectations regarding the quality of food products and their preferences are mainly based on family patterns raised from childhood. The preferences can be also modified by education programme increasing willingness to taste unfamiliar foods. Exploring factors determining perception of food products by adolescent is important for better preparing such programme.

To gain insights into factors determining perception of food products by adolescents using quantitative approach combined with practical task during sensory workshop. Furthermore, ex-

perience and familiarity with various fruits and vegetables were examined together with willingness to consume.

Methods: 765 adolescents aged 11-13 years from Poland participated in the study. The questionnaire covered aspects such as perception of food packaging including practical task with 15 s exposure; the desire to learn new flavours; preparing meals with parents/grandparents; preferences and familiarities of fruits/vegetables and the importance of senses in fruits/vegetables choice and consumption.

Results: Adolescents declared that the most important information for them on the product packaging was the expiry date and then ingredients, nutritional value, storage conditions. The least important were: brand and appearance. Practical task provided additional information on the relevance of the other attributes. About 80% of all adolescent declared that they are interested in getting to know new tastes/flavours by consuming products and they stated participate in preparing meals at home. Nevertheless many adolescents had a problem with giving examples of spices used in the process of seasoning. Among the listed, most popular spices were salt and pepper. A high share of participants claimed to be familiar with domestic and exotic fruits and they declared the desire to consume some unknown fruit (e.g. carambola, figs, avocados) but were far more reluctant to try unknown vegetables (e.g. chicory, asparagus, patison).

Conclusions: The most important information for adolescents on the product's packaging was the expiry date. The variety of spices known and used by participants was relatively low. Adolescents declared less familiarity of some vegetables compared to fruit and less interest in their consumption.

Keywords: Adolescent, perception, experience, familiarity, food consumption

Conflict of Interest Disclosure: Project was funded by Carrefour Foundation. Scientists Team was responsible for all stages of project

Further collaborators:

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144/1230

HEALTHILY, COLOURFULLY, TASTY - BE IN TOUCH WITH YOUR SENSES AND ENJOY CONSUMPTION. SENSORY WORKSHOP WITH ADOLESCENTS: ABC OF HEALTHY EATING PROJECT

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Background and objectives: Sensory experience as a multi-modal perception, memory aspect, expectations and context of consumption influence the formation of eating habits and food choices. Involving children in various tasks related to food preparation could be an opportunity to increase healthy eating behaviour and reduce the formation of neophobia.

Objectives: 1) Introduce adolescents to the role of the senses in food selection, eating and acceptance of products, 2) Increase the ability to recognize the sensory properties in products, 3) Enrich experiences of adolescents in relation to less known/unknown products (fruits, vegetables).

Methods: 765 adolescents aged 11-13 years from Poland took part in the sensory workshops. The workshop consisted of a lecture and a practical tasks. The lecture referred to the role of the senses in the evaluation of product qualities. At practical activities, adolescents described the product's (yoghurt) packaging after 15s of exposure, identified the smell of various herbs/fruits and their acceptability using 5-point facial hedonic scale. They also determined sensory properties of yoghurt took part in preparing the canapes (integration of different senses) and evaluated their eating habits as consumers (now and in the future).

Results: Adolescents noticed and remembered various information on the packaging (e.g. storage conditions). They prepared a map of the most important food label cues from the consumers point of view. During olfactory task, it was revealed that the ability of identification and acceptance of odour by participants depended on the type of stimulus. Adolescents showed great creativity when describing their impressions related to the sensory quality of strawberry yoghurt. While preparing canapes, adolescents willingly included in their composition less known fruits and vegetables. They created visually attractive, tasty and acoustic products and enjoyed their consumption. A large group of children declared willingness to change their eating habits (e.g. reduce consumption of sweets).

Conclusions: Adolescents willingly participated in the workshops and were absorbed by the tasks. They also declared that the workshop made them more open to the preparation and consumption of new, healthy food products and dishes, including fruits and vegetables.

Keywords: Adolescent, senses, impressions, enjoyable consumption

144/1246
MY HEALTHY SCHOOL PROGRAM

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Affiliation: Directorate-General of Health Development. Deputy Mayor's Office. Buenos Aires City Government. Argentina.

Background and objectives: The My Healthy School Program (MHS) of the Directorate-General of Health Development of the Deputy Mayor's Office of the Buenos Aires City Government, is an educational program which promotes healthy habits in the entire educational community. It has been in place since 2012 in Buenos Aires City kindergarten and elementary public schools, with a duration of 2 years in each establishment.

Methods: Indicators of the Program's scope, as well as the main findings of the general assessment are described.

Results: Since its initiation MHS has been implemented in 130 kindergarten schools and 167 elementary schools (one third of all city establishments). This represents a scope of approximately 61 000 children and 6 700 teachers. To date, the Program has carried out 3 236 workshops for children, 662 for teachers and 628 workshops for families. The Recess in Movement component had the participation of 22 342 children, and over 200 articulations with other Government programs were carried out. Furthermore, My Healthy Magazine, a bimonthly publication on MHS key issues, has reached 14 editions and has been distributed to all students of participating schools.

The Program assessment has taken into account the feedback of children, families and teachers. Sixty percent of children who participated in MHS considered they adopted healthier eating habits after the Program, and 55% said they were doing more physical exercise. Among changes in eating habits, children mentioned increase in vegetable (41%), fruit (55%) and water (65%) intake.

In regards to teachers, over 90% expressed being satisfied or very satisfied with the Program, 51% considered MHS generated positive changes in the educational community's habits and 47% said MHS trained and provided them with tools for addressing the issues in the classroom. The qualitative component of the assessment showed the presence of nutritionists in the establishments stands out as a key advantage.

Conclusions: The scope and acceptance of MHS make it a very useful strategy for creating heathier school environments.

Keywords: School nutrition education – School – Healthy habits

144/1251
FOSTERING PHYSICAL ACTIVITY DURING CHILDHOOD: A GOVERNMENT SECTOR EXPERIENCE

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Background and objectives: Physical activity (PA) has multiple benefits for physical and mental health in children, as well as a positive impact during adult life. Childhood is a critical period for the development of healthy habits; therefore, promotion of PA in this stage is essential.

Since 2012, the Directorate-General of Health Development of the Deputy Mayor's Office of the Buenos Aires City Government has implemented, as part of its Health Stations (HS) and My Healthy School (MHS) programs, diverse strategies for fostering PA in child population. The object of this work is to describe those strategies.

Methods: Cross-sectional study.

Results: The Recess In Movement Project (RIM) is an initiative of the MHS program, its goal being the promotion of PA during school recesses. For this purpose, a team of PA professors assist the establishment in the implementation of a series of actions. Furthermore, recreational equipment is provided, and older students and teachers are trained as for the continuity of the project. This strategy has had the participation of 100 schools and 22 342 children, and 2 694 children and 179 teachers were trained.

Moreover, Game Zones have been implemented within the HS setting. They consist of an educational recreational space where PA is fostered and bonds with other children and their families are encouraged. Individual and collective active games are offered, and child population healthy eating issues are tackled. PA professors specially trained in healthy eating notions are in charge of the activities. To date, 26 017 children have participated.

Conclusions: Both strategies attempt to encourage the acquisition of healthy lifestyles commencing in childhood, in the hope that this behavior will endure in adult life and contribute to improving the quality of life and health of the population.

Keywords: Physical activity – health promotion – healthy lifestyles

144/1255

PROJECT JA: A NOVEL APPROACH TO STIMU-LATE POSITIVE ATTITUDE FROM CHILDREN TO FRUITS AND VEGETABLES CONSUMPTION AND TO THE MOVEMENT

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Background and objectives: Consumption of fruit and vegetables among children is generally below recommended levels. In addition it has been shown that only 1/3 of high school students get the recommended levels of physical activity. Different interventions have been demonstrated to be of help in stimulating fruit and vegetables consumption and movement in children. The objective of this presentation is to show the methodology, design and participation results of a recreational intervention developed in Argentina during 2016: Project JA

Methods: A pilot program was developed during 2015, through 7 presentations in 6 schools. Following this pilot program a definitive interactive workshop has been developed by a team conformed by physician, nutritionist, physical education teacher with the collaboration of a scriptwriter. The workshop includes a performance with dances and interactive games with the children's participation lasted 45 minutes, following by 20 minutes exchange of professionals and children and photographs. Fruits colors and movement games and activities were emphasized

Results: From March 2016 to January 2017, 200 workshops were performed in 71 schools and other places (hospitals and sciences expo) at 29 cities in the 24 Argentinean provinces, with participation of around 25000 children aged 6-12. Twenty six thousand brochures and 30000 fruit units were brought to the participants and teachers. A brief video will be shown, including the most popular moments of the workshop and participant's interviews regarding the workshop

Conclusions: The methodology chosen for the workshop had a great acceptance by the participant children and the teachers and a positive approach to fruits and vegetables consumption and to movement has been perceived.

Keywords: Fruits, vegetables, movement, children

144/1333

PORTRAIT OF CONTEMPORARY MOROCCAN LIVES IN CASABLANCA BETWEEN THE ORIGINAL FOOD CULTURE AND MODERNITY

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Background and objectives: Developing countries, including Morocco, experiencing significant discrepancy in dietary practices between the city and rural area. The objective of this study is to compare between certain eating practices of Casablancan (urban) and people from Souss (rural) due to urbanization.

Methods: Our sample includes 149 women and 155 men from Casablanca and 157 women and 152 men from Souss Région . This sample was stratified according to ethnicity (urbans, Casablancan Soussi [CS], and Casablancan not Soussi [CNS]), gender and age.

Results: The food consumed varies according to the meal: As for lunch, we note that 35.5% ate traditional dishes (couscous, tagines) and 47.7% consumed fruits and vegetables (salad, sautéed vegetables). We also note a low consumption of fast food during that meal (0.5%). For the dinner, the typology is more diversified, in fact, during the meal, our study population tended to consume more fast food (19.7%) and dairy products (12.4%), in addition to meat and fish grilled (13.2%), fruits and vegetables (13.7 %). Also, our data indicated an association between the change in the type of food taken at lunch, and ethnicity (p <0.0001) : there is a frequent consumption of fruits and vegetables (51.0%) in rural Soussis at lunch compared to Casablanca (44.2%), relatively the same frequency in both CS and CNS ethnic groups (41.8% and 46.6% respectively) . In addition, Casablanca are more likely (48.3%) to eat couscous and tagines (41.8% in CS and 45.9% in CNS) that Soussis 27.1%. The meal / food category consumed at breakfast is different from that consumed at other meals. Therefore, for this meal, our population prefer taking soup (42.3%), bread with garnish (31.4%) and milk / dairy products (20.7%). Similarly, for this meal, the change in the type of food consumed is associated with ethnicity (p <0.05). Indeed, 48.8% of Soussis took dairy products for breakfast; this prevalence is higher than that observed in Casablanca (24.3%) [Higher in CNS (39.7%) than CS (9.0%)].

Conclusions: Food style of our urban population has a pendulisme between the Western-style food and that of the original Moroccan culture, particularly the typology of food consumed.

Keywords: Food culture. Pendalisme.

SCHOOL TEACHER'S KNOWLEDGE AND SCHOOL PRACTICES RELATED TO FRUIT CONSUMPTION AND THEIR PERCEPTIONS ABOUT STUDENT'S ATTITUDES TOWARD THE SAME ISSUE

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Background and objectives: Nutritional education policies in schools have a positive impact increasing the consumption of fruits and vegetables by children. Teachers play an important role in this goal. The purpose of this study is to establish the degree of school teachers' knowledge and their perception about student's attitudes regarding fruit and vegetables consumption

Methods: A study was conducted in 22 schools of different provinces of Argentina, during 2016. A survey was carried out on teachers of children between 6 and 12 years of age to collect information regarding knowledge, school practices and perception related to fruits and vegetable consumption in their students. Argentinean region and public/private school were studied as independent variables.

Results: 155 from 20 provinces teachers answered the survey.

Knowledge: 47.7% of them knew that at least 3 portions of fruit are recommended per day. 94.8% totally agree that is good to eat fruit and 93.5% totally agreed that it should be eaten every day.

Practices: only 3.9% reported that the school usually offers fruits to children and 3.2% that children usually take fruits to school.

Perceptions: 98.1% think that kids do not consume the adequate portion of fruits. 71.6% think that they consume fewer amounts of fruits than kids of the same age. 93.5% of teachers totally agree that for kids is hard to eat fruit every day.

Evaluating the region as independent variable, it was found that the proportion of teachers who knew that at least 3 portions of fruit is recommended per day, is major in NEA (North East Argentina)-Mesopotamia and Patagonia

Conclusions: Teacher's knowledge regarding fruit consumption recommendations should be improved, as well as school strategies to stimulate children's fruit intake.

Keywords: Knowledge – Fruits consumption - School teachers

IMPACT OF A PROMOTIONAL PROGRAM REGARDING HEALTHY EATING IN BMI AND FEEDING HABITS IN HIGH SCHOOL STUDENTS

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Background and objectives: Introduction: obesity has increased in an epidemic way in the last two decades, presenting itself at earlier ages. Environmental factors like sedentary lifestyle and bad eating habits have become main culprits. Educational interventions focused at providing solutions for feeding and nutritional problems that affect alumni are being recognized as an essential complement to actions aimed at improving feeding security of students.

Objective: analyze the impact of a promotional program of healthy eating regarding BMI and feeding habits in high school students.

Methods: longitudinal and correlation experimental study, it was performed in 415 high school students in two phases. First phase (preintervention) consisted of weight, waist line and height measuring and a questionnaire regarding eating habits and nutrients knowledge was applied, a promotional program of healthy eating (PPHE) was implemented on the experimental (EG) and the control group (CG). An informative flyer on the subject was handed and informative banners were placed at school. The second phase (intervention) was performed in which weight, height and waistline measuring was done, the previous questionnaire was once again applied on both groups. Data analysis was done using SPSS 20 software.

Results: decrease in weight in EG and increase in CG (X2 .001). Better eating habits were observed in the EG after PPHE but no so regarding the consume of fast food and sweets (p=<0.05). Both groups (E&C) showed good knowledge of food and nutrients post intervention, 93% and 94.5% respectively. Regarding good eating habits E showed a good response post intervention in 91.4% (p=<0.05).

Conclusions: there was a positive effect over BMI and change of eating habits in EG. The effects on BMI and eating habits were evaluated on the short term but we cannot conclude if these will remain on the long term.

Keywords: Program, BMI, feeding habits, high school students

144/1355

FUNKY FOODS TO REDUCE MALNUTRITION AMONG YOUNG CHILDREN IN SOTNIKUM OPERATION DISTRICT, SIEM REAP, CAMBODIA

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Background and objectives: In Cambodia, stunting and wasting affect 32% and 10% of children below five years of age respectively. In Siem Reap province, these proportions are even higher, 36% and 10%. Poor infant and young child feeding (IYCF) practices have constantly been reported as the cornerstone of young child nutritional status and development. In Siem Reap, breastfeeding practices are encouraging as 65% of children 0-5 months are exclusively breastfed. Nevertheless, only 36% of children 6-23 months do benefit from the three recommended IYCF practices. The objective of our research was to assess the impact of a higher consumption and promotion of micronutrient-rich local foods on child nutritional status, dietary intake and practices.

Methods: The research is currently ongoing in Sotnikum district area, Southern part of the country. This is a cluster-randomized controlled trial among children 6-23 months old living in 14 villages (cluster) randomly selected and assigned to each treatment group namely: cricket + nutrition education (NE), Moringa oleifera + NE and NE only. The number of villages intends to get a sample size of 120 per group in order to detect a mean improvement of 1 g/ dl of hemoglobin level between baseline and after 6 months of implementation and to take into account a 10% drop-out. Cricket and Moringa are given daily to children. Quantities of each food aimed to add at least 2 mg of iron to their daily diet. Data on nutritional (anthropometry, haemoglobin and ferritin) and health status (c-protein, presence of intestinal parasites in faeces, occurrence of illnesses), dietary intake, food and health practices, household food security and socioeconomics have been collected at baseline and will be collected at endline. On a weekly basis, data on dietary intake, health status, food and health practices including food compliance and responsive feeding are gathered.

Results: At the end of July 2017, the endline study will assess the impact of the consumption and promotion of local foods on child nutrition outcomes.

Conclusions: To come.

Keywords: Complementary feeding, nutrition, Cambodia, young children, local foods

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144/1360

ANTHROPOMETRIC AND LUNCHBOXES COMPOSITION OF PRIVATE SCHOOL STUDENTS OF THE CITY OF INTERIOR OF SÃO PAULO

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Background and objectives: In the most cases are the parents who make the acquisition of food that will be part of school lunchboxes and not always care with the nutritional question acquiring less healthy food. The purpose of the work is evaluate the lunchboxes composition of children 6-8 years of a private school municipality of São Paulo and compare the results with nutritional status.

Methods: For nutritional assessment of students was used the Growth curves for BMI/Age for children 5-19 years of the WHO 2007 and the classification of Ministry of Health (2009). The lunchboxes evaluate was realized through by observation at playtime for two days a week randomly chosen.

Results: Detected a high number of overweight children (overweight and obesity), corresponding to 29% of the total, and no cases of underweight, it was also observed that the incidence of girl´s overweight and obesity was higher than boys, which was not detected in any case of obesity, just overweight. The kids who participated of this study presented caloric intake of 522,6 kcal in a just meal, with minimum varying of 125.85kcal and maximum of 1350kcal. It was found a low consumption of fruits (12,9%) and high consumption of artificial juices (71%).

Conclusions: The Statistic analysis detects that the snack taken by the students didn´t interfere in their status nutritional, however parentes could opt for healthier foods for prevent children eutrophic leave this condition due to inadequate choices in the composition of lunchboxes

Keywords: Lunchbox, school, nutritional status

144/1364

THE IMPORTANCE OF NUTRITIONIST IN THE PREPARATION AND MONITORING THE MENU IN SCHOOL KINDERGARTEN

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Background and objectives: In Brazil, surveys reveal that the prevalence of overweight children more than tripled, showing the importance of developing school practices that promote healthy eating habits. Consequently, this study aimed to: assess whether the monitoring of school lunches by nutritionist at the institution exerts some influence on the nutritional status of preschool children from 2 to 5 years, check qualitatively the distribution of macro and micro nutrients in your daily diet during their stay at school and parents ' opinions about the presence of the nutritionist.

Methods: Through calculation BMI/age assessed the nutritional status of each child. The data obtained with the anthropometric assessment have been classified according to the curves of the World Health Organization (WHO) and the related data results from analysis gathered through the menu prepared by a nutritionist in two early childhood institutions.

Results: It was found that 95% of preschoolers were eutrophic and 5% with thinness in school with nutritionist. The institution without nutritionist 66.6% of preschoolers were eutrophic and 33.3% overweight. Through examining the menu it was observed in both schools, low intake of carbohydrates and proteins and in the institution without the consumption of nutritional lipids and sodium was superior to another school. The intake of calcium, vitamin A and iron was lower than recommended. All parents of two institutions stated that the presence of the nutritionist in daily monitoring was essential, but there have been doubts about the professional presence in the institution, because at school with nutritionist, 83% confirmed the monitoring already in school without professional nutritionist 53. 3% say existed and 46. 6% were unsure, no parent replied that there was no nutritional monitoring.

Conclusions: The results obtained show that the presence of the nutritionist in the daily assistance influences on children's eating habits and anthropometric profile, being essential for adequate nutritional status.

Keywords: Importance of nutrition, food consumption and nutritional status.

144/1376

HOUSEHOLD POND-FISH PRODUCTION IN SOUTHERN ETHIOPIA INCREASES FISH CONSUMPTION FREQUENCY AND DIETARY DIVERSITY IN WOMEN OF REPRODUCTIVE AGE

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Background and objectives: The National Nutrition Program in Ethiopia focuses on food and nutrition security especially in vulnerable populations (e.g. women and children). In southern Ethiopia, government and university partners have recently (within 5 years) introduced aquaculture in farming practices (i.e. fish ponds) as means to address these security concerns. Evaluation of the aquaculture initiative in improving nutrition security is required. Our objective was to determine the association of household pond-fish production with fish consumption, dietary diversity and nutrition status of women of reproductive age.

Methods: Women, 19-49y of age, from fish producing (FP) [n=61] and non-fish producing (NFP) [n=117] households residing in Dila Zuria and Wensho Woredas (i.e. districts) participated. Fish consumption frequency was measured using three consumption patterns (i.e. frequent, occasional and non-fish eaters). Women's dietary diversity score (DDS) was determined by intake of 9 food groups within a 24h period. Nutrition status of the women was crudely assessed by measuring body mass index (BMI). In addition, focus group discussions were performed to obtain in depth information about pond fish production, consumption and usage.

Results: Nile tilapia (Oreochromis niloticus) was the most common pond species and species preferred for sale (i.e. income). Respondents from NFP households were less likely to consume fish frequently (OR=0.044, p<0.001) than those FP households. The mean (±SD) DDS in women from FP households (5.50±2.16) was significantly higher than their NFP counterpart (4.09±1.98, p<0.001). No differences (p>0.05) in mean height, weight and BMI were found between women in FP and NFP households.

Conclusions: The short period of time (<5 years) since the introduction of fish-ponds in the Woredas and the simple measure used to assess nutrition status (i.e. BMI) may explain the lack of difference observed in the nutrition status of the women. However, aquaculture has great potential in improving the food and nutrition security (e.g. nutrients, income) and our results illustrate some of the benefits of pond-fish production in southern Ethiopia

(i.e. more fish consumption and improved DDS). Further research is necessary to determine the longer-term impact of fish production on the nutrition status of both women and children.

Keywords: Dietary diversity, Nutrition status, Aquaculture, Food security, Ethiopian women

144/1393

PARECE ALFACE, MAS NÃO É. (IT LOOKS LIKE LETTUCE, BUT IT IS NOT)

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Background and objectives: The school plays a mediating and crucial role in the formation of students' eating habits. In this sense, it is possible to affirm that in the school environment the importance of the autonomy of the educating ones for their own alimentary choices, being responsible for the other social actors, members of the school community in the territory, for the control of the health, for the reduction of the risk factors and favoring healthy eating environments. The present intervention work intended to awaken children's curiosity and the social and cultural importance of food. With the educators, it helps them in building a pleasant ambiance of the meal and instigates them to work alimentation subjects in class.

Methods: In order for the objectives to be achieved, the intervention focused on two distinct groups: students and educators. After the initial observation period, the authors elaborated 4 dynamics for the 255 students enrolled in the Municipal School of Infant Teaching - Santos Dumont (Magic Box, dance and massage with food, ceramic Continents, food stamps and finalization) and two dynamics for the 24 school educators.

Results: The results were obtained through observation after the intervention and application of initial and final questionnaires with the educators. The data obtained in the questionnaires show that the educators felt more encouraged and confident to work with their students in the classroom. At the observed lunches, the teachers sat at the table with their students and the rule of absolute silence was not present. Some students demonstrated knowledge of the vegetables worked in the dynamics and were not afraid, nor disgusted to try new foods.

Conclusions: The intervention work inserted this school community within a ludic perspective of learning and improvement. It presents ways and new ideas for food to be worked in classrooms. The study becomes an example of how basic health care can be applied in schools, especially under a vision of health promoting and protecting.

Keywords: Health promotion, nutrition education, school.
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144/1397

EFFECTIVENESS OF AN INTERVENTION TO INCREASE HEALTHY EATING AND LEISURE-TIME WALKING AMONG PREGNANT WOMEN IN ANTENATAL CARE

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Background and objectives: Sedentary lifestyle and unhealthy eating behaviors during pregnancy are highly prevalent in the world and have great negative impact on maternal and child outcomes. Interventions in prenatal care can change this situation. The present study aims to evaluate the effectiveness of an intervention promoting healthy eating and leisure-time walking in antenatal care.

Methods: A controlled, non-randomized, intervention study in primary health care in a midsize city in southeastern Brazil. Trial Registration: RBR-6kf7wc. Obstetric low-risk adult pregnant women included in the first trimester and followed through the third trimester, divided into two groups: intervention (n=181), pregnant women receiving care from professionals participating in the educational intervention, and control (n=172), pregnant women receiving usual antenatal care. The intervention was conducted by doctors and nurses who participated in an educational training to promote leisure-time walking and healthy eating during antenatal care visits. The impact on pregnant women's behaviors was evaluated by multilevel logistic regression, with the main outcome of being reached the recommended 150 minutes per week of leisure-time walking (yes/no).

Results: There were positive impacts on the percentage of women in intervention group who walked at least 150 minutes per week (OR 3.1; 95%CI: 1.24, 7.75) compared to controled group. The practice of leisure-time walking in the second trimester (OR 2.59; 95%CI: 1.04, 6.42) and third trimester of pregnancy (OR 3.33; 95%CI: 1.69, 6.55) was higher in intervention group. Furthermore, there were protective effects against high consumption of soft drinks and/or industrially processed cookies in the third trimester (OR 0.49; 95%CI: 0.24, 0.98) in the same group. There was no impact on the other eating behaviors (vegetables, fruits and beans).

Conclusions: These lifestyle intervention was effective, tripling the proportion of pregnant women who achieve the recommended walking time and reducing the proportion with a high consumption of soft drinks and industrially processed cookies by half.

Keywords: Health Promotion; Physical Activity; Food Practices; Intervention Studies; Attitudes and Practices in Health.

Further collaborators:

144/1407

NUTRITION EDUCATION AND YOUTH: A TRAINING AN INTERVENTION INITIATIVE TO PROMOTE SOCIAL CHANGE WITHIN YOUNG WOMEN IN SAN MARCOS, GUATEMALA

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Background and objectives: According to the National Institute of Statistics in Guatemala (INE) youth represents the majority among national population. Social context for young women in Guatemala faced challenges in access to education, health and the guarantee of their human rights in general. Poverty and exclusion sum additional stressors to young women nutrition and health wellbeing and access to processes for social change can contribute to improve their opportunities to a better life

Methods: This reports from a bigger training and intervention initiative aimed to reduce anemia and nutritional vulnerability through capacity building processes. Training was developed through a guide which took into account the Food and Nutritional Guidelines content developed for Guatemala by the Ministry of Health. This guide was also adapted based on local context using the "Vulnerability and Capacity analysis" proposed by the Red Cross International and UNICEF. 6 participatory workshops with 1,300 young women were implemented and 600 young women were supplement with Iron and folic acid. Pre-post qualitative assessment was performed to identified impact changes. A follow up with young women who received supplements is still in need to perform.

Results: Improvement in the importance of nutrition perception was identified among participants. Leadership roles in food security commissions were performed by young women in 6 communities after completed training processes. Youth groups were conformed after having the training processes implemented, including initiatives at the municipal level

Conclusions: Training processes for social change, in the case of nutrition and youth, needs to take into account the context to develop and perform them better. Including decision making figures into training and intervention initiatives can support young women health, nutrition and leadership.

Keywords: Youth, Education, Social Change.

144/1435

PROGRAM FOR HEALTHY EATING PRACTICES IN A RURAL COMMUNITY OF NORTH INDIA

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Background and objectives: Women are the main person in the family preparing and managing food for the family and should understand the best dietary practices which fit in their budget and can be available locally, so it is very important that female understand the healthy eating practices with low cost locally available food.

Methods: This was part of another study, where we collected data for nutrition related health problem in females in Ballbagarh area of Haryana state in northern part of India. During study we found that most of the females have very poor knowledge about nutrition So we planned an intervention, where live demonstration was given by trained dietician in their own community near their homes about foods which are locally available and part of their food. Self help groups were made and help of grass route level health workers, volunteers were taken to make it sustainable

Results: Most of the females were not aware about healthy eating practices, there was high salt intake and fat intake as they were adding lot of extra salt and fat in most of items. Consumption of green leafy vegetables and sprouts was low in the area. After demonstration we have found that most of the females stopped using extra salt and fat in diet and started using sprouts. This program continued for one

Conclusions: Due to our efforts during study, the awareness and the overall improvement in the nutrition and health status of the postmenopausal women has increased in the area. We involved ASHA, ANM, AW worker and most importantly volunteers from their community to promote healthy eating practices even after completion of study for long term sustainability and bringing it into day to day practice.

Keywords: Nutrition rural females

144/1476

IMPACT ON BODY WEIGHT AND BODY COMPOSITION OF A NUTRITIONAL INTERVENTION PROGRAM PERFORMED AT THE WORKSITE: DATA FROM SI. MEDITERRANEO PROJECT

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Background and objectives: Overweight and obesity are the major risk factors for non-communicable diseases. Worksites have

the potential to become a central element in national efforts to reduce obesity because the majority of adults spend most of their time at work; therefore, worksites provide opportunities for group interventions that could facilitate weight control. Accordingly, the purpose of this study was to investigate the effects on body weight and body composition of a nutritional intervention program based on the promotion of the Mediterranean diet and regular physical exercise at worksite.

Methods: Overweight and obese employees (n=58) enrolled in this worksite trial with a 0-6-month nutritional intervention program and a follow-up after six-month. The intervention, collected by a nutritionist, was based on recommendations to reduce energy intake and saturated fat, and increase fiber consumption, according to the features of the Mediterranean diet. An increase of daily physical activity was also promoted. Outcome measurements included changes in body weight, waist circumference and body composition. Dietary habits were investigated by self-administered-24-hour-recall. Physical activity was assessed by a validated questionnaire.

Results: Significant decreases in body weight were observed during the intervention compared to baseline. The same findings were observed after 6-month of follow-up, even if the majority of the participants showed a tendency to resume their initial weight. A lower body fat and waist circumference was also observed during the intervention compared to baseline (p<.05). However, after 6-month of follow-up, a significant increase of fat mass was observed. The analysis of the habitual diet showed several beneficial dietary changes: fiber and polyunsaturated-fatty-acids intake were increased, while saturated-fatty-acids and added sugar consumption were decreased. The analysis of the physical activity questionnaire showed a significant increase of time spent walking during the intervention. On the contrary, a significant decrease was observed at 6-month of follow-up.

Conclusions: A nutritional education program is an effective tool to improve anthropometric measures and body composition in people at work. Unfortunately, most of the benefits tend to disappear when the intervention is discontinued. Systematic nutritional management programs should be developed and implemented at the worksites to help people to control their body weight and improve their food choices.

Keywords: Body weight; Body composition; Mediterranean diet; Physical activity; Nutrition education program

144/1585

FACILITATORS AND BARRIERS INFLUENCING OPTIMAL NUTRITION PRACTICES AMONG PREGNANT WOMEN

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Background and objectives: From May - October 2015, Alive & Thrive conducted formative research in the states of Bihar and Uttar Pradesh (UP), India to understand the determinants, barriers and facilitators for adopting optimal maternal, infant, and young child nutrition (MIYCN) practices and behaviors at the household level. This poster focuses on two maternal nutrition behaviors: consumption of iron and folic acid (IFA) and calcium tablets, and dietary diversity (intake of specific nutrient-rich food) in pregnant women.

Methods: Qualitative and quantitative methods were used including in-depth interviews with pregnant women, husbands of pregnant women, and frontline workers. We also conducted small group discussions, observations, and a set of rapid household trials to test recommended 'small do-able actions' for more than 200 pregnant women.

Results: Social norms, affordability, availability, cultural preferences, food habits and support from family members determined actual practice of dietary diversity among pregnant women. Inadequate supply, lack of specific knowledge regarding benefits (e.g. IFA prevents serious risk of death from postpartum hemorrhage) and ways to manage IFA side effects, among pregnant women, husbands, and mothers-in-law were determining factors for low IFA and calcium consumption.

Rapid household trials showed that women were willing to try new nutrition practices with support from family members in procuring necessary food items from the market and reminding them to eat recommended foods in required quantities. An important aspect of the trials which led to uptake in the recommended practice of ensuring IFA and calcium consumption was counselling of women and influencers on its health benefits and specific mortality reducing effects.

Conclusions: The capacity of frontline workers needs to be strengthened to provide timely counseling and demonstrate dietary diversity to pregnant women and mothers. Support and engagement of husbands and mothers-in-law can play an important role in motivating and building confidence of pregnant women to improve their nutrition practices and uptake of IFA and calcium consumption.

Keywords: Formative-Research, Maternal-Nutrition, Diet-Diversity, Determinants, Influencers

144/1587

SYSTEMATIC REVIEW COMPARING COMPLEMENTARY FEEDING PRACTICES IN URBAN AND RURAL AREAS IN KENYA

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Background and objectives: Breastfeeding is crucial during the first six months of an infant's life as it provides optimal nutrition to enhance child survival, growth and development. At 6 months of age, breast milk alone is no longer

sufficient to meet the nutritional requirements of infants necessitating the introduction of other foods and liquids alongside the breast milk. The WHO recommends that the process continues from 6 months up to 24 months of age; although breastfeeding may continue beyond 2 years. This is a critical growth phase for children whereby if appropriate care is not given nutrient deficiencies and frequent illnesses contribute to a vicious cycle of under-nutrition and disease. Poor complimentary feeding practices also contribute to negative growth outcomes such as stunting, underweight and obesity among children below five years of age; which can be risk factors for ill health during early childhood, adolescence and adulthood.

The objective of this study is to review published literature on the complementary feeding practices; comparing those practiced in rural areas with those practiced in urban areas in order to enhance knowledge that can help promote best practice when it comes to complementary feeding in Kenya.

Methods: This study adopts a systematic literature review approach. A search for literature published from 2007 to 2017 was carried out on PubMed and Google Scholar. Search results were screened for eligibility in a multi-stage process. Inclusion criteria included year of publication, location of study (Kenya), age group studied (children between 6 and 24 months) and outcome of interest (complimentary feeding).

Results: Out of 593 search results, only 46 studies were reviewed. This paper outlines complementary feeding strategies practiced in Kenya both in rural and urban settings. Sorghum and millet porridge, mashed potatoes, plantain and pumpkin are the most common foods introduced. Juices, fruits, milk and water are also given additionally. Diets of children in rural areas is more rich in natural foods compared to diets of those in urban areas. However it less diverse.

Conclusions: Kenya being a middle-income country, certain barriers both in rural and urban areas limit practical adherence to optimal complementary feeding guidelines.

Keywords: Some of the key words used included: "complementary feeding practices", "rural and urban" "early childhood feeding" and "Kenya"

Conflict of Interest Disclosure: No financial or non-monetary support has been received from any organization for the conduct of this study. Therefore I wish to declare no conflict of interests.

144/1594

THE KITCHEN IS OURS: DEVELOPING COOKINGS KILLS IN THE COMMUNITY

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Background and objectives: The ability to prepare food can impact on people's food choices. Cooking skills have been devised, developed and perfected in all societies, and improved from generation to generation. However, it is of concern that young people are not acquiring the basic skills of cooking that enable them to have autonomy over the foods they choose. Given this scenario, it is necessary to develop strategies aimed at sensitizing people on the importance of cooking and improving culinary skills. The objective of the present study was to show a food and nutritional education program developed with audio-visual resources, to encourage the development of cooking skills in the community.

Methods: The selection of themes to compound the program was based on a review of cooking techniques (cutting, chopping, peeling, tempering, and cooking methods like roasting, grilling, frying, steam cooking) involved in pre-preparation and preparation of foods. The elaboration of theoretical content used in the videos was based on books of gastronomy and scientific articles. The videos were recorded by three students of the undergraduate nutrition course of the Federal University of Santa Catarina, Brazil, supervised by teachers of disciplines related to food preparation. All videos were developed in the Dietetic Technique Laboratory of the university, using a semiprofessional camera and the program Final Cut Pro for Windows to edict the videos.

Results: Twenty-five videos were developed on the following topics: cleaning fruits and vegetables, measuring techniques and ingredients weighing, types of knives, mise en place, use and functions of utensils in the kitchen (sieve, vegetables peeler, kitchen brush, sharpening steel, cutting board, fouet, spatula) use and functions of stand mixer, food processor, blender and oven. Up to now 15 videos have been posted weekly in a youtube channel developed for this purpose and they were shared in social networking's Facebook and Instagram for the dissemination of the activities developed in the program. The average video views on Facebook and Instagram were 259.27 and 103.42, respectively.

Conclusions: The activities developed allowed the development of materials on topics of culinary practice that are fundamental for the development and improvement of the culinary skills of the community.

Keywords: Cooking skills, healthy eating, culinary confidence, food preparation

DO "EMPOWERED" WOMEN AND THEIR CHILDREN HAVE BETTER NUTRITION OUTCOMES THAN THEIR LESS-EMPOWERED PEERS?

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Background and objectives: Women's empowerment is considered key to improving women's and children's nutrition, but issues of measurement and complexity mean that direct evidence of a link is limited. This research examines the association between different domains of empowerment and dietary and nutrition status outcomes among women and their young children in Burkina Faso.

Methods: We examine cross-sectional data on married women and their young children from a 2014 household survey (designed by the International Food Policy Research Institute, n=2468) across 60 villages in rural Eastern Burkina Faso. Based on a set of questions about women's status, a set of "empowerment scores" were created covering seven domains (1) spousal communication, (2) purchasing decisions, (3) healthcare decisions, (4) family planning decisions, (5) infant and young child feeding decisions, (5) meeting with other women, and (6) social support, as well as an aggregate women's empowerment score. Using simple and multivariate regression analysis, we examine unadjusted and adjusted associations between each empowerment domain and the aggregate score and woman-based outcomes including dietary diversity, consumption of key nutrient-rich foods, anemia prevalence, hemoglobin concentrations, BMI, and underweight status. We repeat similar analyses to examine associations with child-based outcomes, including exclusive breastfeeding through 6 mo of age, consuming nutrient-rich foods, dietary diversity, and HAZ, WAZ, and WHZ scores. Multivariate regressions control for potential confounding variables, such as educational attainment and wealth, as well as clustering of results by village.

Results: The results show moderate but not systematically positive associations between women's empowerment and child/maternal nutrition outcomes. For example, women's hemoglobin levels, BMI, and likelihood of early breastfeeding are found to be positively associated with the empowerment scores, whereas children's growth outcomes are uncorrelated with empowerment. Certain domains of empowerment were more commonly positively associated with outcomes: interaction with women in community, social support, and healthcare decisions.

Conclusions: While women's status is associated with nutrition outcomes, the relationships found here are not clear-cut. This may be due to the cross-sectional nature of the data or the way in which empowerment was measured in this study.

Keywords: Gender, empowerment, women's nutrition
Further collaborators:
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DOES ENHANCED HOMESTEAD FOOD PRODUCTION (EHFP) AND NUTRITION EDUCATION HAVE AN IMPACT ON WOMEN'S DIETARY DIVERSITY AND NUTRITIOUS FOOD AVAILABILITY? A CASE FROM PROJECT LEASER BEAM (PLB) IN BANGLADESH

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Background and objectives: Micronutrient inadequacy is a major challenge faced by individuals in resource-poor countries such as Bangladesh where the diet is predominantly plant and rice based. Women and children face higher levels of malnutrition than men. In partnership with the Mondelez Foundation, Helen Keller International (HKI) implemented Project Laser Bean (PLB) from 2012 to 2016 in four upazilas of Satkhira District, in the southwestern coastal area. PLB provided training to households to increase the amount and diversity of garden production. We introduced poultry-rearing practices for egg production, formed marketing committees with links to market actors, built business skills to market agricultural products, and educated mothers through nutrition education.

Methods: Data were collected from project participants as a panel survey at baseline (n=207) during 2012 and end line (n=197) at 2016. A pre-post comparison was done to analyze the changes in key outcome measures among beneficiary households.

Results: We observed a significant reduction in inadequate dietary diversity from 76% at baseline to 23 % at end line (p<0.001). We also saw an increase in the knowledge of vitamin A rich foods from 14% at baseline to 93% at the end line (p<0.001). While knowledge of anemia symptoms was high in the beginning of the project, it also increased from 85% to 99% (p<0.001). We observed a reduction in the average number of months in the year that households reported having an insufficient amount of food to eat as well from 1.24 months at baseline to 0.47 months at endline.

Conclusions: We observed positive changes in both food security and dietary diversity among mothers over the program period, with substantial improvements in knowledge. As change in knowledge did not act as a mediator in the increase in dietary diversity, future research should investigate other pathways to dietary improvement. Moreover, since we had no comparison pop-

ulation, we cannot attribute these changes to the program alone, but the program was likely a contributor. Further research should explore these issues utilizing a control group to be able to determine program impact and attribution.

Keywords: Food security, Dietary diversity, Nutrition knowledge, Months of adequate food sufficiency

Further collaborators:

Mondelez Foundation

DIET SODA CONSUMPTION AND ITS RELATIONSHIP WITH OVERWEIGH IN ADULTS AND ELDERLY IN BRAZIL

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Background and objectives: Recent studies suggested that diet soda consumption may also be associated with health consequences, particularly type 2 diabetes and the metabolic syndrome. The objective of this study was to analyze the relationship between DS consumption and overweight in adults and elderly.

Methods: A cross-sectional study involving adult employees of two public universities in São Paulo state, Brazil. An online questionnaire was applied containing questions on the diet soda consumption and information about demographic, socioeconomic, anthropometric and health characteristics. The statistical analyses performed included: the chi-square test to determine association between explanatory and dependent variables, adopting a level of significance of $p < 0.05$.

Results: A total of 1323 individuals took part in the study. The prevalence of DS consumption was 36.8%. 64.2% were women, 83.3% were aged between 30 and 40 years old, with ≥16 years of schooling (76.6%) and income above $ 11900.00 (83.7%). 59.4% of the DS consumers had some degree of overweight and 63.6% reported having difficulty maintaining body weight. Among the obese, the prevalence of consumers was 45.6 times higher than those who did not consume. The frequency of difficulty in maintaining body weight was higher in consumers (63.6%) than in non-consumers (46.5%). In the evaluation of DS consumption and overweight, consumers were divided into three groups according to the amount and frequency of DS consumption frequency: "low" (mean frequency of consumption less than once per week and average amount of less than a glass), "moderate" (mean frequency of consumption once a week and average amount of one glass) and "intense" (mean frequency of consumption 2 to 3 times a week and average amount of consumption of two glasses). There was a statistically significant association between DS intake and nutritional status ($p = 0.004$). 41.8% of the obese individuals were present in the "intense" group while 23.8% of the eutrophic subjects were in this group, while on the other hand, the situation is reversed in the group "low", since the eutrophic individuals were the most present in this group.

Conclusions: The majority of DC consumers presented some degree of overweight and DS consumption was associated with overweight.

Keywords: Diet soda, overweight, consumption, artificial sweeteners, beverages

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FACTORS OF RELEVANCE FOR HEALTHY EATING FROM THE PERSPECTIVE OF NUTRITION COLLEGE STUDENTS OF STATE OF SAO PAULO

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Background and objectives: Alimentation is an important determinant of health. The concept of healthy eating, however, is variable and suffers multiple influences nowadays. In the case of experts in nutrition, the perception of what is healthy eating can influence their professional conduct. The purpose was to evaluate factors considered relevant for healthy eating between nutrition college students of state of Sao Paulo participants of the Brazilian cohort Nutritionist Health Study - NutriHS

Methods: A sample of 412 nutrition college students (18 and 30 years) of 34 public and private institutions in 22 cities of the state of São Paulo answered online questionnaires indicating the importance of 14 factors for healthy eating and eating disorders (ED) risk behavior. They related age, weight, height, type of institution and graduation year. The nutritional status were assessed by means of Body Mass Index. Factors of importance for healthy eating were evaluated with respect to type of institution, nutritional status and ED risk behavior by weighted frequency.

Results: Students were on average 22.7 years (SD 2.9), 70.1% had normal range weight, 48.8% were in the first two years of graduation and 28.4% presented ED risk. The main factors of relevance to healthy eating - the consumption of natural or minimally processed foods, pleasure and respect for signals of hunger and satiety - are in line with the Guideline for the Brazilian population, independent of type of institution, year of graduation, nutritional status and ED risk behavior. Some differences were observed in others factors of relevance to healthy eating. Caloric restriction was considered less important among students in the fifth year and more important among students with obesity caloric restriction. Have contact with food, cook and eat in appropriate environments were considered more important among public institutions students.

Conclusions: Characteristics strongly defended by the Guideline for the Brazilian Population as consumption of natural or minimally processed foods and pleasure have been incorporated as important by nutrition college students. Despite this, several

other characteristics related to healthy eating are different among students and need to be better worked during the college.

Keywords: Health, feeding, nutritional sciences, students

144/1849

DESIGNING CULTURALLY APPROPRIATE MESSAGES AND APPROACHES FOR MATERNAL, INFANT, AND YOUNG CHILD NUTRITION IN MOZAMBIQUE: USE AND ADAPTATION OF TRIALS OF IMPROVED PRACTICES

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Background and objectives: The United States Agency for International Development-funded Maternal and Child Survival Program (MCSP) is implementing an integrated reproductive, maternal, newborn, and child health and nutrition project in Northern Mozambique. The nutrition component focuses on preventive and curative interventions, both at facility and community level, with the goal of improving maternal, infant, and young child nutrition (MIYCN) practices. Despite the breadth of nutrition programs in Mozambique, little is known about behaviors, cultural beliefs, and perceptions that influence MIYCN, yet the Mozambique Ministry of Health recommends locally contextualized nutrition messages. We conducted a formative assessment to ascertain: 1) cultural beliefs, perceptions, and challenges related to infant and young child feeding (IYCF) for children 0-23 months of age using the Trials of Improved Practices (TIPs) methodology; 2) the role of fathers and grandmothers in influencing IYCF; and 3) cultural beliefs and perceptions related to maternal food consumption.

Methods: TIPs consists of 3 home visits to mothers of children 6-23 months of age. The first visit is to understand current feeding practices and ascertain challenges, the second is to counsel the mother on the feasible IYCF practices to try in a 7-day period, and the third visit is to discuss their experiences with the trial period. In-depth interviews (IDIs) and food frequency questionnaires were conducted with 26 mothers of children 6-23 months of age. IDIs were also conducted with mothers of children 0-5 months of age, pregnant women, and key influencers, including husbands and grandmothers. IDIs were recorded, transcribed, and coded by theme.

Results: A counseling guide was rolled out by MCSP in Mozambique. Targeted approaches and messages were aimed at ad-

dressing challenges to exclusive breastfeeding, increasing quality and quantity of food intake, increasing adherence to maternal iron and folic acid supplementation, and using local foods for recipes in cooking demonstrations.

Conclusions: TIPs is an innovative approach that allows mothers to test feasible practices at home and can inform program design and implementation to improve IYCF practices.

Keywords: Trials of Improved Practices, behavior change, infant and young child feeding, counseling messages, Mozambique

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144/1866

STUDY OF THE REASONS OF THE LOW CONSUMPTION OF VEGETABLES IN A POPULATION OF URUGUAYAN CHILDREN OF SCHOOL AGE

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Background and objectives: The low intake of fruits and vegetables that children eat is becoming a cause of growing concern around the world. A low intake has been linked to a higher risk of developing noncommunicable diseases. Uruguay does not escape this world situation.

The objective of the present study is to explore the reasons and barriers of low consumption of vegetables in Uruguayan children of school age, in order to find strategies to promote the consumption of these foods.

Methods: A database of children from 6 to 12 years old interested in participating in the research was generated.

From the first study with the group of parents, we categorize the main reasons for the low consumption of vegetables that were obtained, which were grouped in 14 sentences.

With the sentences obtained in study 1, we sent a second survey, along with the list of the 20 most consumed vegetables in our market. For each sentence, they selected the vegetables that responded to the same one.

The frequency of mention of each vegetables was calculated for each sentence, followed by a Correspondence Analysis (CA) to visualize the relationship between the sentences and vegetables and a Hierarchical Agromerative Clustering of the vegetables.

Results: Factors 1 and 2 of the CA explained 81.63% of the variance of the results obtained from 260 parents.

Of the 20 listed vegetables, they were categorizate into 5 groups, each associated with different sentences.

For Example:

Cauliflower was considered a vegetable that many children do not consume because their parents never offered it, because someone in the family does not like it or because they do not know how to prepare it, so that vegetable is not usually part of the family diet.

Peas, spinach, chard, and zucchini are vegetables that children used to consume when they were young, but not today, and most parents do not know why they do not like them now and therefore must "force" them to consume them.

Conclusions: The results obtained allowed us to obtain a first approximation aimed at proposing future working hypotheses, with the aim of increasing the consumption of vegetables among children of school age.

Keywords: Children, low cosumption, vegetables

Further collaborators:

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144/1888

ROLE-MODELING CULTURALLY APPROPRIATE NURTURING CARE PRACTICES TO IMPROVE INFANT AND YOUNG CHILD NUTRITION

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Results: **Background and objectives:** The 2016 Lancet early childhood development series highlighted the importance of nurturing care (combining health, nutrition, and caregiving), indicating that improper nutrition and lack of stimulation can lead to irreversible developmental and health outcomes. The period from birth to three years is a critical time for brain development, and caregivers often interact most with children this age during mealtime. Based on this evidence, SPRING promotes nurturing care practices that help improve caloric intake and diversify young children's diets during this critical window of opportunity.

Methods: SPRING uses a community-led video model to promote nutrition, hygiene, and nurturing care through videos starring local early adopters who role-model positive behaviors. This approach begins with qualitative formative research, which is used to prioritize culturally-specific nurturing care practices to improve maternal, infant, and young child nutrition (MIYCN). Community members are then trained in production and early adopters star in locally produced videos that demonstrate positive nutrition practices, including responsive feeding and nurturing caregiving interactions by both men and women. The local videos are screened during community group meetings and always involve facilitated discussions. This model was first implemented in India and then adapted for Niger.

Results: In India, the complementary feeding videos highlighted feeding young children patiently, not force-feeding, and encouraging the child to self-feed with finger foods, along with messages on food consistency and dietary diversity. In Niger, the videos focused on promoting a responsive caregiver feeding style and using a separate plate because formative research showed children ate from a family plate, with little interaction with a caregiver. Monitoring data has shown an increase in nurturing care behaviors in both countries, and qualitative research findings indicate that seeing the practices modeled in the videos helps caregivers to adopt them.

Conclusions: These results indicate that community video is an effective approach for improving responsive feeding behaviors that contribute to improved nutrition through the concept of nurturing care. This work provides an opportunity to strengthen linkages between nutrition and early childhood development by highlighting nutrition and care behaviors that can potentially help to enhance child development and positive parenting skills.

Keywords: Nutrition, IYCF, responsive feeding, SBCC, nurturing care

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144/1932

PREVALENCE OF FOOD AND NUTRITION SECURITY IN VULNERABLE GROUPS (MOTHERS AND THEIR CHILDREN (7-36 MONTHS)) FROM URBAN SLUMS OF VADODARA, GUJARAT, INDIA

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Background and objectives: Urban poor, dwelling in slums, are at higher risk of Food and Nutrition insecurity and women and children are the most vulnerable group. Hence, the present investigation aimed at mapping the prevalence of food and nutrition insecurity among vulnerable individuals (mothers and their children (7-36 months)) living in urban slums of Vadodara city.

Methods: Two Hundred Ninety Seven slum households from two out of five zones of Vadodara city were assessed for Food and Nutrition Security (FNS). Four dimensions of Food and Nutrition Security namely, accessibility, availability, utilization and stability were assessed for mothers and children 7-36 months of age by WFP VAM method (2010).

Results: Mothers were found to be moderately secure using 1890 Kcal energy/consumer unit/day as the indicator for availability. Using optimal breastfeeding practices as indicator of availability the children were categorised as having low FNS. Presence and availing of safety net programs namely food through public distribution system and take home ration through government feeding programs for mothers and children indicated high FNS while the marginal to poor utilisation of same threatened the FNS in the vulnerable groups. Accessibility as studied using Individual Dietary Diversity Score (IDDS) of mothers showed that 91%, 9.1%, and 0.3% were moderately secure, secure and insecure, respectively while 82%, 6% and 12% of children were moderately secure, secure and insecure respectively. Although 89% of the mothers were literate no significant correlation was found between IDDS of mother and child with the education level of mother. FNS measured by utilization namely presence of chronic energy deficiency (CED) indicated that 29% of the mothers had CED, 43% were nor-

mal and 28% were overweight. About 54% were stunted, 25% were wasted and 45% were underweight.

Presence of safety net programmes indicated stability of FNS. The composite index for overall FNS in study households indicated moderate security.

Conclusions: Though the presence of safety net program ensured availability of food and stability, the mothers and children from the urban slum households experienced moderate to low FNS due to poor utilization of the same.

Keywords: Food and Nutrition Security, Vulnerable Groups, Urban Slums, Individual Dietary Diversity Score

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144/1955

APTITUDES AND STYLES OF LIVING, IN TYPE II DIABETES ADULT PATIENTS ADMITTED IN THE MEDICAL CLINIC I WARD OF THE SOCIAL SECURITY CENTRAL HOSPITAL IN ASUNCIÓN

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Background and objectives: Therapeutic compliance of patients suffering from chronic diseases requires a multidisciplinary approach. Health professionals should develop awareness son the problem in patients and their families. Not only the family, but the community and also patient organizations are key factors for the success of treatment.

To describe aptitudes and styles of living, in Type II Diabetes adult patients admitted in the Medical Clinic I ward of the Social Security Central Hospital in Asunción.

Methods: Descriptive design and transversal analysis. One hundred patients withType II Diabetes Mellitus were part of the study. The IMEVID questionnaire was applied to all of them. Variables studied were. Age, sex, lifestyles, level of Glycated Hemoglobin. Statistics: Parametric and non Parametric Measurements. Pearson Correlation Test. Significance: $p < 0,05$.

Results: 100 patients were admitted. Female subjects: 66 %. An inappropriate lifestyle was confirmed in 58 % of the patients admitted with Type II Diabetes Mellitus. Female subjects were predominan treaching 66% of the total. 47 % of the patients had Glycated Hemoglobin above 7%. Pearson correlaction reached 0.03207 ($p<0,05$).

Conclusions: A high percentage of the patients admitted to the Hospital withType II Diabetes Mellitus leadanin appropriate lifestyle and present a high value of Glycated Hemoglobin.

Keywords: Diabetes Mellitus, lifestyle, glycated hemoglobin.

144/1974

STUDY OF FOOD PATTERN, BY USING GROUP DISCUSSION METHOD, IN MOROCCAN RURAL POPULATION

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Background and objectives: It is now well established that nutritional factors are the major determinants of food behavior and the emergence of chronic diseases. In Morocco, there is no data on food behavior in rural population as Moroccan population now is in epidemiological transition.

This research aims to study the food pattern in rural population (Bani Zeroual) of Taounate region.

Methods: We used a well-known analysis method: Focus Groups (FG) to determine all items that may be characteristics of this population. Also we have assessed the diet over a period of three to five days during which the respondent is asked to recall and describe all food and drinks consumed in the 24 hour prior to the interview

Results: The data obtained showed that the Mediterranean diet was not the diet commonly followed by the whole population studied. Moreover, the phenomenon of nutritional transition whose specificity in Bani Zeroual population is the maintenance of certain traditional foods such as cereals and vegetables in addition to the introduction of westernized foods such as dairy products. These profiles were associated with the socio-demographic characteristics of individuals

Conclusions: It becomes clear that the use of focus groups is an effective tool for studying the behavior of food and health status of a population. Therefore, focus groups can be used not only for Behavioral Study Food and health status of a population, but also in other areas.

At the end of this study, this method of idea generation: FG can be an "indicative" diagnostic tool for the behavior of food and the health status of a population that can act as a "smoke detector ". Subsequently, the obstacles and problems detected are to be verified and confirmed by conventional diagnostic methods of 24 recall and frequency questionnaire.

Keywords: Focus groups, dietary pattern, health status of a rural population

PILOT STUDY TO ASSESS PREFERENCE AND AC-CEPTABILITY OF RECIPES USING BIOFORTIFIED SWEET POTATOES AMONG WOMEN IN PANA-MANIAN RURAL COMMUNITIES

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Background and objectives: Undernutrition and micronutrient deficiencies among rural indigenous and non-indigenous communities remain as a public health problem in Panama. The present study is aimed to determine the preference and acceptability of recipes with biofortified sweet potatoes with housewives from the communities of Chichica and El Copé, two rural Panamanian communities.

Methods: A descriptive cross-sectional observational pilot study was conducted through a survey of acceptability, using a hedonic scale, and one of preference. This study is part of a muti sectoral nutrition- sensitive agriculture project leaded by IDIAP in Panama (AgroNutre). Four recipes based on usual consumption patterns were selected, two with a salty taste and two with a sweet taste. The sample had a total of 50 housewives from Chichica and El Copé. Data on dietary diversity and frequency of consumption of vitamin A source foods were also obtained through the USAID Home Dietary Diversity Indicator (HDDS).

Results: The four recipes evaluated in this study were accepted by both communities. In addition, the most preferred salty recipe was sweetpotato tamale in both communities. As for the sweet recipe, the most preferred in Chichica was sweet potato soda; and in El Cope, it was the sweet potato weevil

Conclusions: Biofortified sweet potato was well accepted in both communities, which supports the use of this biofortified item as a strategy to combat vitamin A deficiency.

Keywords: Panama, indigenous, biofortified crops, nutrition, food security.

MEDITERRANEAN DIETARY MODEL FOR PRE-VENTION OF FOOD-RELATED DISEASES AND FREQUENCY OF CONSUMPTION SELECTED PRODUCTS IN ITALIAN AND POLISH STUDENTS

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Background and objectives: Traditional Mediterranean diet was characterized by an abundance of vegetable, fruit, cereals and legumes, dairy products consumed in moderate amounts, olive oil as the principal source of fat, red meat consumed in low amounts, fish consumed in moderate amounts, and wine consumed in moderate amount, normally with meals.

Currently, there is a growing interest in the possibility of overall dietary patterns' complex influence on the risk of ischemic heart disease, arterial hypertension, diabetes cancers, biomarkers of obesity, and cardiovascular disease because some food items and nutrients could have synergistic or antagonistic effects when they are consumed in combination.

Methods: The study was conducted between 2015 and 2016 at three Roman universities. 454 students aged 20-25 from Italy and Poland participated in the study. The QEB Questionnaire was developed by the Behavioral Nutrition Behavioral Team, the Committee on the Science of Human Nutrition, the Polish Academy of Sciences. Students answered questions in the questionnaire designed to study nutritional behaviors and opinions on food and nutrition placed on the g mail platform.

Results: 47% from of students Italy and Poland consumed 3 meals a day, and over 48% consumed them irregularly. Approximately 43% of the respondents dripped fish once a week and 24% several times a week. In this group was the majority of Italian students. Only 42% consumed fruit and 44% vegetables a few times a day, the majority of them were Italian students (34%). Students from Poland (36% of the respondents) were more likely to eat white bread than the Italian ones. Italian students (45% of the respondents) consumed whole wheat pasta more often than students from Poland. 61% of students do not use any fat to spread the bread, mainly Italian students. Students from Poland (43% respondents) more often eat red meat several times a week than Italian students.

Conclusions: Polish students although they are studying and currently live in Italy do not apply the rules of the Mediterranean diet. There is a large group of Italian students who also do not follow the rules recommended in this diet.

Keywords: Mediterranean diet, dietary patterns, nutritional behaviors, food-related diseases,

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144/2043

ATTITUDES TOWARD BEEF AMONG NUTRITION COLLEGE STUDENTS

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Background and objectives: Although meat consumption be indicated as part of healthy eating, attitudes toward meat are diverse in society. Eating attitudes - beliefs, thoughts, feelings, behavior and relationships with food - of nutrition college students will guide professional practice. The purpose was to evaluate attitudes toward beef among nutrition college students of state of São Paulo participants of the Brazilian cohort Nutritionist Health Study – NutriHS.

Methods: A sample of 613 nutrition college students (from 18 to 30 years) of 34 public and private institutions in 22 cities of the state of São Paulo answered online, in free association, the first word that comes to mind when they think in the word "beef" and a questionnaire about eating disorders (ED) risk behavior. They related age, weight, height, type of institution and graduation year. The nutritional status was assessed by means of Body Mass Index. The frequency of the words that came to mind when students were prompted to free associate to the word "beef" was evaluated and compared according to ED risk behavior, type of institution and graduation year.

Results: Students were on average 22.9 years (SD 3.0), 70.5% had normal range weight, 50.9% were in the first two years of graduation and 28.4% presented ED risk. Of the ten most frequent associations 34.4% reported some nutrient, 23.9% some type of meat, 20.9% culinary association, 7.9% appreciation, 3.1% meal, 2.5% animal, 2.5% disapproval, 1.6% blood, 1.3% death and 1.0% frequency of consumption. Some differences between groups were observed as associations with type of meat were more frequent among students of fifth year and culinary associations were more frequent between students with low weight.

Conclusions: Attitudes toward beef are varied among nutrition college students. Although this variation is expected, the results indicate that attitudes toward food should be better discussed during the college, since they can directly influence professional practices.

Keywords: Attitudes, beef, nutritional sciences, students

144/2061

EFFECT OF NUTRITION EDUCATION TO MOTHERS ON IMPROVED PULSE CONSUMPTION BY YOUNG CHILDREN AGED 6-24 MONTHS IN RURAL SIDAMA, SOUTH ETHIOPIA

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Background and objectives: Poor feeding practice is not always lack of food but lack of knowledge of caregivers on appropriate feeding practices. Households with low income consume large amounts of starchy staples and little protein in low income countries. Pulse crops are rich in protein and key micronutrients yet pulse consumption is very low in Ethiopia, especially in SNNPR. The aim of the current study was to evaluate the effect of nutrition education for mothers on the consumption of pulse among their children aged 6-24 months.

Methods: 771 mothers-child pair (386 intervention, 385 control) randomly selected from 12 villages were participated in the educational intervention study from Sidama Zone, South Ethiopia. Nutrition education given for mothers for 9 months on key messages about pulse benefits, household pulse processing techniques and incorporating pulse in the complementary food (CF). Health Extension Workers (HEWs) were trained on the key messages, and then provided group education and house-to-house counseling for mothers for 9 months. In control sites HEWs gave usual lessons. Frequency of pulse consumption as well as mothers' practice of incorporating pulse in complementary food was assessed using a standard pre-tested questionnaire at baseline, midline and endline.

Results: Using pulse for CF improved at midline and endline compared to baseline. At baseline 49.9% of mothers from intervention group reported that they have used pulse for CF and this increased at midline (94%) and endline (98.4%). Used haricot bean was most common: 46.4% at baseline of which 73% give once or twice a week; 96.3% at midline of which 37% give more than one per day and 94.6% at endline of which 57% give more than one per day. At endline nearly 3% of mothers from the intervention group also started using faba bean in CF. At baseline 64.2% mothers from control group reported that they have used pulse for CF which did not increase midline (67%) or endline (67.7%).

Conclusions: Nutrition education intervention improved pulse consumption among children in rural communities of Ethiopia. Thus, promoting of pulse crops for incorporating in complementary food should be encouraged.

Keywords: Pulses, legumes, complementary feeding, malnutrition, Ethiopia

144/2144

TRANSFORMATIONS AND SOCIO-CULTURAL ASPECTS OF THE MEDELLIN SCHOOL DINING PROGRAM FROM 1961 TO 2010

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Background and objectives: Diet is a complex sociocultural act providing biological, nutritional, political and social dimensions. Interlocking them creates inequalities such as food shortages and access to food through social programs. The aim of this study is to identify the changes in the program of school restaurants in Medellin (Colombia), and to interpret the perception of the program's beneficiaries.

Methods: Qualitative and historical perspectives; ethnography and history of the present time. Ethnography was conducted with school beneficiaries and their parents, councilors, program coordinators, food handlers and nutritionists. Historical Archives of Medellin and Minutes Archive Medellin Municipal Council were reviewed to collect the historical information, reports and correspondence.

Results: The program has different models of service provision and different coverage; it has retained the sympathy of the mayors and officials of the various secretariats. This was set up at the beginning, in 1935, from a perspective of charity school by elite women, and then it had a hygienist and nutritional vision of right to food; and finally, a food and nutrition safety vision. In the supplied speeches and preparations, the absence of cultural references is identified.

Conclusions: School Restaurants programs help to reduce the suffering caused by hunger, but they are not always designed thinking about the cultural aspects that involves food.

Keywords: School restaurants, hunger, food, Medellín
Further collaborators: Only two authors

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EFFECT OF THE SCHOOL-BASED HEALTH PROMOTION INTERVENTION ACTIVITAL ON DIETARY INTAKE AND WAIST CIRCUMFERENCE: A CLUSTER RANDOMIZED CONTROLLED TRIAL

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Background and objectives: Unhealthy diet and abdominal obesity during childhood are important risk factors for chronic diseases at adulthood. We report the effect of a school-based intervention on the nutritional value of dietary intake and waist circumference after 28 months; and explore if the effect varied within important subgroups (weight and socioeconomic status).

Methods: A cluster randomized controlled trial (10 intervention/10 control schools) including 1430 adolescents (12-14 years old) was conducted in Ecuador. The intervention aimed to decrease adolescents sugar intake and unhealthy competitive food (rich in sodium, fat or added sugar) intake, as well as to promote fruit and vegetable intake (primary outcomes). Waist circumference was a secondary outcome. Primary outcomes were estimated by means of two twenty-four-hour recall. All outcomes were measured before and after the intervention. The interventions consisted of healthy eating classes with adolescents, healthy eating workshops with parents and canteen staff, and social events. The effect of the intervention was assessed using linear mixed effects models. A subgroup analysis by weight and socioeconomic status was performed including all the outcomes with a significant intervention effect.

Results: The analysis involved data from 1046 adolescents. Students from the intervention group consumed less unhealthy competitive food during snacks (-23.32 g; 95% CI: -45.25,-1.37) and less added sugar (-5.66g; 95% CI: -9.63,-1.65). Daily fruit and vegetable intake decreased compared to baseline, albeit significantly less in the intervention group (23.88 g; 95% CI: 7.36, 40.40). Waist circumference (-0.84 cm; 95% CI: -1.68, 0.28) was lower in the intervention group. The intervention effect on fruit, vegetables, added sugar, and, competitive food was independent of the weight and socioeconomic status of the participants. The effect on waist circumference, was larger among overweight-obese (-1.35 cm; 95% CI: -2.25, -0.45) but similar for different socioeconomic backgrounds.

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EARLY INFANT AND CHILD FEEDING PRACTICES AND THEIR ASSOCIATION WITH CHILD GROWTH IN THE RURAL KALALÉ DISTRICT OF NORTHERN BENIN

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Background and objectives: An understanding of feeding practices can help develop appropriate nutrition education messages. The objective for this study was to determine what were the early infant and child feeding practices in Northern Benin and their relationship with child growth.

Methods: Baseline data from a village-level irrigation program on food production was used for this study. Dietary and anthropometric data were collected from 559 children < 24 months of age. 24-hour recall was used to determine what foods were currently consumed by the children and if they were currently breastfeeding. Mothers were asked to recall when specific food items were first given to their children. 24-hour recall data were used to create a modified Infant and Child Feeding Score (ICFS) as described by Arimond and Ruel. Correlations and general linear models were used to determine the relationship between the ICFS and growth of children, controlling for education, employment, marital status, and SES. Results were also stratified by 4 age groups: 6-8 months, 9-11 months, 12-17 months and 17-24 months of age.

Results: Greater than 90% of infants were breastfeed through 17 months of age and 53.8% were breastfeed between 17 and 24 months. 13.1% were stunted and 20.7% were underweight. The most common order for introduction of foods to the children followed a pattern of liquids first then porridge, cow's milk, soft food, fish, vegetables. Meat was usually the last food introduced with less than 30% consuming meat at 10 months of age. The diet was also low in oil with < 20% consuming oil before 12 months of age. The ICFS was positively related with weigh-for-age for 6-8 month old children and with lengh-for-age for all children and for the age groups 12-17 months and 17-24 months. These relationships remained significant in a fully adjusted model. There was no significant association between the ICFS and weight-for-length.

Conclusions: The ICFS was associated with child growth. Additionally the results suggest that the pattern of introducing complementary foods could be modified to improve child growth.

Keywords: Infant, Breastfeeding Diet, Growth

144/2199

THE RELATIONSHIP BETWEEN THE SUBJECTIVE EVALUATION OF MEAL IN FEMALE UNIVERSITY STUDENTS AND THEIR LIFE STYLE

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Background and objectives: The nutritional environment in Japan has been changing rapidly. Environmental, social, and individual factors influence eating patterns, which in turn affect maintaining an appropriate bodyweight. It is important to eat three meals daily, breakfast, lunch, dinner, and to choose meals of appropriate quantity and quality. However, it is difficult for female university students to effectively choose in the manner. The aim of this study was to uncover the level of recognition of desired meal characteristics for female university students, and examine the reason why they are not able to choose appropriate quantity or quality in their meals.

Methods: A self-administered questionnaire was distributed to Japanese female university students attending Women's' University (F: n=185) or Physical Education University (PE: n=70). The questionnaire contained questions on lifestyle, physical characteristics, food intake frequency, and included a comment section regarding photographs of two kinds of meals. We classified their comments as "dietary behavior", "quantity", "nutrient", "food group", "dish division", "quantity/nutrient/food group unidentified", and "other" according to Healthy Japan 21 (second term), counted the number of comments in each category. The subjects were also divided into two groups based on "quantity". The data was analyzed by t-test. Difference with $p<0.05$ was considered significant.

Results: The results showed no significant difference in the number of the comments between F (4.4 ± 2.4) and PE (4.9 ± 2.4). Also the number of the comments of "quantity of meal" showed no significant difference between the two groups (0.78 ± 0.92).

Conclusions: The results indicated that exercise habits, food intake frequency and dietary habits in Japanese young females did not influence dietary behavior.

Keywords: Quantity of meal, female university students, life style, physical characteristics

Conflict of Interest Disclosure: No potential conflicts of interest were disclosed.

Further collaborators:

PROMOTING FACTORS OF NUTRITIONAL CULTURE IN ADOLESCENTS AND YOUNG ADULTS OF THE UNIVERSITY OF LA SABANA

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Background and objectives: The adolescents of our country, have become a group for the study of the development of chronic non communicable deseases as diabetes and obesity through the study of some risk factors evaluated.

The purpose of our work is to evaluate the body composition, lifestyles and nutricional habits of young adults of the Universidad de La Sabana, Bogotá with the purpose of implement programs to promote a nutricional culture.

Methods: This study was descriptive cross-section with random sampling of the University population of the Universidad de La Sabana. It was done through the measurement of body composition through the use of an impedanciometre, anthropometric measures, measures of perimeter, diameters and taking of fasting blood samples for the determination of total cholesterol, triglycerides and lipoproteins in a population of 165 students between the ages of 16 and 21 years.

Results: The results obtained show that among the 165 students, 10.3% were underweight, 13.93% were overweight and 0.6% showed obesity. As to gender, 4.8% of the men and 9% of the women were overweight, 3% of the men and 7.2% of the women were underweight and 0.6% of the women showed obesity. Blood chemistry: 30% suffered hypercholesterolemia, 18% suffered hypertriglyceridemia, 17% had low levels of HDL and 67% had high levels of LDL. Also 2% had pre-diabetes levels, this in a population that ranged from 16 to 21 years can be related with genetical factors or also due to bad nutritional habits. 7% of the population whose homocysteine values were higher than the normal parameter have an increased risk of thromboembolism, heart disease, stroke and complications of diabetes such as neuropathy. The elevation of this aminoacid can be caused by bad eating habits. From all cases studied, 40% showed risk factors for a metabolic syndrome. 60% did not perform any physical activity, 44.70% of them were women

Conclusions: These results allowed us to implement in the institution a culture of healthy habits, reason why we worked with the University Welfare Department to adjust the menu that offers the campus encouraging the students to a higher consumption of fruits and vegetables, low-salt food and low carb foods.

Keywords: Nutritional culture, obesity, cardiovascular risk, body composition, body mass index.

Conflict of Interest Disclosure: These results show Diabetes Mellitus and metabolic syndrome are not diseases of older adults, as we found it among the population of ages between 16 and 21 years old; which are individuals that suffer from high cardiovascular risk factors as hemocisteinemia, hypertriglyceridemia, hyper-cholesterolemia, obesity and even 2% of them have pre-diabetes. This results are really important because if not corrected on time, the damage could be irreversible.

Further collaborators:

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FACTORS ASSOCIATED WITH FOOD CHOICE IN ADOLESCENTS

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Background and objectives: Introduction: Food choice is influenced by several factors, including sensory, economic, social, cultural, and psychological aspects, and is related to social environment and personal history and values.

Objective: To describe the factors that influence food choice in adolescents according to sex, weight, and physical activity level.

Methods: The study investigated 405 6th and 7th graders from two public schools in Niterói, Rio de Janeiro, Brazil. Data were collected in 2014 using a multidimensional questionnaire. Adolescents were asked to select, among 15 options, the 3 most important reasons for their food choice, which were categorized as: sensory aspects ("taste", "color", "smell", "appearance"), socio-cultural aspects ("habit", "my family usually eat", "my friends like", "low-calorie foods", "religion"), economic/access aspects ("have in my house", "price", "easy to buy", "easy to prepare"), and "healthy eating". The chi-square test ($p < 0.05$) was used to verify the homogeneity of proportions of factors according to categories of gender, weight status, and physical activity level.

Results: Among the analyzed adolescents mean age was 12,05 years old, 53,6% were male, 34,4 % overweight, 58% physically active. The top factors influencing food choice by the studied adolescents were "taste" (72%), "smell" (45%), "appearance" (32%), "texture" (22%), and "color" (20%), followed by "having a healthy diet" (19%) and "my family usually eat" (16%). Compared to insufficiently active adolescents, a higher proportion of active adolescents cited "having a healthy diet" as an important factor in food

choice; the same was observed for females compared to males. Overweight adolescents showed greater interest in low-calorie foods, compared to non-overweight adolescents. These differences presented statistical significance.

Conclusions: The study indicated that sensory aspects appear to be the most important factors took into consideration when choosing foods. Physically active adolescents and female showed more concern about healthy eating. These findings can help in the design of healthy eating promotion actions aiming adolescents.

Keywords: Adolescents. Food choice. Motives to choose food. Food consumption.

Further collaborators:

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EVALUATION OF CLASSROOM FOOD EDUCATION (SHOKUIKU) COMBINED WITH VEGETABLE TASTE TESTING FOR COLLEGIATE FEMALE ATHLETES

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Background and objectives: There are comprehensive food education programs, namely Shokuiku, that aim to improve dietary practices and reduce lifestyle-related diseases. This study aims to assess the effectiveness of the shokuiku combined with vegetable taste testing of bean sprouts, which aims to improve attitudes toward healthy eating vegetables.

Methods: The shokuiku was delivered to long distance runners (n=6) and naginata athletes (n=9) aged 18-22 years, within 90 minutes post-training. We prepared two kinds of bean sprouts cooking (boiled and fried) for the shokuiku. The content of the shokuiku included preparing two types of bean sprouts (boiled and fried) and recording the participants' feedback on appearance and taste. Afterward, they attended a lecture on vegetable preparation and nutritional value, and again recorded feedback. The feedback was divided and recorded into three categories, those being interest and motivation, knowledge and understanding, thinking and judgment. The questionnaire contained questions on knowledge of vegetable dishes and dietary habits.

Results: The long distance runners (83.3%) had more focus nutritional balance than the naginata athletes (22.2%) and were selective in their meals. The naginata athletes focused more on quantity of the meal. Furthermore, the naginata athletes showed a higher price ceiling than long distance runners, having a higher intake of vegetable dishes with potatoes and starches, green and yellow vegetable, white vegetable, fungi and algae. In their assessments, long distance runners had more feedback on the "knowledge and understanding", where naginata athletes had a higher feedback percentage in "interest, and motivation,"

Conclusions: For cases such as the long-distance runners, we should undertake Shokuiku focused on "knowledge and understanding". For naginata athletes who prioritized quantity, it is likely that Shokuiku regarding "interest and motivation" would have an affect on their day-to-day dietary habits.

Keywords: Food Education, vegetable dishes , collegiate female athletes

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FOOD AND BEAUTY CONDUCT ADVERTISEMENTS: AN ANALYSIS OF THE MAGAZINE ANUÁRIO DAS SENHORAS' CONTENTS

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Background and objectives: In Brazil, during the 30s there was a noticeable industrial development along with increased consumption of goods and culture both imported from other countries, especially the United States. It was in this context that several magazines aimed at women were created, like "Yearbook of Ladies" an example of publication of this time, directed for this genre, that suggested ways of living, dressing, consuming and especially ways of how women should behave toward society and when taking care of their houses. The aim of this study was therefore to identify food advertising intended to women, information on health, beauty, nourishment and body image present in magazines and how they were passed on to the readers of these reports by approaching ads and materials linked to the magazine.

Methods: The study was developed from observation and content analysis of seven (7) volumes of this magazine published between the years of 1941 and 1957.

Results: Thus, it was found over that the number of publications intended for food increased along the years, mainly about the called ultra processed one in addition to a large representativeness of women with tuned silhouettes and a strong focus on thinness in almost all content intended to beauty and women's health presented in magazines.

Conclusions: The way society is transformed and changes its relationship to the way of living, consuming, dressing, eating, relating to each other, and even getting sick is closely linked with the media, with the technical scientific development process, along with socioeconomic interests.

Keywords: Media, advertising, food, beauty, women.

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CONSUMPTION OF HABITUAL CULINARY PREPARATIONS IN NEIGHBORHOODS OF MONTEVIDEO ACCORDING TO PERCENTAGE OF HOUSEHOLDS AT POVERTY

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Background and objectives: Information on culinary preparations habitually consumed by the population taking into account poverty status is relevant for the understanding of cultural eating practices and for providing the basis of educational strategies on food and nutrition.

To study the culinary preparations habitually consumed in different neighborhoods of Montevideo during May 2016 according to percentage of households at poverty.

Methods: Observational, non-probabilistic, descriptive study of 756 households distributed in different neighborhoods of Montevideo. The person in charge of the home culinary preparations was interviewed using a structured questionnaire. Neighborhoods were classified according to the percentage of households with income at poverty level (Encuesta Continua de Hogares- Instituto Nacional de Estadística, 2014).

Results: 52% of households were composed by 2 to 3 members, and 75% of those interviewed were female indicating that women have a leading role in family feeding. Preparations more frequently consumed at lunch time were pot meals (47%), in neighborhoods with highest poverty, and fried breaded beef (33.9%) in neighborhoods with lowest poverty. At dinner time, pot meals were outstanding (19.8%) in all neighborhoods, probably due to the season of the interview. In those neighborhoods with lowest poverty, taste (42%) was the main reason for consumption, whereas price (25.6%) was the main reason in those with highest percentage of low income consistent with this resilient practice at poverty. During the week-end, more than half of all households selected barbecued or baked meats (28.5%) and simple or stuffed pasta (28.4%), the latter preparation more present in neighborhoods with highest percentage of poverty. These selections could be due to cultural factors and tradition, as a result of the influence of immigration during the first half of the XX century, as well as native culinary practices.

Conclusions: During week days, differences found in habitual culinary preparations in neighborhoods according to presence of poverty indicate the importance of efficiency, satiety and price as factors influencing selection, whereas on week-ends multiple cultural influences appear to be present, especially Spanish and Italian.

Keywords: Culinary preparations- Neighborhoods- Poor households

Further collaborators:

Survey of consumption by students of the Intermediate level of the Degree in Nutrition of the School of Nutrition. Escuela de Nutrición. Universidad de la República, in the framework of the course of Nutrición Poblacional I year 2016.

144/2278

"MISUSE OF FOOD DURING GRADUATION CELEBRATIONS ON SCHOOL OF NUTRITION STUDENTS OF UNIVERSITY OF BUENOS AIRES (UBA), ARGENTINA: CAN ONLINE SOCIAL NETWORKS DISCOURAGE WASTE OF FOOD?"

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Background and objectives: Throwing food at recent university graduates is an Argentine tradition, wasting food that should be used for nourishment.

To help fix this problem, the School of Nutrition (UBA) in partnership with national organizations signed a Letter of Adherence to the "Save Food" FAO-led Initiative.

Objectives: 1) collecting UBA Nutrition students' opinions about this use of food; 2) developing a Social Marketing Program ("Festejo NutriConsciente") to propose alternative forms of celebration via social networks; 3) doing a Program's short-term evaluation.

Methods: This study was conducted between April 2016 and March 2017. For the first aim, a semi-structured survey on a sample of UBA Nutrition students was applied. For aims 2 and 3, "Festejo NutriConsciente" through Instagram, Facebook, and Twitter was developed. In a short-term evaluation, number of "Likes" in social networks were accounted and an online survey among 69 Nutrition students graduated in November 2016 was conducted.

Results: On 202 initially surveyed students 68.3% considered this celebration "bad" /"very bad" mainly due to the waste of food; 12% considered this kind of celebration "good" / "very good" for being a tradition. 53.5% believed that achieving a behavioral change would be "difficult" / "very difficult"; 64.4% never questioned the wasting of food during graduation celebrations. When assessing social networks, 5,465 Likes were obtained in Instagram, 4,732 in Facebook, and 789 in Twitter. Among 69 Nutritionists graduated in November 2016, 30 reported having celebrated without food. 26 of them reported that they had been influenced by Festejo NutriConsciente Program; the rest argued being against

throwing food during celebrations before the Program was implemented. Those who did use food claimed it was their families' and friends' decision to do so. All of surveyed subjects claimed to have heard about the Festejo NutriConsciente Program.

Conclusions: Given the impact of the Festejo NutriConsciente Program, it should be continued to propagate behavioral changes and should be extended to other undergraduate degree programs in UBA.

Keywords: Food waste - Social Marketing Program- UBA Nutrition students - NutriConsciente Program

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144/2285

ROLE OF FOOD DEMONSTRATION WITH INTENSIVE COUNSELLING IN INCREASING DIETARY DIVERSITY AMONG PREGNANT WOMEN: RURAL BANGLADESH PERSPECTIVE

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Background and objectives: 'Alive & Thrive's integration of Maternal Nutrition Interventions (MNI) into BRAC Maternal, Neonatal and Child Health (MNCH) programme of BRAC Bangladesh aimed to test the operational feasibility to deliver a package of maternal nutrition interventions through behaviour change communication as part of a large scale rural MNCH programme. The purpose of this project is to reduce maternal malnutrition through promoting dietary diversity, increased energy intake, and iron-folic acid and calcium intakes. This initiative cover almost 3.3 million (3,368,312) people from 10 sub-districts of 4 districts. One of the key activities of this project is demonstration of the daily required amount of 5 highly recommended varieties of food i.e. fish or meat, egg, milk or milk product, dark green leafy vegetables and yellow/orange fruits and vegetables beside rice and pulses by community health workers with intensive counselling about the importance of these food in each trimester to the pregnant women. Therefore this abstract intends to reveal the achievement of the programme activities from September, 2015 to February, 2017.

Methods: This paper used secondary data source that is the management and information system (MIS) of the MNI project. All intervention sub-districts under this project is considered as study area.

Results: From September, 2015 to February, 2017, data revealed that, a total of 128,914 pregnant women were registered and 284,395 number of demonstration sessions were conducted.

Within this period, consumption of all 5 recommended variety of foods by pregnant women dramatically increased from 20% in 2015 (September) to 84% in 2017 (February) which may resulted from the extensive demonstration with counselling. In February 2017, percentage of women who consume all 5 groups of foods increased to almost 80% whereas in September 2015 this percentage was 55% for fish/meat consumption, 30% for egg, 26% for milk, 31% for dark green leafy vegetables and 25% for yellow/orange fruits and vegetables.

Conclusions: The results provide clear evidence and indication that practical demonstration of food with intensive counselling can increase diversified food consumption among pregnant women and thus it can be used as powerful tool to improve maternal dietary diversity as well as to reduce the malnutrition during pregnancy.

Keywords: Food demonstration, counselling, dietary diversity, maternal malnutrition, behaviour change communication

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144/2357

FACTORS THAT INFLUENCE FOOD PURCHASE DECISIONS OF FAMILIES

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Background and objectives: Background:

Purchase decisions of a household relate to quantity and quality of food needed to lead an active and healthy life is an important indicator for the assessment of food and nutrition security, to identify and characterize the nature of food insecurity, the severity of food deficits, predict who are at greater risk of future hunger, detect changes and evaluate the impact of interventions.

Evaluating purchase decisions in our population provides evidence on food availability that the population has access to.

Objective:

To determine the factors that influence the purchase decisions of those in charge of household purchases

Methods: The population of the present study included families with preschool and school-age children of both sexes in daycare or primary school vulnerable in the 5th region of Chile. A focus group was held and 8 household representatives in charge of food purchases at home participated. Participant ages ranged between 32 and 50 years old.

Results: Participants indicated that they buy food weekly (5/8), 2 daily and 1 monthly. Vegetables and fruits were reported

to be purchased at the farmers market. Factors influencing food choice for the home were: cost, taste and, as less important, nutritional quality. Participants indicated that they did not mind traveling farther distances to find better prices. Participants noted that they did not plan and prepare food according to the food they have at home. In relationship to attending workshops at Primary Care Centres, participants reported that they do not participate, but stated that their choices may be influenced if they attended.

Conclusions: The factors that influence food-purchasing decisions for the home of families with preschool and school age children were: cost of food and taste. It is necessary to strengthen strategies of food education that involve the nuclear family.

Keywords: Purchasing decision, focus group, food availability.
Further collaborators:
All collaborators in the abstract

144/2380

BELIEFS ABOUT THE BENEFITS AND DANGERS OF COW'S MILK CONSUMPTION BY WOMEN AND CHILDREN IN SOME PERI-URBAN COMMUNITIES IN GHANA

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Background and objectives: Dairy products are a source of quality protein and bioavailable micronutrients important for women of reproductive age (WRA) and children. However, negative beliefs about milk may limit their consumption. Understanding beliefs about milk relative to WRA and young children may inform interventions to enhance milk consumption and contribute to addressing the high burden of malnutrition among WRA and preschool age children. We assessed perceptions about the benefits and harms of milk consumption by WRA and young children among adults in some peri-urban communities in Ghana.

Methods: Exploratory qualitative study comprising 26 focus group discussions (FGD) conducted among the following groups: Adult men and different categories of WRA; mothers with children <5y, lactating mothers, pregnant women, non-pregnant and non-lactating women. Trained moderators facilitated the FGD either in English or the local language of choice. A socio-demographic questionnaire was administered and a semi-structured interview guide was used to solicit information on their beliefs and attitudes towards milk consumption. The discussions were record-

ed, translated and transcribed into English. The transcripts were then coded and analyzed using the thematic analysis approach.

Results: A total of 190 people participated in the FGD, 81.6% were women, 17.9% were 40y and above, 7.9% had no formal education, 14.9% were unemployed and 75.1% were married. While dairy were generally perceived as nutritious and healthy for children and WRA, the FGD also identified positive and negative beliefs about milk consumption. The most salient positive beliefs about milk consumption emphasized their perceived benefits for pregnant and lactating women. For pregnant women, milk was said to 'give blood', prevent dizziness and heartburn. For breast-feeding women, it was believed to enhance breast milk output. For young children, dairy consumption was believed to promote growth, intelligence and advance puberty. However, it was cautioned that consumption levels for milk needed to be moderated as high consumption frequency could cause diarrhea and stomach sores particularly among children.

Conclusions: The largely positive beliefs about milk suggest a favorable attitude towards drinking milk in the communities studied. However many of these positive and negative beliefs were misconceptions that will need to be addressed through nutrition education.

Keywords: Dairy, milk consumption, beliefs, benefits, Ghana
Further collaborators:
Sponsored by the Bill & Melinda Gates Foundation and DFID.

144/2405

INVOLVEMENT OF SOCIAL AND GENDER ASPECTS IN THE CHOICE OF NUTRITION

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Background and objectives: There are few studies about sociocultural aspects which origin are in some food behaviour, in this particular case of women. Future studies will be required to introduce the routine demanded by dietary advice in every day life.

Determine the causes that lead to women to decide their diet.

Methods: Transversal descriptive study consisted of 38,455 women, of which we selected by random sampling a proportional and representative sample of 500 women, aged between 40 and 60 years. These women are subjected to an own design questionnaire, with socioeconomic, demographic variables, and some of them related with attitutes and lifestyles. We took aspects of the image body shape questionnaire of Cooper et al., (1987) and eat-

ing attitudes test of Garner et al., (1982), which we added others of interests for us.

Results: Firstly we consider of the women:

- Economy 45.53%
- Children and/or couple preferences 14.35%
- Fashion style 9%
- Ease of study preparation 9%
- Health 4.46%
- Other reasons (esthetic among them) 26.66%

98.19 % of women are responsible for family diet.

80.4 % of women recognizes that they eat things that are not in their interest, even though they know that it is so, conditioned by the above issues.

93.69% of women of the sample consider of interest to receive in diet topics.

Conclusions: Family economy is the first reason that determines the choice. Nowadays, related with the economic crisis.

About the other reasons, the main is pleasing children and couple. Fullfilling the women role to assume nutrition responsibility, that exclusively falls on them. Meaning satisfaction of all, although that may condition that the feeding of the women themselves distract from what is convenient, with consequences of their health.

Keywords: Gender Identity, diet, Social Determinants of Health.

Further collaborators:

Mª José Castro Alija (MD, PhD)[1,2], Mª José Cao Torija (RN, PhD)[1,2], Ana García del Río (MSc)[1], María Lopez Vallecillo (RN, PhD)[1], Manuel Frutos Martín (RN, PhD)[1], José Mª Jiménez Pérez (RN, PhD)[1,2].

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144/2416

EVALUATION OF FOOD WASTE AND THE PROMOTION OF THE FULL USE OF FOODS IN AN INSTITUTION OF LONG PERMANENCE FOR ELEDERLY (ILPE)

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Background and objectives: Most of the Long Permanence Institutions for the Elderly (ILPE) in Brazil are philanthropic, and the food comes from individuals and legal entities donations, which could lead to nutritional deficits due to a lack of adequate nutrition planning. However, nutrient deficiencies can be minimized by full utilization of food. This work aims to evaluate and promote the integral utilization of food by a ILPI in Dourados, MS (Brazil).

Methods: This is an action- intervention study that belongs to na extension Project held in the year 2015. In a period of thirty days, there was the weighing of the unconventional parts of the food discarded by the institution. In the second stage, the illustrative booklet with recipes was elaborated according to the non-use of the vegetable/ fruits observed. The kitchen employees also completed a self-administered questionnaire with seven mixed questions adapted from Da Rosa (2009). The questions were to evaluate the knowledge about the integral use of food and were applied before and after the course. Two practical mini-course (4 hours each) approaching the benifts of integral use of food and the preparation of 4 recipes contained in the booklet and randomly selected were made: salted pie made with peel and stalks of vegetables and sweet made with the shell / crust of watermelon with coconut; and banana peel jelly and carrot dip.

Results: It can be observed that the vegetables/fruits were not fully utilized by the institution. In addition, 6,672 kg of lettuce (leaf, stem), 1.278 kg of tomato, 492 g of cabbage, 678 g of arugula, 400 g of chard, 396 g broccoli were discarded for lack of storage and excessive withdrawal during pre-preparation. The results of the questionnaire showed that the employees already had some knowledge about the integral use of the food, but they didn't use the technique, due to the lack of knowledge of the variety of recipes.

Conclusions: It could be noted that there is food waste in this institution due to the lack of instruction regarding the integral use of food, that can be used to reduce waste and enrich the elderly's diet.

Keywords: Institution of Long Permanence; Consumption, Waste; Full Use of Food

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144/2467

OBESITY: ANALYSIS OF THE USE OF A COMPREHENSIVE SYSTEM OF CARE, THEIR ADJUSTMENTS AND THERAPEUTIC COURSE OF THEIR PATIENTS THROUGH A RETROSPECTIVE STUDY

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Background and objectives: Background: We understand obesity is closely related to lifestyle; where the context and meanings about commensality and the automatism of habits, represent the backbone that sustains the disease, and in turn these patterns of behavior sustained over time leave a neuroendocrine footprint that demand more therapeutic resources to be modified. Our therapeutic setting is an integral and dynamic interdisciplinary approach through individual consultations and group meetings high frequency, with a multicentric experience of 23 years.

Objective: To observe the use of a comprehensive health system by obese patients

Methods: Retrospective analysis of 13 years database, Markie, stata sand Microsoft Excel programs were used, in front of therapeutic adaptations implemented in the institution.

Results: Total population 31815 patients (75% female, mean age in years (SD): 44.20 (11.6))

Significant differences between an early period 2003 to 2011 were observed and one late in the 2011-2015 which had already settled many therapeutic adaptations strategic (diversification for monitoring and patient care, multidimensional motivational enhancement, decisive changes in dietary patterns adaptations performance modules, etc. Noting the following differences:

Patients reached the maintenance first time: P1 (P=period of time) = 13%; P2= 53%. Patientes that returned to the system: P1= 1r (r=re-entry): 25%; At least 2r 8.6%; At least 3r : 3%; At list 4r: 1%. P2= 1r: 36%; 2r: 12%; 3r: 2%; 4r: 0.35%. Weight threshold recovered: P1= 90% returned at least 1 time with weight regain but less weight than income; 78% returned at least one more time but with less weight than they had in the first return; 77% less weight than the second return. P2= 92% returned at least 1 time but with less weight than the start; 81% patients returned at least one more time but less than the last weight; 92% returned at least one more time but with less weight previous.

Number of active groups in maintenance: P1= 1; P2= 6. Rate asset maintenance patients: P1= 0.2%; P2= 12%.

Conclusions: The adjustments to the professionals to the needs of patients, and maturation of resources has a positive impact on the thresholds and therapeutic goals

Keywords: Comprehensive health system obese patients

Conflict of Interest Disclosure: It is important to mention for the analysis of implications that the researcher belongs to the institution in which it is investigated, this being the same one that funds the investigation. Private institution that performs activities of private order (individual attention in medical and nutritional clinics and therapeutic groups) and also public order activities (such as collaboration with public canteens, schools, physical activity open to the community in parks)

144/2569

BENEFITS OF DIETARY FIBRE FOR HUMAN HEALTH AND EATING HABITS IN DIFFERENT COUNTRIES

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Background and objectives: Because DF has unequivocally demonstrated many benefits for the human health, its consumption should be encouraged. In this way, this research aimed at identifying the eating habits regarding fibre rich foods and assessing the knowledge about the effects of DF as enhancers of human wellbeing. The study was undertaken simultaneously in five countries situated in different parts of the globe, namely South America (Argentina), Africa (Egypt), South Europe (Italy), Central Europe (Romania) and North Europe (Latvia).

Methods: A descriptive cross-sectional study was carried out on a non-probabilistic sample of 2290 participants from 5 countries. The data collection was made by a questionnaires translated into the native languages in all participating countries.

Results: The consumption of vegetables and salads was higher for Argentina and lower for Egypt while fruits are more consumed in Italy and less in Latvia. Whole grains are more consumed in Latvia and Romania and less in Argentina and Italy. The knowledge about the benefits of DF for cardiovascular diseases and cholesterol is higher in Argentina, for bowel cancer and diabetes in Romania and for obesity and constipation in Latvia. Still, an important number of participants do not have opinions about the different health benefits of DF.

Conclusions: In general, the participants showed a moderate consumption of vegetables and fruits but low in whole cereals. The level of knowledge about the effects of DF on human health is still far from desirable levels, and differs considerably from country to country.

Keywords: Dietary fibre, eating habits, fibre rich foods, questionnaire survey

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144/2587

FOSTERING SCIENTIFIC RESEARCH ON FOOD AND NUTRITION IN SCHOOLS. EXPERIENCE AT THE "TORRENT DE CAN CARABASSA" SCHOOL IN BARCELONA

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Background and objectives: The Catalan Foundation for Research and Innovation (FCRi) participates in the project "Amgen Exper(i)encia" within a European program, to provide a more complete and up-to-date scientific and technical education to our young people through the participation of retired scientists in the school centres.

Methods: The school "Torrent de Can Carabassa" in Barcelona is one of those participating in this program. 39 students with a mean age of 10 years participated in this program with retired pharmaceutical researchers in the field of food and nutrition. A survey was conducted to evaluate healthy habits of these children, regarding physical activity and diet, to focus on the scientific aspects in this field.

The intervention consisted in several talks, debates and workshops with a duration of 8 hours distributed in two months, with participation of students and professors.

Results: The discovery of the importance of research and the knowledge about relevant scientists gave as a result that 79% of

children expressed interest in being scientists as a future profession. Among the high quantity of results obtained from the survey, it should be noted that 55% of the children ate sweets or buns daily. 45% did not achieve the recommended intake of fruits and vegetables. 48% dedicated 2 to 3 hours per day to watch TV, play at the computer or console, and 21% did not perform any physical activity outside school.

Conclusions: Learning about science and the introduction to the scientific method in the classroom encourages scientific vocations. The collaboration of scientists with teachers has been much appreciated and is a great tool to introduce science in classrooms. It is possible to improve the knowledge of the children in the mistaken habits detected.

Keywords: Education. Science. School
Further collaborators:
Catalan Foundation for Research and Innovation (FCRi). Barcelona. Spain.

144/2625

THE RELATIONSHIP BETWEEN GENDER, BODY IMAGE, BODY SIZE AND REMOTENESS WITH DISCRETIONARY INTAKE AMONG A NATIONALLY REPRESENTATIVE SAMPLE OF INDIGENOUS AUSTRALIANS

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Background and objectives: Over a quarter of the Burden of Disease among the Australian Indigenous population can be reduced by eliminating poor diet, alcohol and high body mass. Adolescents have the greatest intake of nutrient-poor foods and beverages and are more likely to have body image issues. We aimed to determine the relationship between discretionary food intake among adolescents and demographic, geographic, anthropometric and body image variables.

Methods: Day 1 data from 12-18 year olds in the 2012-13 National Aboriginal and Torres Strait Islander Nutrition and Physical Activity Survey were used (n=588). Discretionary foods and beverages (DF) are high in saturated fats, added sugars, and/or salt. Waist circumference to height ratio classified participants' risk of metabolic complications. Remoteness, body image, dieting and DF contribution to total energy were analysed.

Results: Prevalence of being at increased risk of metabolic complications was significantly higher among boys (42.6%) than girls (28.2%) (P<0.05), and all boys (100%) who perceived themselves overweight were at risk of metabolic complications compared to 58.8% of girls. 9.6% of girls were dieting compared to 4.1% of boys, and dieting was higher among those at risk of

metabolic complications (19.4% of girls, 10.3% of boys). 55.0% of girls and 17.6% of boys who perceived themselves overweight were on a diet. DF contributed 39.9% of total energy, almost half came from lunch (25.1%) and dinner (24.2%), was similar between boys (40.9%) and girls (38.9%), and was significantly lower among those from remote (33.5%) compared to non-remote (41.5%) areas (P<0.05). The energy contribution from DF was higher among boys who perceived themselves overweight (56.3%) than girls (26.9%), and higher among girls who perceived their weight as acceptable (43.6%) than boys (39.7%).

Conclusions: Boys were more likely to be at risk of metabolic complications, and those at risk had a greater discretionary contribution than those not at risk. By contrast, girls at risk of metabolic complications had a lower contribution from DF than those not at risk. These results support a need to reduce DF intake among Indigenous adolescents, and to implement gender specific strategies related to dieting and body image, taking remoteness of location into account.

Keywords: Indigenous, adolescent, body weight, body image, discretionary foods

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144/2646

ASSESSING THE EFFECT OF THE PLATE COLOUR ON ENERGY INTAKE DURING AN OPEN BUFFET MEAL

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Background and objectives: Recent research suggests that the plate colour may affect the amount of the food consumed. More specifically, colour red was shown to reduce the intake of food due to its act as a consumption-stopping sign. In light of this, the main objective of this study was to determine whether the food consumption during an open buffet meal was different when using same sized white, red or black plates.

Methods: This was a cross-over study conducted on 54 female participants aged 18-27 years with normal BMI levels. Participants were recruited from Hacettepe University and the surrounding community. On experimental days, participants ate a standard breakfast and were then randomly assigned to eat lunch (pasta with tomato sauce and soft drinks) using white, red or black plates. Energy and macronutrient intakes during lunch were recorded..

Results: Results indicated that plate colour exerted a significant effect on food intake during the test days (p=0.021). The average total energy intake on red (1102.16±47.12 kcal, p=0.05) and black plates (1113.19±47.12 kcal, p=0.034) were significantly in-

creased when compared to white plate (945.72±47.12 kcal). There was no difference between red and black plates (p=0.985).

Conclusions: In this study, colours red and black did not induce a suppressing effect on food intake. These results supported the notion that the food colour is also a crucial determinant of energy intake. The contrast between the plate colour and the food colour should be considered as an important factor when making recommendations about this topic.

Keywords: Plate colour, energy intake, satiety response

144/2671

CHARACTERISTICS OF MEALS IN HOUSEHOLDS WITH MIDDLE SCHOOL STUDENTS WHO RARELY EAT BREAKFAST WITH THEIR FAMILIES THOUGH HAVE A POSITIVE QUALITY OF LIFE

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Background and objectives: Family meals frequency link healthy dietary behaviors and quality of life (QOL). This study was made to clarify the characteristics of meals in households with middle school students who rarely eat breakfast with their families and have good QOL.

Methods: A survey was conducted in September 2015 of 797 second year middle school students in seven schools in Fukui Prefecture, Japan and the results of valid responses from 762 students were analyzed. The questions covered general attributes, the way students ate meals with their families, their enjoyment of meals, and their QOL. Regarding the way students ate meals with their families, the survey asked about how often breakfast and dinner were eaten together with their families, the duration of dinner on weekdays and weekends, whether families listened to them during meals, and how often families scolded them during meals. For QOL measurement, a QOL assessment designed for middle school students (Kiddo-KINDLR) was used. The students who responded that they "almost never" ate breakfast with their families were divided into a low QOL group and a high QOL group based on median total QOL scores of all participants. The study compared the way students in each of these groups ate with their families.

Results: Of the 300 students who almost never eat breakfast with their families, 63 male and 56 female students were in the high QOL score group. The high QOL score group ate dinner with their families more often than the low QOL score group, were more often listened to by their family members during meals, were less often scolded during meals, and more students in this group reported enjoying eating with their families.

Conclusions: These results suggest that among middle school students who rarely eat breakfast with their families, eating dinner together frequently, being listened to by family members often

during meals, and enjoying meals with family are characteristics associated with a positive QOL.

Keywords: Middle school students, quality of Life (QOL), family meal

Conflict of Interest Disclosure: Conflict of Interest of the Principal Presenter: No potential COI to disclose

Further collaborators:

144/2684

RESCUING FOOD CULTURE WITH EDUCATIONAL STRATEGIES IN THE SCHOOL ENVIRONMENT: INTERSECTORAL ACTION BETWEEN HEALTH AND EDUCATION

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Background and objectives: The relationship between school and basic health unit strengthens food and nutrition education activities (FNE) from the perspective of an integral development, interfering in the culture and in the social production of health. This article takes educational strategies in order to rescue food culture in the school environment, linking health and education.

Methods: CRNutri belongs to the Teaching Health Center Geraldo de Paula Souza of the University of São Paulo, Brazil - and it aims to promote health together with the prevention and treatment of diseases related to food and nutrition. During 2016, nutritionists and nutrition undergraduates, acted collectively in order to rescue food culture at a Children's Educational Center (CEC), in the Teaching Health Center area. The activity has reached all CEC team, joining board, pedagogical coordination, educators, and administrative officials, in addition to 56 children participants.

Results: Five strategies were used to build a multidisciplinary and shared knowledge and to rescue food culture in the school environment: 1) Motivational Meeting with the team of the CEC, using dynamics to create links, identify knowledge, myths and activities already carried out on food and nutrition and raise expectations; 2) Motivational meeting with the child's guardians, dynamics development to enhance the shared construction and the importance of different social roles; 3) Application of a questionnaire to the child's guardians to identify family eating habits/culture, directing the two proposed practical workshops with staff and students in order to expand food recipe options through regional food and with children, encourage the consumption of

different foods; 4) Anthropometric assessment, diagnosing children's nutritional status using the results to sensitize stakeholders and direct the planning of activities and 5) Observational activity: witness students' lunch hour to experience the environment, the individual and the interpersonal relationship between the child and the act of eating, identifying and developing attitudes that may influence on food choices.

Conclusions: Through strategies, it was possible to insert different actors in the methodological process towards working with FNE, which unable a collective construction and generated an identity for the intervention moments, making everyone involved responsible and encouraging the rescue of food culture.

Keywords: Food and Nutrition Education; preschool; school feeding; school health; intersectoral action.

144/2722

PERCEPTIONS ON FOOD AND NUTRITION EDUCATION OF THE ACADEMIC COMMUNITY OF THE SCHOOLS OF NUTRITION AND DIETETICS OF THE UNIVERSITY OF ANTIOQUIA (UDEA)-COLOMBIA, AND THE NATIONAL UNIVERSITY OF CORDOBA

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Background and objectives: In 2011, FAO conducted a study on best practices in nutritional education in South America and found that 43.6% of the participating programs in the region rated good practices; The study in Colombia reported 30% and in the case of Argentina, 33% of the programs described as good practices.

Objective: To determine and to understand the perceptions that professors and students have of the careers of Nutrition and Dietetics about Food and Nutrition Education and to relate them to the criteria of Good Practices in this field, referring to the change of alimentary habits.

Methods: Qualitative research, through semi-structured surveys and focus groups. The sample was composed of 86 students and 31 professors of the UdeA, and 174 y 37 of the National University of Córdoba (UNC) during the year 2015, and content analysis was carried out following the Minayo method.

Results: For UdeA students there is a full connection between pedagogical references and eating habits; they propose the nutritional education in function of the change of habits improper, defined by the nutritionist reason why the valid knowledge is the

one that it owns; For their part, those of the UNC perceive contradictions between the subjects that develop content on Nutrition Education, since the model in which the subject is theoretically positioned becomes in tension with the type of practice performed by the teacher. According to UdeA teachers, the nutritional education is recognized as a transmission, promoted by the hidden curriculum exercised by teachers of the basic scope and discipline of knowledge; In the UNC the Nutritionist educator can be conceived with predominant traits as facilitator and transmitter that seeks the modification of the alimentary practices from a process, considered of long term, since it implies profound changes in the social and cultural life of the subjects.

Conclusions: In both universities, they conceive of nutritional education as a process, which is expressed in the transmission of knowledge, from a manifest intention of transcending the educational level of information, towards a change in dietary practices, to constructions involved in social development, which are sometimes incompatible with each other

Keywords: Food and Nutrition Education, role of dietitian nutritionist

Further collaborators:

144/2741

INFLUENCE OF AN EDUCATIONAL INTERVENTION IN THE DEVELOPMENT OF OBESITY IN SCHOOLCHILDREN OF 6-8 YEARS

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Background and objectives: The school stage is a stable period of growth and development, physical and intellectual, where a healthy diet is based on a correct nutritional education, as it is where they begin to settle the eating habits, that will be resistant to changes in adulthood. It is a key moment to form and consolidate "eating habits" that will keep adult.

Objective: To evaluate the influence of an educational intervention in school children 6-8 years of public schools and its influence on levels of Overweight/obesity.

Methods: A design was used quasi-experimental with a single group, with measurements (just prior to the implementation of the proposal) pretest, posttest to establish comparisons. The sample was 205 school (89 boys and 116 girls) aged between 6-8 years. The proportion of overweight (obesity overweight) has been estimated by calculating the index of body mass (IMC) by the formula weight (kg) / size in m2 and using as a reference the standards of who

Results: Girls have values significantly higher BMI than children in the pre-intervention educational analysis, thus noted that the 28.4% of girls were obese face a 6.7 per cent of children. After the realization of educational interventions such as RPG (Cook), Video class, interactive lectures to children and parents, BMI fell

by 2.6% in girls (25.4% obese female) and a 2.3% in children (4.4% children obese).

Conclusions: The implementation of educational intervention is an effective tool to improve eating habits at school as an initiative of individual empowerment. The previous identification of healthy lifestyle habits in schoolchildren; It allowed to design, implement, and evaluate educational intervention, which through an integrated to the Act of teaching and learning process helped promote healthy habits in schoolchildren and consustancialmente raised the level of knowledge

Keywords: Childhood obesity, school children, dietary habits

Conflict of Interest Disclosure: It was felt that the design of the study was the most suitable due to the characteristics of the programme for the promotion of healthy living, and also the duration of the same. The reason for not choosing a group on which the educational intervention is carried out and compare it to another without training talks, was due to the low number of students within the centres at each educational level

Further collaborators:
Teachers from schools in Ourense and Vigo

144/2742

EFFECTIVENESS OF AN EDUCATIONAL INTERVENTION ON LIFE HABITS ASSOCIATED WITH SCHEDULE TV CONSUMPTION DAILY IN SCHOOL CHILDREN FROM 6 TO 12 YEARS

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Background and objectives: During childhood and adolescence conform the main features of learning, thus acting in these ages is key to obtain a greater impact on the development to future of certain diseases.

Objective: To determine if an educational intervention carried out by a health professional improves the habits of life associated with the consumption of hours of tv daily in school children 6-12 years and check their relationship with the presence or not of television in the child's room.

Methods: A written pre-test consisting of questions about healthy lifestyle habits associated with the use of tv, internet and the existence or not of tv and computer in the fourth and socio-demographic characteristics was given to 322 students from 6-12 years of Orense. Subsequently, was an educational intervention supported by videos and informative talks about the risks associated with an elevated daily tv consumption. Two months later was reassessed through a pos test habits.

Results: After the educational intervention, the intervention group students have improved their consumption habits of daily tv by 44% with respect to the pre test.

Conclusions: Education about healthy lifestyle habits activities implemented by health care professionals provide an increase

in knowledge about our school, it would be so interesting to complement the training with such activities

Keywords: Habits of healthy lives, school, Television

Conflict of Interest Disclosure: The results obtained in this study reflect that age may have influenced positively in the acquisition of healthy lifestyle habits in schoolchildren after the educational intervention. It is important to also highlight an adequate environment organization, including spaces, material resources and time distribution, was fundamental to the achievement of the proposed objectives

Further collaborators:
Teachers College Xunqueira Ourense

144/2813

DEVELOPMENT OF A SMARTPHONE APPLICATION FOR HEALTHY NUTRITION HABITS AND PHYSICAL ACTIVITY FOR PREVENTION OF WEIGHT GAIN IN CHILDREN

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Background and objectives: Background
Current generations of children and teenagers are considered mobile first, they use smartphones as primary source of entertainment, social media and information consumption. There is an ongoing child obesity epidemic that's being addressed using traditional treatment or prevention strategies based on classic media channels leaving these new digital tools underexplored and used.
Objectives
The purpose of this study was to evaluate and generate a functional product description to develop a smartphone application scientific based for children that maximizes the adoption, usage and retention rate while strictly following the medical objective of spreading healthy nutrition habits in children aged 10-12.

Methods: Gamification strategies were explored as the chosen age range has a natural ludic tendency. A cartoon character-based strategy was selected as it had the best feedback during early reviews with children. The set of medical requirements was worked through a multidimensional matrix including positive and negative emotions, physical self awareness, nutritional information, exercise levels producing a dynamic schedule of games, contents, contacts using push notifications and other activities. A list of the top 100 both commercial and government-backed smartphone applications were evaluated. The list was built using the highest ranked applications from the Apple's App Store and Google Play store.

Results: Application's full specifications were developed, including wireframes, high definition screen and screen transitions,

functional descriptions, process rationales and medical argumentations for critical decisions.

Conclusions: The system developed during this study might provide a unique opportunity to prevent weight gain in children in a highly cost-effective basis. A positive feedback loop of test-feedback-development, as it is usual in this type of processes, will be necessary.

Keywords: Child obesity, smartphone, physical activity, health education.

Further collaborators:

Fernando Deleau Bachelor of Business Administration Buenos Aires. Argentina. CEO Seis Grados Salud. Argentina

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KNOWLEDGE AND REALIZATION OF BREAST-FEEDING BY WOMEN OF A FAMILY HEALTH UNIT IN THE CITY OF DOURADOS-MS

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Background and objectives: Currently, according to the World Health Organization, many scientific studies demonstrate the relevance of breastfeeding for maternal and child health and for spacing gestations as a factor of decreased fertility. The objective of this study was to evaluate the knowledge and the realization of breastfeeding by women of a Family Health Unit in the city of Dourados-MS.

Methods: The study was carried out with 23 women, who participated in an extension project entitled "Promotion of Breastfeeding - PROAMA II", registered in SIGProj under number 218095.1107.199203.18112015. Before the initiation of educational actions, a diagnostic evaluation was applied through a questionnaire to characterize the population and verify the knowledge and realization of breastfeeding by these women.

Results: Of the women evaluated, the mean age was 25.4 ± 6.4 years, 47.8% had primary education, 39.1% had only one child, 56.5% had previously breastfed and 87.0% had been breastfed. It was observed that 95.7% reported knowing the signs of correct baby's handhold on the breast, however, only 21.7% knew how to respond adequately when questioned about these signs. Of the women evaluated, 47.8% reported that the baby is always breastfeeding and 30.4% give the breast when the baby is hungry. Regarding breastfeeding, 96.7% were breastfeeding at the time of the evaluation, 100.0% started breastfeeding at the hospital, 78.3% breastfed during the first hour of the baby's life, 50% were mixed breastfed, 65.2% had help in the first feeding, and for 86.7% this help was provided by the nurse. It was also observed that 91.3% of the women reported that the first time they breastfed was more pleasant than they had imagined.

Conclusions: Most women reported knowing the signs of correct baby's handhold on the breast, although they did not have ad-

equate knowledge, were breastfeeding their babies, started breastfeeding at the hospital and breastfed for the first hour of the baby's life. The evaluation made it possible to verify the importance of carrying out educational actions with this population on the realization of adequate breastfeeding.

Keywords: Breastfeeding. Knowledge. Women. Family Health Unit.

Further collaborators:

Pro-Rectory of Extension and Culture (PROEX) of the Federal University of Grande Dourados.

ANTHROPOMETRIC PROFILE AND NUTRITIONAL EDUCATION FOR INDIGENOUS SCHOOLCHILDREN IN THE CITY OF DOURADOS-MS

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Background and objectives: The city of Dourados has the second largest indigenous urban reserve in Brazil, with approximately 11 thousand indians. Many are the factors by which the lifestyle of these peoples had great modifications, culminating both in the commitment of their food security and in the consumption of industrialized foods, especially sugar. The objective of the present study was to do anthropometric evaluation of indigenous schoolchildren and promote healthy eating habits for these students.

Methods: It is an extension project, registered in SIGProj about number: 180319.878.185668.19052014, done with forty seven students of the fourth year of an indian school in the city of Dourados-MS. In 2016 four nutrition education workshops were started with the presentation and explanation of the theme, followed by games to fix the content. An anthropometric evaluation of weight and height was also performed at the first and last meeting. The topics covered were Personal Hygiene, New Food Guide for the Brazilian Population, Food Builders and Food Labeling. Some methods used were: handshake dynamics, handwashing with gouache paint, food tray, food semaphore, posters, games and shopping list.

Results: The processed foods were the ones that generated the most doubts among the students. Milk and dairy products and beans were not recognized as protein sources by most students. It was observed that 78.3% of the students had between 70 and 100% of hits in the shopping list. In the initial anthropometric evaluation, 100% of the students had adequate weight for age and height for age, and according to BMI for age, 64.8% were eutrophic, 31.9% overweight and 4.2% obese. In the final evaluation, 100% had adequate weight for age, 97.5% adequate height for age, and according to BMI for age, 65.8% were eutrophic, 29.2% overweight and 5.0% obese.

Conclusions: The results obtained with this work demonstrate the importance of continuing the development of nutritional ed-

ucation activities with indigenous schoolchildren, in order to enable them to make good food choices and to stimulate hygiene habits, preventing chronic and infectious parasitic diseases and controlling the development of overweight and obesity in this population.

Keywords: Nutritional education. Indigenous. Schoolchildren. Overweight.

Further collaborators:

Pro-Rectory of Extension and Culture (PROEX) of the Federal University of Grande Dourados. Students: Ana Paula de Jesus, Marisa Ramos, Patricia Freitas, Thaina de Oliveira, Lais Garcia, Rafaela Souza e Ludmilla Cabral.

144/2945

CULTURAL DOMAIN ANALYSIS: FINDINGS FROM FORMATIVE IMPLEMENTATION RESEARCH IN NORTHERN SENEGAL

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Background and objectives: Infant and young child feeding (IYCF) practices are a product of culture and context. Effective IYCF interventions should be grounded in formative implementation research that provides an understanding of caregivers' knowledge systems and values that inform their complementary feeding practices. The objective of this study was to examine cognitive frameworks of Senegalese caregivers with respect to IYCF using cultural domain analysis techniques.

Methods: Selected modules of the Focused Ethnographic Study for Infant and Young Child Feeding Manual were administered to a sample of 46 caregivers from rural (N=22) and peri-urban (N=24) communities in Saint-Louis, Senegal. Respondents first rated 38 food items on a scale of 1 (low) to 5 (high) according to five dimensions that were hypothesized to influence IYCF: appeal, child acceptance, convenience, healthiness, and modernity. Then, respondents were asked to group the 38 foods into piles based on their own sorting criteria. Data analysis was conducted using R-Cmap, a concept-mapping technique included in the R analytic package. Multidimensional scaling (MDS) analyses produced graphical outputs of aggregate food clusters, separately for each location. Cluster rating maps were produced by combining the mean food rating values with the clusters generated by MDS, and comparison of statistical significance between clusters was conducted using the Tukey method. Rural and peri-urban samples were analyzed separately.

Results: The analysis showed that peri-urban respondents identified five clusters ("foods that are good for the body," "snack foods," "light foods," "heavy foods," and "packaged foods"), and rural respondents identified four clusters ("heavy foods," "snack foods," "light foods," and "foraged foods"). In the rural community, "snack foods" received the highest mean rating across all value dimensions, whereas "foraged foods" received the lowest mean rating on all dimensions except convenience. In contrast, the peri-urban community rated "packaged foods" highest across all dimensions except appeal.

Conclusions: This study reveals both similarities and differences between the knowledge frameworks of caregivers in the rural and peri-urban study sites, as well as broader differences in both from biomedical concepts of nutrition. These findings provide instructive information to inform the design of complementary feeding interventions in northern Senegal.

Keywords: Cultural domain analysis, Senegal, implementation research, pile sort, rating

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144/2946

COGNITIVE MAPPING TECHNIQUES REVEAL CULTURAL INFORMATION ON INFANT AND YOUNG CHILD FEEDING DECISIONS TO INFORM DESIGN OF NUTRITION INTERVENTIONS IN NORTHERN SENEGAL

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Background and objectives: Caregivers of infants and young children make decisions about feeding their children based on complex interactions of knowledge, beliefs, and values, as well as situational determinants, such as economic and social constraints and opportunities. Because of the relationships and influences of these factors on adopting new infant and young child feeding behaviors, the design and development of nutrition interventions must be grounded in knowledge about the target population. This study used cognitive mapping techniques to gain insight into caregivers' knowledge and perceptions of local foods for infants and young children and examined their potential significance for feeding decisions in northern Senegal.

Methods: Guided by mixed methods protocols from the Focused Ethnographic Study for Infant and Young Child Feeding Manual, in-depth interviews that included qualitative discussions

and cognitive mapping techniques were conducted with 46 caregivers in rural and peri-urban communities of Saint-Louis, Senegal. We explored caregivers' perceptions about five dimensions that were hypothesized to affect food decision-making (healthiness, convenience, child acceptance, appeal, and modernity), examining perceptions of 38 food items in relationship to these dimensions. Data analysis entailed a combination of qualitative thematic analysis and descriptive statistics.

Results: In both communities, "healthiness" was the most valued dimension for food decision-making by a large margin (total mean rating[SD] of 4.7[0.8]), followed by child acceptance (3.6[1.1]), appeal (2.7[1.2]), modernity (2.6[1.0]), and convenience (2.5[1.5]). We explore how different interpretations of these dimensions, and their relationships to local foods, may influence the design and planning of nutrition interventions. For example, respondents almost unanimously associated healthiness, the most highly valued dimension, with cleanliness. With respect to specific foods, eggs, watermelon, Cerelac, and the generic category of vegetables were all rated highly (mean rating >4.5) as healthy foods by both rural and peri-ruban communities.

Conclusions: Caregivers weigh many competing factors when making decisions about foods for infants and young children, particularly in low- and middle-income settings where choices are limited and resources are scarce. This study describes caregiver perceptions in two Senegalese communities using a mixed methods, ethnographic approach that illustrates simple and efficient techniques to illuminate the emic perspectives of caregivers, which can be used in designing nutrition interventions.

Keywords: Senegal, food decision-making, focused ethnographic study, implementation research, cognitive mapping

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144/2970

FOLIC ACID FORTIFICATION OF CORN MASA PRODUCTS: ASSESSING THE CONSUMPTION, IMPORTANCE OF FORTIFICATION AND NEED OF NUTRITION EDUCATION AMONG HISPANIC POPULATION LIVING IN NEW MEXICO, USA

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Background and objectives: Folic acid (FA) intake is a key micro nutrient for human cell metabolism. One of the most striking consequences of FA insufficiency is a birth defect called: Spina bifida. Arth et al (2016) reported, spina bifida and anencephaly are preventable with sufficient FA intake and "mandatory folic acid fortification of 200 µg/day" has reduced the incidence of birth defects to a minimum of 0.5 per 1000 births. A remarkable reduction, however Latin American descent population might not get enough folic acid through corn masa products which is a staple

for the population. The US Food and Drug Administration (FDA) in 2016 approved for manufacturers voluntarily to fortified corn masa flour products, such as corn tortillas.

Objectives:

1.- Understand the major sources of folic acid and folate and identify the most commonly consumed corn masa product among Hispanics of Southern New Mexico (NM), USA.

2.- Assess FA fortification need and education among residents and corn masa products (CMP) manufacturers.

Methods: The descriptive research surveyed Hispanic residents of Southern NM about their diets with a 24-hour food recall. Calculation of FA intake was assessed, 36 different food items like natural sources of folate, FA fortified wheat products, and non-fortified corn masa products. Food data bank from USDA was used. Data was collected from population, ages 18-85.

Results: 42 surveys were gathered from the region. Participants consumed an average of:

5.7 servings of non-fortified corn product per day (70%), compared to 2.4 servings of fortified wheat products (30%).

407 mcg of folate of natural sources, 404 mcg of FA fortified wheat products & 135 mcg of FA non-fortified corn masa products (CMP).

The most common non-fortified CMP was corn tortilla.

Conclusions: The Hispanic population continues with corn products as a staple in this part of the USA.

Consumption of non-fortified corn products is greater (70%) than fortified wheat products (30%). This is a concern, especially in child-bearing age women, Hispanics have a higher risk of FA deficiency birth defects. It's important to educate young hispanic population on how to read food labels and identify FA fortified CMP. Education of CMP manufacturers will be key as well.

Keywords: Corn masa products, Hispanics, Folic Acid fortification, Birth defects prevention

Further collaborators:

New Mexico State University, Plant and Environmental Sciences Department.

144/3003

A THREE PRONGED APPROACH TO E-LEARNING: THE NEED FOR NUTRITION EDUCATION/INNOVATION PROGRAMME

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Background and objectives: Technology is an essential part of almost all aspects of daily life nowadays however the way we teach students has largely remained the same for generations. Blackboards became PowerPoint presentations and chalk became

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laser pointers yet students are still trained that learning reams of material from textbooks verbatim is still an effective way to learn coursework and prepare them for the wordforce. The Need for Nutrition Education/Innovation Programme (NNEdPro) is attempting to modernise the way nutrition is taught to students using a three-point plan.

NNEdPro is aiming to use the technology many of us have grown up using daily to teach nutrition education.

Methods: A 360 degree assessment of teaching and learning via participant interaction and review, focus group work on various aspects of nutrition education and KAP surveys throughout NNEdPro activities.

Results: NNEdPro has established three main platforms to achieve its goal:

(1) Using the Nutrition in Medicine platform at University of North Carolina at Chapel Hill to create the NNEdPro-NIM Global platform. This material will be specially designed for medical professionals only.

(2) Utilising the Virtual Learning Environment (VLE) team at the University of Cambridge to tailor specific video podcasts for medical students through the Nutrition Education Review Group (NERG).

(3) Designing its own platform to present lectures from the annual Summer School in Applied Human Nutrition in an interactive manner. This is the outward facing platform as all members of the public are eligible to apply to attend the Summer School where they would be granted access to this material.

Each of these platforms will present interactive modules rather than simply relying on a video of a lecture.

Conclusions: Though NNEdPro has achieved some success so far in the area of e-Learning, it is clear that there is much to do in this area. Through the continued support of its partner organisations, NNEdPro can continue to pursue the aim of improving nutrition education among medical professionals, student and the general population.

Keywords: Education, technology, innovation

144/3619

IMPROVING HOUSEHOLD FOOD SECURITY, DIET AND NUTRITION STATUS THROUGH WOMEN'S GROUPS IN EASTERN DEMOCRATIC REPUBLIC OF CONGO

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Background and objectives: Adventist Development and Relief Agency (ADRA) implemented a USAID funded project (Jenga Jamaa II) from 2012 to 2016 aimed at improving food security in Eastern Democratic Republic of Congo (DRC). Johns Hopkins Bloomberg School of Public Health was the operations research partner for the evaluation program activities. As part of this project, women empowerment groups (WEGs) were established to enhance the business skills and bargaining power of women, their knowledge on proper family nutrition, leadership and life skills. This study focuses on evaluating the effectiveness of the WEGs in improving household food security and nutritional status.

Methods: The household food security and nutrition indicators measured included the household dietary diversity score (HDDS) and the prevalence of wasting, underweight and stunting. In each of the 13 WEG villages, one WEG group and one control group of households not participating in WEGs was selected, encompassing a total of 325 households. Baseline and endline data, collected through a structured questionnaire were used for data collection.

Results: At the end of the project, 62% of the WEG participants achieved the target HDDS. The mean HDDS significantly increased from 3.40 in the baseline to 5.51 at the endline. The WEGs showed a statistically significant difference in household food insecurity improvement as compared to the control group. Although the mean height for age and weight for age scores among the WEG beneficiaries significantly improved from baseline to endline, there were no significant differences between the prevalence of wasting and stunting in the WEG and control groups at the endline.

Conclusions: The study shows that including nutrition activities in women empowerment interventions is a feasible way to improve household food security. However, a detailed analysis of the determinants of malnutrition is necessary to identify other factors contributing to change in nutrition outcomes.

Keywords: Women Empowerment Group (WEG), Democratic Republic of Congo (DRC), stunting, dietary diversity, food security.

Conflict of Interest Disclosure: The author declares that there is no conflict of interest regarding the publication of this article.

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SUGAR CONTENT IN FOOD PRODUCTS ASSUMED BY THE INDUSTRY AS "HEALTHY"

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Background and objectives: There are numerous terms to define sugars, with an indiscriminate use by the industry in products that claim to be "healthy." On the other hand, the epidemic of chronic non- transmissible diseases are increasing despite of the availability of these products. Several studies suggest that the consumption of high fructose corn syrup (HFCS) and other added sugars could be compromised in their development.

To record the presence, percentage content, types of sugar and / or their counterparts in products alleged to be "healthy" by the industry.

Methods: A descriptive, cross-sectional study was conducted. Data were obtained from the acquisition of products that in their containers contain concepts of "claims" such as:

- Light
- Recommended by scientific societies
- Fiber Source
- Only" x "Kcal
- Food for a better life
- Start or eat well
- Healthy

Available in the most known supermarket chains of the city of Lomas de Zamora during the period of November 2016-February 2017

Results: We analyzed 19 types of cookies and cereals, 7 low calorie drinks and 8 snacks, alleged as "healthy" by the industry.

The 94.7% (n18) of the cookies, 85.7% (n6) of the drinks and 100% of the snacks registered the presence of sugar. The 44.4% (n8) of the cookies and 37.5% (n3) of the snacks contain more than 11 grams of sugar in 100 grams of product. The 42.9% of beverages contains less than 10%. The 66.7% of the cookies, 50% (n3) of the drinks and 25% of the snacks (n2) contain 2 to 5 different types of added sugars. (Sugar, HFCS, malt extract, maltodextrin, molasses and glucose syrup).

Conclusions: The 93.4% of the analyzed products alleged to be healthy by the industry contain sugar and / or their counterparts. The 47.2% contain more than 2 types of added sugars. The 40.95% of the cookies and snacks have more than 11 grams of sugar in 100g of product.

Keywords: Sugar, healthy food, industry

Track 8: Agriculture, Food Science and Safety

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AGRICULTURAL DEVELOPMENT INTERVENTIONS AND DIETARY DIVERSITY OF RURAL SMALLHOLDER FARMING HOUSEHOLDS IN EAST AND SOUTHERN AFRICA (ESA)

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Background and objectives: International Fund for Agricultural Development (IFAD) is proactively promoting nutrition-sensitive agriculture agenda in its operations. To provide guidance for an effective nutrition mainstreaming in IFAD's work, this study was conducted to map various nutrition sensitive interventions in IFAD portfolio; identify pathways for nutrition outcomes; identify challenges; and areas of opportunities for scaling.

Methods: This is a cross-sectional survey conducted in July and August 2016 which involved three countries and five study projects in the ESA region. The investment theme for the various study projects were agribusiness (Zambia); dairy (Kenya); productivity promotion (Zambia); rural marketing (Mozambique); and natural resource management (Kenya). Quantitative data was collected from 402 beneficiary households while qualitative data came from 161 focus group discussants and 34 community key informants (IFAD Country teams, project management staff and implementers). Dietary diversity was evaluated at both household (Household dietary diversity score: HDDS) and individual levels (Minimum Dietary Diversity for women: MDD-W & Minimum Dietary Diversity for children: MDD-C). Multiple Classification Analysis (MCA) model was adopted to relate key project interventions as variables to the dietary diversity.

Results: The quantitative and qualitative data indicated that integrated nutrition activities i.e. nutrition education; food demonstration; recipe development; kitchen garden as well as key project investment i.e. diversification of food production; women empowerment; commercialization and access to market; production-focused training had positive effects on dietary profile. The proportion for good dietary diversity was higher for HDDS (63.7-97.3%) as compared to MDD-W (22.5-63.5%) and MDD-C (1.2-47.6%). The MCA analysis showed that HDDS varied significantly according to diversification of services, market linkages, women empowerment, capacity building and literacy status. For the women group, household size, women empowerment and diversification were found as strong determinant factors. Whereas capacity building indicated the most influence on dietary diversity for children.

Conclusions: This study conceptualized a simplified framework of integrated impact pathways with distinctive focus on nutrition knowledge, climate and women empowerment as influencers in maximizing impact of agricultural development interventions for improved dietary intake.

Keywords: Nutrition-senistice Agriculture, Diet Diversity, IFAD

Conflict of Interest Disclosure: This report is a product of staff of the International Fund for Agricultural Development (IFAD) and the findings and conclusions expressed herein do not necessarily reflect the views of its Member States or their representatives to its Executive Board. IFAD or any of its Member States do not guarantee the accuracy of the data included in this work. The designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of IFAD concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries.

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DEVELOPMENT, CHARACTERIZATION AND SENSORY ANALYSIS OF SUGAR-FREE PRICKLY PEAR JAM (OPUNTIA FICUS INDICA)

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Background and objectives: Diabetes is one of the most common metabolic disorders in the world and its prevalence has been increasing in the last decades. Besides, more and more people are concerned about their health choosing sugar-free products. The aim of this work was to develop a jam with a non-traditional fruit like prickly pear, containing no added simple sugars, and to evaluate their physicochemical, microbiological and sensory characteristics.

Methods: The sugar-free jam was made with the whole fruit pulp of orange variety. Stevia was added as a non-nutritive sweetener, and agar-agar and locust bean gum as gelling agents. Sorbitol, maltodextrin, potassium sorbate, ascorbic and citric acid were also added. It was determined the proximate composition, pH, °Brix, and color. Carbohydrate content was estimated by difference. Microbiological analyses were performed. Sensory analysis was taken with 26 non-trained people who evaluated color, brightness, flavor, texture, taste and global acceptance, using a 5-point hedonic scale.

Results: The final sugar-free jam contained (g% wb): moisture 62.8, carbohydrate 33.3, protein 1.10, fat 0.9, ashes 1.0, fiber 0.9, pH of 4.3 and 21°Brix. Total energy was 138 Kcal/100g, 54% less than traditional prickly pear jam. Chromatic parameters L*, a*, b* and DE (fresh fruit as reference) were 30.98, 7.00, 20.20 and 7.58, respectively. In the sensorial test the flavor showed the lowest score (3.35) perhaps because people is not accustomed to this fruit. Color and brightness had the best scores (3.88 and 3.85, respectively) and to the global acceptance was 3.77. The jam met the microbiological standards of current legislation.

Conclusions: This sugar-free prickly pear jam could be a novel option for diabetics and people who wants to avoid sugar-sweetened products.

Keywords: Key words: jam, tuna fruit, diabetes, sugar-free

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INVESTIGATION OF THE REACTIONS OF THERMAL PROCESS CONTAMINANTS IN BISCUITS DURING DIGESTION

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Background and objectives: Processing of foods cause to the formation of toxic compounds in foods which possess detrimental effects on human health. Acrylamide, 5-hydroxymethylfurfural, α-dicarbonyl compounds are such process contaminants formed as a result of high temperature processing of carbohydrate rich and low-protein crops such as potato, wheat. Besides these contaminants, foods also bear reactive components thus their interactions during digestion is of importance. This study aimed to investigate the reactions of thermal process contaminants including acrylamide, 5-hydroxymethylfurfural (HMF), methylglyoxal (MGO) and 3-deoxyglucosone (3-DG) in biscuits during digestion.

Methods: An in vitro enzymatic digestion system simulating gastric, duodenal and colon phases was used and the change in the amount of these compounds was monitored during digestion of different biscuits.

Results: Acrylamide levels as well as MGO and 3-DG levels of biscuits gradually decreased through gastric, duodenal and colon phases of digestion. At the end of digestion, acrylamide reduction ranged between 49.2% and 73.4%. Similarly, 3-DG and MGO reduction was found to be varying between 23% and 58.91%, 50.08 %and 77%, respectively. On the other hand, dramatic increase was observed in HMF contents of biscuits at the end of gastric phase. However, with the progress of digestion, HMF concentration significantly decreased, as well. Since these contaminants contain reactive carbonyl groups, reactions with amino and sulfhydryl groups of amino acids might take place. To understand this, model systems composed of contaminants and amino acids including lysine and cysteine were subjected to digestion. The results revealed that disappearance was due to interactions of reactive carbonyl groups with the accumulating amino and sulfhydryl groups

during digestive process. By high-resolution mass spectrometry analysis in model systems and biscuits, the formation of adducts of contaminants with amino or sulfhydryl groups of amino acids were confirmed.

Conclusions: In conclusion, simulated digestion conditions favored the addition of amino acids to process contaminants. Owing to its two nucleophilic groups (–SH, –NH2), cysteine becomes highly reactive among the amino acids. Gastrointestinal conditions and the ingested food composition affect the levels of bioavailable process contaminants, and should be taken into consideration.

Keywords: acrylamide, HMF, α-dicarbonyl compounds, in vitro digestion, biscuits

POTENTIAL OF ALTERNATIVE FOOD NETWORKS IN MEDELLÍN

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Background and objectives: New kind of networks to produce, distribute, and consume foods is being developed in several countries around the world. The alternativeness consists of growing organically produced foods without using a chemical toxic product. The transportation is done with very few intermediaries and short trips, producers have stable and fair price systems and relations between producers and consumers are close and direct. They are called Alternative Food Networks (AFN), which seek to become an alternative to the conventional food system, driven by multinational food producers and big chain retailers, located especially in urban areas. This study aimed to characterize the AFN of Medellin. AFN specifically practices, acts, motivates the camaraderie relations among producers, distributors, and consumers, promoting an ethical and professional behavior.

Methods: A qualitative study collective cases; semi-structured interviews were conducted with producers and distributors taking part of 12 AFN in Medellin. Assessments of the participants were also carried out at food sales sites to observe interrelations and practices.

Results: This study found that in Medellin are incipient AFN experiences. They encompass producers, distributors, and consumers. They sell different products mainly fruits and vegetables. In fewer amounts, they sell: rice, quinoa. Finally, they handmade processed meals like chocolate, cocoa, butter, and cheese. These networks promote local development and use short trade channels because foods are grown in rural Medellin areas or nearby regions. Its consumers are people of high social socio-economic strata and with high educational level. Consumers of high strata buy this type of food especially to preserve their health, take care of the environment, and support the small producers.

Conclusions: There are AFNs existing in Medellin which are of recent creation; they share the alternativeness of other networks around the world and in the future may become an alternative food system that transforms the current hegemonic model.

Keywords: Alternative Food Networks, Food supply, Sustainable agriculture, Organic foods, Food production

EFFECTS OF SEASONALITY ON HOUSEHOLD FOOD SECURITY AND FOOD CONSUMPTION PATTERNS OF PASTORALIST'S CHILDREN IN KAJIADO COUNTY, KENYA

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Background and objectives: The livelihood of communities in arid and semi-arid lands of Kenya is mainly pastoralism. Climatic seasonality is one of the determinants of food security. Food consumption patterns have been shown to fluctuate depending on the food security situation in a household. Households in ASALs are more likely to be affected by the fluctuations of the seasons which in turn affect food availability. This study aimed to investigate the effect of seasonality on food security and food consumption patterns among children (6 - 59 months) from pastoralists' households.

Methods: The study adopted a longitudinal, observational study design, following on households for one year. The study was carried out on 150 randomly selected households in Kajiado County. Data were collected on a monthly basis for one year. Data on the climatic profile was obtained from the meteorological department. Analysis of variance was used to assess for any differences in food security and food consumption patterns across the seasons. ANOVA was used to analyze for significant differences across different seasons.

Results: The dietary diversity score was significantly higher ($p < 0.05$) during the long rains season (5.13 ± 0.06) as compared to short rains (4.13 ± 0.04) and the dry season (3.45 ± 0.03). During the dry period, the households lacked the capacity to access adequate food due to low production, high food prices and low income from livestock and livestock products. Food scarcity was noted in the markets especially during the dry period due to low supplies. During dry seasons, there was a low frequency of food consumption, less number of meals consumed and reduced nutrient intake among children.

Conclusions: Seasonality had a significant effect on food security with the situation becoming worse during the dry season. The change in dietary diversity, the number of meals consumed per day, the frequency of food consumption across seasons was an in-

dicator of how different seasons affected household food security and food consumption patterns. This study recommends promotion of food preservation during the plenty seasons, production of drought-resistant crops, initiation of irrigation projects and use of social safety nets during extreme conditions.

Keywords: Food Security, Food Consumption Patterns, Seasonality, Arid Areas, Pastoralists

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RECONCILING SAFETY ALLOWANCES FOR BETA AGONIST RESIDUES IN MEAT FROM FOOD ANIMALS

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Background and objectives: Cattle and hog producers are adding beta agonists to feedstuffs in the United States and Canada that leave residues in meat products consumed by humans. Both the U.S. Food and Drug Administration and a Joint FAO/WHO Expert Committee on Food Additives have decided that low amounts of beta agonist residues do not pose a health problem for humans. Conversely, evaluating nearly identical data, the European Food Safety Authority decided that beta agonists had not been shown to be safe for human ingestion. This research explains how the U.S. and EU have reached different conclusions on the safety of beta agonist residues.

Methods: Affect and availability heuristics of animal production practices in the United States and the European Union are analyzed to explain why regulators relying on the same data have adopted divergent provisions for beta agonists. Through the identification of different approaches to animal production, the divergent conclusions reached on the risks of beta agonist residues in food products can be explained.

Results: Animal production technologies previously regulated in the U.S. and EU were identified that may account for the discrepancies in the regulatory regimes on beta agonists. Six technologies authorized in the U.S. and limited in the EU offer an explanation for difference conclusions by regulators on risks posed by beta agonist residues in meat products.

Conclusions: Regulators in the U.S. had authorized concentrations of animals, tail docking of pigs, castration of male pigs without anesthesia, and the use of hormones, recombinant bovine somatotropin, and non-therapeutic antibiotics. EU regulators had placed limits on these six technologies or banned them. Given these foundations of regulatory controls over food animal production, regulators in the US and EU developed divergent regulatory approaches for beta agonist usage. They weighed risks differently, and cultural beliefs on animal welfare and human health led to different interpretations of data regarding beta agonist residues in food products.

Keywords: beta agonists, Codex, U.S. Food and Drug Administration, World Trade Organization

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TRANSFORMATIONS IN AGRICULTURE AND MEETING THE FOOD NEEDS OF POPULATION AS A RESULT OF CLIMATIC CHANGES

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Background and objectives: The paper is an attempt at evaluation of the oncoming transformations in the food economy induced by climatic changes. The paper focuses on the regional diversity and arising from the consequences of food security. The basic hypothesis is, climate change, deepening of negative spatial polarization in food production.

Methods: The study is based on the analysis of statistical data (FAO, EUROSTAT, ESPON), IPCC reports and cartographic methods.

Results: It is assumed that climate warming in the next decades is a phenomenon the most probable to occur. Consequently, it may bring about spatial polarization in the food production - a growth in rich countries (located in the temperate zone) and decrease in poor nations (mainly in the tropical and equatorial areas). In temperate zones the expected changes may result in a growth in potential production of food in view of the increasingly extended vegetative period and widening the geographical ranges of crops. Meanwhile, today is observed in the EU countries the problem of overproduction of food, which seeks to mitigate the CAP. One of the activities is extensification of food production and reduction of agricultural land. In turn, warm areas, including primarily exposed to prolonged droughts increase in average temperatures will bring more negative effects. The most vulnerable continent to climate change seems to be Africa. Limitation of precipitation will strengthen the process of desertification, especially at the edge of the Sahara and south of the continent. This problem is aggravated by the fact that the greater part of its population depends on farming. Present and future interactions between the climate and food security can also be considered in the context of demographic processes. The greatest increases in population will be witnessed in countries that are currently affected by problems in access to food. The result of these processes will be great migrations of population and social conflicts.

Conclusions: Climate change probably will not stop. Therefore, it is important to introduce in poor regions a modern methods of food production and to ensure proper distribution of food. We must also be prepare for the major societal challenges.

Keywords: food, production polarization, climate change, agriculture

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COGNITIVE BIAS IN FOOD HANDLERS: MORE KNOWLEDGE MEANS FOOD SAFETY?

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Background and objectives: As food handlers are liable to contaminate food by inappropriate behaviors. In this sense, training is the strategy indicated to instruct them in order to prevent foodborne diseases (FBD) outbreaks. Cognitive biases are hard to prevent and may puzzle correct decisions. The objective of this study is to discuss the relation between knowledge about sanitary norms and cognitive biases.

Methods: Ethnography and participant observation were the main strategies used. Participant observation was carried out in six commercial restaurants of two Brazilian cities during 42 days. Information related to foodservice infrastructure, service characteristics, location, details about the agents, their speeches, non-verbal communications, interpersonal relationship, work routine and relation with food safety were written in field diaries. Content analysis of the thematic type was used to elucidate data. It was observed 68 food handlers. Six of them, one of each local, voluntarily answered to questionnaires which provided data about optimistic bias and locus of control.

Results: These workers presented an optimistic bias tendency in those questions related to consumer, family and friend's risk of having a FBD when eating a meal which was prepared by them. Despite the disconnection between observed practices and adequate knowledge, those workers showed internal locus of control when they assumed their responsibility for food safety. Optimistic bias and illusion of control seem to manifest only in the presence of knowledge about sanitary norms, since workers felt overconfident. When workers perceive the sanitary risk they may act in a way to prevent it if they know the adequate practices and the negative implications to client's health, as well as if the infrastructural conditions and time are favorable to them. External locus of control corroborates with the belief the occurrence of FBD is not possible and that workers are protected by religious adornments and their beliefs. These situations may increase the risk of FBD.

Conclusions: Workers' risk perception becomes permeated by cognitive biases that arise with the help of knowledge about sanitary norms. It is suggested that the training approach does not reach the depth needed to transform the food handlers' thinking and their work environment towards food safety.

Keywords: risk perception, cognitive biases, food safety, food handlers, ethnography.

Further collaborators:
CAPES - CNPq (National Counsel of Technological and Scientific Development).

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BRAZILIAN FOOD LAW: AN INTEGRATIVE LITERATURE REVIEW

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Background and objectives: One of the branches of law is in charge of legislating on food-related issues in Brazil. In a country with great territorial extension and still marked by much informality in several sectors of the production chain, it is necessary to act rigorously through a law on the production of foodstuffs to guarantee the protection of consumer health. Objective: To emphasize the elementary importance of the legal mechanisms acting in consonance with inspection agencies in the food production chain in the national territory.

Methods: This study is an integrative literature review. The search was carried out on the SciELO platform (Scientific Electronic Library Online), with the descriptors Legislation, Food and Brazil. The platform returned 65 results, the search was filtered searching for texts strictly related to the subject and incomplete texts were duplicated, before the year 2012 or published in a language other than Portuguese, English or Spanish. There remained only nine texts. The research was complemented with textbooks.

Results: Brazil has a broad legislative mechanism for the production, packaging, transport, conservation and commercialization of food products. One of the main obstacles to the fulfillment of all determinations is the difficulty of inspection in such a large territory. Added to this is the lack of knowledge of many operational procedures by the producers. It is noted that some themes also acquire bioethical connotations, as in the case of transgenics.

Conclusions: This legislative branch will ensure an increase in the quality of national food production, given that the country is

quite heterogeneous. Patent registration benefits greatly from such legislation, and any crimes of this scope end up being inhibited.

Keywords: food law; inspection; national food production

SOCIAL WORK IN FOOD SECURITY FOR THE ELDERLY POPULATION

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Background and objectives: The determinants of the health of the population, focused on food and nutritional security may be a reflection of the socioeconomic conditions of the population. Data from the 2002/2003 Family Budget Survey (POF) report that there is a prevalence of overweight in low income families in Brazil. Other studies bring an increase in cardiovascular diseases, type 2 diabetes and fixed types of cancer, accentuating morbimortality related to nutritional status. Objective: To identify a role of the social worker inserted in the multiprofessional team of health care, for an insertion of the low income elderly into social food programs of the Brazilian government.

Methods: This is a review of the literature in the SciELO database and Virtual Health Library (VHL), 6 studies were selected from the inclusion criteria. Other materials such as books and sites of governmental social programs focused on a theme were also used.

Results: The research evidenced that there is a shortage of studies on the performance of the professional social worker of the identifier by the health team of low income elderly people without access to basic foodstuffs and in sufficient quantity, who seek the health service or are assisted in their Home Programs such as fed-

eral government hunger zero, aims to combat hunger and ensure food and nutritional security in low-income populations. However, for the acquisition and consumption of food, development must be done through actions. In this way, as well the Federal Council of Social Service (CFESS), the product in care provided by the social worker, should give through A direct relationship with its users, in relation to the elderly, this with the caregiver / family.

Conclusions: The treatment of a multiprofessional and intersectoral work relationship, without social service qualities of the most varied dimensions in which the elderly person finds himself needs a dialogue, appropriate social programs aimed at food security when necessary, in view of the vulnerability For the promotion of health.

Keywords: social service; food safety; social programs

MICROBIOLOGICAL ANALYSIS OF FOOD MANIPULATION SURFACES IN CANTEENS OF A PUBLIC UNIVERSITY

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Background and objectives: Foodborne Diseases (FD) are all clinical occurrences caused by the ingestion of food that may be contaminated with pathogenic microorganisms, chemicals, harmful objects or that contain toxic structures in amounts that affect the health of the consumer, individually or collectively. Food-producing establishments are conducive to microbial contamination. The objective of the study was to evaluate the sanitary quality of the surfaces used for food manipulation in scholar canteens of Brazil

Methods: The survey was conducted at 11 canteens located at Federal University of Rio Grande do Norte (UFRN) between February and March of 2016. The study was submitted and approved by the Research Ethics Committee of the University Hospital of UFRN under the number 737.109.

The samples were collected in the canteens using the swab technique and were transported to the Laboratory of Food Microbiology in thermal box with ice bags immediately after their collection to determine the Most Probable Number (MPN) of Coliforms at 45 ° C and Mesophilic Aerobic Bacteria.

Results: Coliforms at 45°C were detected in cutting boards used in 63% of the evaluated establishments. The counts were higher than the microbiological sanitary standard in 7 of the 11 canteens investigated. The sites in which they obtained an unsatisfactory classification showed results between 3.0 and 1100 MPN / 50 cm2.

For aerobic mesophilic bacteria, the cutting boards showed a high count in 73% of the canteens classified as unsatisfactory.

For sites that presented unsatisfactory environmental conditions, a minimum and maximum contamination value of 216 and 4600 CFU respectively was observed.

Conclusions: The results showed unsatisfactory microbiological quality of the cutting boards utilized in canteens. Considering that food handling surfaces are utensils directly related to the high number of foodborne diseases, this study demonstrates the need to take urgent and effective measures to reduce or eliminate the microbiological contamination found in cutting boards of these food-services.

Keywords: Hygienic-sanitary conditions; microbiological analysis; food safety

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144/544

LEVERAGING PRIVATE SECTOR FOR GENDER AND NUTRITION RESPONSIVE AGRICULTURE

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Background and objectives: Zambia PROFIT+ is a USAID Feed the Future project which operates a market led approach where private sector partnerships drive mutually beneficial development for them and the target communities. A major emphasis in the project is the promotion of job creation through entrepreneurship with the private commissioning Community Agro dealers (CA) to provide services in rural Zambia reaching the most rural areas or "last mile". In addition to input supplies, farm services such as mechanization, and spraying services, the CA provide a variety of training including nutrition, use of improved and nutrient-rich commodities, in addition to creating savings and credit groups. The project trained 334 CA's (28% women), reached over 182,000 smallholder farmers (55% women).

An assessment of the CA model was conducted to determine if the program design and outcomes were reached which included: increased household income, improved production, gender empowerment, and nutrition transformation, as well as improvement in climate smart agriculture practices in the communities.

Methods: The assessment included focus group discussions designed to assess the CA model's impact on women's empowerment, nutrition, introduction of nutrient-rich commodities, increased household incomes, and improved production patterns. The interviews involved 286 CAs in 33 groups across the program area.

Results: The CA are recognized as role models and change agents in their community. They report an 40% increase in household assets (proxy for income). Farmers working with CA's report a 24% increase in yield as well as increase in production of nutrient rich crops. The Ministry of Health, Ministry of Agriculture, NGOs and private sector leverage the CA's to deliver nutrition and health messages due to their reach into the rural communities or "last mile". In addition, 35% of the women report they are respected as leaders within their communities.

Conclusions: Leveraging the private sector to support a market based approach to improve nutrition, increase incomes and improve gender empowerment is sustainable and scalable model thus reducing the need for continued donor funding. By linking CA's with the private sector, this sustainable model reaches rural communities, improves their livelihoods and nutritional status, and increase women's empowerment.

Keywords: nutrition-sensitive agriculture, gender, private sector

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MILKING FOR ALL IT'S WORTH: WOMEN, NUTRITION, AND LIVESTOCK

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Background and objectives: Livestock raising in developing world offers the potential to significantly increase incomes and improve household nutrition. RWANU a USAID/Food for Peace Development Food Aid Program in southern Karamoja challenged the cultural norms of male dominated, lucrative, nutrient-rich livestock value chains by engaging women to own and sale livestock, and to also use the income and livestock products for household nutrition.

An assessment of the Women's Livestock Groups was conducted to determine if the program design and outcomes were reached which included: improved women's empowerment, improved nutrition, and improved women's participation in livestock activities.

Methods: The assessment used both primary and secondary data sources through a desk review of key programmatic and research documents and through in-depth interviews and focus groups with program beneficiaries, community leaders, key household members, and women not chosen for the program.

Results: The assessment showed the program was successful in changing gendered norms around goat ownership, making it socially acceptable for women to own goats and increasing women's sole and joint decision-making power in households. The increase in women's status and value in the household improved along with family relationships. A majority of women reported increased milk consumption especially among small children. On the negative side the men still controlled the selling of the goats, thus control over the money.

Conclusions: All three major pathways from livestock (agriculture) to nutrition were affected by this activity: production (home consumption of milk), increased incomes and women's empowerment. Working through women's groups for livestock production allowed the program to explore the social norms and complexities surrounding women's engagement in livestock value chains to improve income and nutrition. However, the assessment found that despite the improvements on improving consumption of milk and changing gender norms around goat ownership, men still maintain primary responsibility for goat care and management, as well as their sale and purchase. Therefore, it is impor-

tant when designing gender-sensitive livestock projects to include women's economic empowerment activities that will address the social norms that prevent women from engaging and benefiting from their labor.

Keywords: livestock, nutrition-sensitive agriculture, women

144/548

ALUMINIUM-CONTAINING FOOD ADDITIVES EXPOSURE ASSESSMENT

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Background and objectives: Available studies show adverse effects of aluminium on the nervous and reproductive systems in animals. The major source of exposure to aluminium for the general population is through the diet. Aluminium in foods originates from its natural occurrence, from the use of aluminium-containing food additives and from the presence of aluminium in food contact materials. The main purpose of this study was to evaluate the presence of food additives containing aluminium in foods, to analyze aluminium content in them and to estimate possible exposure for the general population. JECFA (Joint FAO/WHO Expert Committee on Food Additives) recommended a Provisional Tolerable Weekly Intake (PTWI) of 2mg/kg bw.

Methods: A survey was carried out in supermarkets of Ciudad Autónoma de Buenos Aires to determine through the reading of food labels the presence of aluminium-containing food additives authorized for use in food by national legislation. Samples were microwave digested and analyzed by direct graphite furnace atomic absorption spectrometry in order to determinate the total aluminium content. Finally, a possible scenario of exposure was established and a weekly potential exposure was estimated.

Results: The results of the survey in the supermarkets indicated that flour-based food products as cakes, croissants, rolled cakes, cake powder mixes, among othersare the products that mainly contribute to the ingestion of aluminium. All analyzed products complied with the Food Code limits for food additives containing aluminium (content ranged from less or equal to 0,01 to 0,1g/100g).

On the basis of analytical results, it is possible to infer that the ingestion of one biscuit portion (40g), containing 0,028 g% of aluminium (maximum level detected), 3 times per week, for a 15 kg bw kid represents a potentially weekly intake of 2,2 mg/kg bw, higher than PTWI.

Conclusions: Considering that other sources of exposure are possible, and that food industry is using levels of these additives below the maximum allowed amount by national legislation, a deeper risk assessment is required.

Keywords: aluminium exposure, risk assessment, food additives, tolerable weekly intake, flour-based food products

144/662

POPULAR RESTAURANT PROGRAM: GUARANTEE OF SAFE MEALS?

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Background and objectives: The main objective of 'Popular Restaurant Program' is to provide adequate nutritional meals at low cost, to people in risk of food insecurity in Brazil. This work aimed evaluate hygienic-sanitary conditions in Popular Restaurants of Rio Grande do Norte (RN) state.

Methods: RN has 24 Popular Restaurants units, and 10 different cities were selected by random sample system. For data collection, a checklist was applied based on Brazilian federal law (RDC 216/2004), containing 183 verification items grouped in 12 evaluation blocks, which allowed the evaluation of the hygienic-sanitary conditions of the establishments. A single visit to the restaurants was carried out to fill out the checklist. To obtain the final diagnosis of each unit, the average of the items in the list was calculated. The restaurants were classified in: "Very bad": 0 to 19% of adequacy of the requirements; "Bad": 20 to 49%; "Regular": 50 to 69%; "Good": 70 to 90% and "Very good": 91 to 100%.

Results: The overall adequacy of the 10 Popular Restaurants was 69%, classifying the units as "Regular". The block "building, facilities, equipment, furniture and utensils" was the one that presented the highest percentage of inadequacies. The managers of the visited units reported that the buildings were adapted, and because they were planned for another purposes and not for food production, they did not allow an ordered flow of the food, as well as favored the shelter of vectors and urban pests.

Conclusions: The study showed that the establishments presented inadequate conditions for food production and there is no guarantee of safe food to consumers.

Keywords: Food Service; Food Safety.

144/710

INTERNATIONALLY COMPARABLE PRICES OF HEALTHY AND UNHEALTHY FOODS IN 176 COUNTRIES: IMPLICATIONS FOR FOOD AND NUTRITION POLICIES

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Background and objectives: While diets typically diversify as incomes rise, decisions on which foods to consume may heavily

depend on relative food prices. Prices will not vary substantially across countries if a food is highly tradable. But while many unhealthy foods are non-perishable and therefore highly tradable (e.g. Coca Cola, oils, salt, sugar), many health foods are highly perishable imperfectly tradable (e.g. eggs, fresh milk). Despite this intuition, no previous research has systematically examined the affordability of different foods across countries.

Methods: We use data on the prices of homogeneously defined foods for 176 countries from the 2011 round of the International Comparison Program (ICP). We construct a novel measure of relative prices, the price of 1 kg of a given food ("large brown eggs") relative to the price of 1 kg of the cheapest cereal in each country. This measure captures how expensive it is for households to diversify out of cereals into a specific food group. We compare means and variance of relative food prices across regions, and use least squares regressions to assess cross-country relationships between relative food prices and the consumption patterns of children aged 6-23 months, after controlling for GDP per capita.

Results: As expected, relatively unhealthy foods vary little across countries and are often cheap sources of calories. Prices of healthy fruits and vegetables are relatively cheap in developed countries but somewhat more expensive in poorer regions. Animal sourced foods (ASFs) vary substantially across countries and are often very expensive sources of calories, generally 5-15 times more expensive in poor countries compared to OECD countries. Among major food groups it is only the consumption of ASFs that is strongly associated with their own relative prices and with GDP per capita.

Conclusions: The expensiveness of healthy foods, particularly ASFs, is a major obstacle to improving diets in poor countries. This suggests that conventional remedies for monotonous diets - income transfers and behavioral change interventions - may be less effective for poor populations facing extremely high ASF prices. This justifies an important role for food policies to drive down the relative prices of nutritious foods.

Keywords: Food prices; ASFs; dietary diversity

EFFECT OF ROSEMARY ON COLORIMETRIC STABILITY OF FLYING FISH HAMBURGER

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Background and objectives: Obtaining Mechanically Separated Meat (MSM) is an alternative to recovery edible parts of low commercial value fishes. Flying fish (Hirundichthys affinis) constitutes an important fishing resource in the northeast region of Brazil and can be used like raw material in food products. The use of natural compounds as antioxidant has been used to retard undesirable reactions that occur in fish products during storage. Thus, the objective of this work was to evaluate the effect of rosemary (Rosmarinus officinalis) on color stability of 3 different formulations of flying fish hamburger, during freezing storage.

Methods: Color determinations were performed on 0, 30, 60 and 90 days of freezing storage with Minolta CM-5 spectrophotometer (CIE L^* a^* b^*). The formulations of hamburger differed in the quantity of rosemary: F1 (0), F2 (0.5%) and F3 (1.0%).

Results: The values of lightness (L^*) increased throughout the time for all samples at the end of the storage period ($p<0.05$). Values of b^* did not changed throughout the time in F1. However, the samples with rosemary (F2 and F3) had the values of b^* increased in the day 90. The values of a^* were higher in the samples with rosemary for the analysis carried out in the days 0, 30 and 60, which ensures the increase of the red color intensity in the hamburger, directly proportional to the amount of rosemary in these days of analysis.

Conclusions: Formulations with rosemary obtained better color indices during storage, indicating maintenance of the quality when compared to the formulation without rosemary.

Keywords: rosemary; fish hamburger; color stability

FOOD ALLERGEN LABELING AND DETECTION OF TRACES OF MILK, SOY AND EGG IN FOOD PRODUCTS USUALLY CONSUMED BY CHILDREN

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Background and objectives: Food allergens labeling will soon be incorporated in the Argentine Food Code (article 235 seventh). The objectives of the present study were: to analyze allergen declaration and the presence of precautionary statements in the labels of food usually consumed by children, to quantify traces of milk, soy and egg using commercial ELISA kits in the same products and to evaluate the possible declaration of these allergens according to either Japanese legislation or VITAL 2.0, which establish thresholds in different foods.

Methods: Two different batches of 11 commercial products were analyzed, which were randomly acquired in supermarkets in Buenos Aires, Argentina. Correct statements of allergens ac-

cording to article 235 seventh were assessed. Milk, soy and egg allergens were determined using commercial ELISA kits from the brands R-Biopharm, Neogen and/or Romer (two for each allergen).

Results: In the case of milk and egg, the kits showed the same behavior in all the analyzed foods and in most of the samples coincided with what was stated on the labels. However, in one of the samples traces of milk were detected even though there was no statement about possible presence of milk in its labeling. The values were 3.9 and 4.2 ppm of milk protein with the R-Biopharm kit and 2.4 and 3.5 ppm of skim milk powder with the Neogen kit. In the analysis of the soy allergen, different results were obtained with the two kits used in some of the samples analyzed. In addition, positive results were obtained for soy in almost all the analyzed samples (9/11 samples), even in 4 samples that did not declare soy at all. In these samples, the values were between 3.6 and 8.7 ppm of soy proteins with R- Biopharm kit. Regarding the Japanese legislation or the VITAL 2.0 system, it is very difficult to conclude what declaration must be made since they are based on different criteria.

Conclusions: The final approval of article 235 seventh will be surely a tool of great value for the food industry and allergic patients since the label of any food should provide safe and reliable information for allergic patients and their families.

Keywords: Allergens, milk, soy, egg, ELISA

144/773

PHYSICOCHEMICAL QUALITY ASSESSMENT OF COMMERCIALISED FISH (LUTJANUS JOCU) IN A BRAZILIAN PUBLIC MARKET

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Background and objectives: There are several studies that identify health benefits associated with regular consumption of fish and it is important to emphasize that this consumption may be associated with reduced risk of various diseases. However, fishery products are very perishable compared to others of animal origin due fish's own susceptibility for microbial growth and chemical changes. This study aims to assess the physicochemical quality of Lutjanus jocu samples exposed in a Brazilian public market.

Methods: The study included 4 lots of fish species Lutjanus jocu, each batch consisting of 5 fish samples. These samples were obtained gutted, headless and without scales on a fish market in the city of Natal/Rio Grande do Norte/Brazil, and subjected to determination of Total Volatile Bases (TVB) and pH analyses.

Results: Among the samples analyzed, 75% had TVB values above the limit allowed by current legislation (30 mg N/100g). TVB values ranged from 25.69 to 50.12 mg N/100g and all samples from batch 2 and 4 showed TVB values above the maximum allowed value. Regarding the pH values, 55% of the samples weren't according to the Brazilian legislation. The pH values found were between 5.52 and 7.55.

Conclusions: Most fish batches were inadequate in terms of physicochemical quality parameters. Therefore, a risk to the health of the consumer was evidenced, and the forms of manipulation and commercialization should be reviewed in order to control this risk.

Keywords: Quality control; fish; physicochemical quality

144/782

UMAMI TASTE PREFERENCE (MONOSODIC GLUTAMATE) IN MEXICAN SCHOLAR CHILDREN

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Background and objectives: Taste is a predictor of food choice. Umami taste is found naturally in food, but monosodium glutamate (MSG) is the main stimulant of umami taste in food. The addition of MSG to food has been popularized being one of the most used and commercialized food additives increases palatability, sensorial qualities and product preference. MSG has specific brain receptors, which block satiety signaling of the consumer, which may contribute to an increase in obesity. In addition, the use of MSG has been associated with adverse side effects such as depression, cardiac arrhythmias and allergies. Research has shown that the taste of MSG is preferred by the entire population, regardless of age, worldwide. The aim of this work was to determine the preference for the umami taste (MSG) in Mexican children.

Methods: 120 children (8-11 years) participated, both sexes. The preference for the umami flavor was determined by two sensory evaluation tests: forced double-choice test (2AFC) and analogue visual scale (VAS) range of (0-10), for two types of cracking

one with 0.1% MSG added and another without adding. Statistical analysis was performed by an ANOVA and Chi2 test to determine the preference for a cracking with MSG added or not added.

Results: It was determined by VAS that the umami flavor cracker is not rated as preferred by children with a recovery range of 0-3.5 points on the scale; the mean was 2.75 ± .50. 88% of children prefer cracking without added MSG, statistically significant difference. There were no differences by gender or age. The results obtained by 2AFC and VAS are similar to each other.

Conclusions: The children who participated in this study prefer a cracking without the addition of MSG and it was determined that the preference for a food with added MSG is low. it should be avoided adding MSG in food because of the adverse effects that its consumption contracts. In Mexico, although some of the industrialized products are highly consumed and contain MSG, children have not generated a taste for the use of this ingredient, so habituation to MSG has not achieved a good percentage of acceptance.

Keywords: Preference, umami, children

144/800

POTASSIUM CONTENT IN TEA INFUSIONS

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Background and objectives: The concentration of intracellular potassium is 150 mEq/L and the extracellular concentration of 4-5 mEq/L. There is severe health complications when this balance is broken. In renal patients with glomerular filtration <10% or when potassium intake is multiplied by 20, the potassium balance is altered and it is necessary to control the contribution of the mineral. The aim of the study was to determine the potassium content per cup, for different contact times, types and forms of presentation.

Methods: It was worked with 20 types of tea of different brands, in their different presentations: black, green, strands and bags. The infusions were prepared with 2 g of each type of tea and two volumes of hot water: 100 ml and 150 ml, with different contact times: 1, 3, 5 and 7 minutes. It was obtained 280 infusions and it was determined potassium by flame photometry. It was a quantitative and experimental study, in which the variable potassium concentration (dependent) was related to contact time, water volume, type of tea and form of presentation (independent), applying descriptive statistics to the results.

Results: It was demostrated that a cup of 150 ml of tea provided the following amounts of potassium: black (strands) from 63±3 mg to 87±4 mg; black (bags): 75±2 mg to 109±4 mg; green (strands): 80±2 mg to 118±4 mg; green (bags): 68± mg to 93±3 mg; the ranges correspond to different contact times.

Conclusions: The results obtained from the potassium content in tea are useful to consider in acute kidney injury, both in the oliguric phase, where it should not exceed 30-50 mEq/day of the mineral, as in the polyuric phase, where is essential to restore the losses of water and electrolytes. It should be noted that in hemodialysis or dialysis with acidosis and without diuresis, potassium should be restricted to 1 mEq/kg/day to avoid complications. The data obtained provide information that must be taken into account for the calculation of potassium intake.

Keywords: Tea, potasssium, infusions, kidney disease
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144/995

EVALUATION OF THE MECHANISMS OF MAYONNAISE PHOSPHOLIPID PEROXIDATION

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Background and objectives: Mayonnaise, which is widely used in foods, is rich in lipids and therefore susceptible to oxidation during the manufacturing process, which can result in loss of quality. Hence, an improved understanding of the cause of mayonnaise lipid peroxidation could lead to a means of ensuring maintenance of the quality of the product.

Several classes of lipid hydroperoxides may be present in mayonnaise, such as triacylglycerol hydroperoxide, cholesterol hydroperoxide and phospholipid hydroperoxide. Of these lipid hydroperoxides, we have recently developed a sensitive and selective liquid chromatography-tandem mass spectrometry (LC-MS/MS) method for detecting phosphatidylcholine hydroperoxide (PCOOH), a primary oxidation product of phosphatidylcholine (PC). Determination of the hydroperoxide group position in PCOOH isomers may be helpful for elucidating the cause of mayonnaise lipid peroxidation, as demonstrated in our previous study (Anal. Biochem., 471, 51-60, 2015) in which we analyzed PCOOH isomers in human plasma and found that radical (and/or enzymatic) oxidation, rather than singlet oxygen-oxidation, is likely the cause of plasma PC peroxidation.

Methods: Based on above findings, we analyzed PCOOH isomers in 3 commercial mayonnaise using LC-MS/MS in the present study.

Results: PCOOH analysis was carried out with 3 commercial mayonnaise products immediately after unsealing. From the analysis, it was estimated that about 0.01-0.03% of PC had already been oxidized to hydroperoxide prior to opening. To the best of our knowledge, this is the first report demonstrating that oxidized phospholipid was detected in mayonnaise, despite of the freshness. The PCOOH isomer composition suggests that mayonnaise phos-

pholipid peroxidation is predominantly initiated by radical-oxidation (i.e. upon autoxidation), rather than singlet oxygen-oxidation (e.g. upon light exposure), during manufacturing, packaging and/or storage. Hence, antioxidants such as tocopherol (radical trapping reagent), rather than carotenoids (singlet oxygen trapping reagent), can be more useful to prevent mayonnaise phospholipid oxidation.

Conclusions: The present LC-MS/MS method will be useful for elucidating the cause of lipid peroxidation in mayonnaise and related foods. Such information will be valuable to ensure maintenance of product quality.

Keywords: Mayonnaise, Oxidation, Phospholipid, Hydroperoxide isomer, LC-MS/MS

144/1017

CHANGES IN ARSENIC CONTENT IN THE DIFFERENT ORGANS OF SEAWEED; AKAMOKU, SARGASSUM HORNERI, AFTER PARBOILING

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Background and objectives: Akamoku, Sargassum horneri Turner C. Agardh, is an annual seaweed that grows along ocean coasts, and is considered a good foodstuff consisting as it contains high amounts of dietary fiber and minerals (Murakami et al., 2016, Natural Resources). This seaweed is native to Asia with a wide distribution range from the Japanese coast to the East and the South China Seas. However, this seaweed was observed in California, USA and Baja California, Mexico in recent years. Similar to the other members of Phaeophyta, Akamoku contains a rather high level of arsenic (Katayama et al., 2008, Trace Nutrient Research). Akamoku has been used as food only in a few areas of Niigata and Akita Prefectures, Japan, but recently, Toyama, Iwate, and Fukuoka Prefectures have begun using it as a food material. We measured the arsenic accumulation in Akamoku in order to gain a better perspective on the species' safety and usability as a seafood product. Further, we attempted to understand the arsenic accumulation behavior in different part of the seaweed for its better utilization as a foodstuff.

Methods: Akamoku plants were harvested in March 2017 at Suo-oshima, Inland Sea, Seto, Japan. Mature male and female plants were harvested separately, washed thoroughly, and separated into inedible and edible portions; receptacles, branch (with leaves and air-vesicle), and stalks. Half of edible portion was parboiled with 2.2%NaCl for 1 min. The boiled sample was then refrigerated with ultrapure water for 1 min. The total arsenic and inorganic arsenic contents were determined by atomic absorption spectrophotometry and high performance liquid chromatography with inductively coupled plasma mass spectrometry.

Results: Our results showed that parboiling decreased the arsenic contents in the edible portion of Akamoku by about 85% by processing for food (Murakami et al., 2013, ISUN 20th International Congress of Nutrition. PO3182). Further, we report changes in arsenic contents in the diferent organs of Akamoku after parboiling.

Conclusions: The biochemical mechanism of the arsenic accumulation in high level in the intact plants are yet obscure, a proper treatment to the plants will lead to a good foodstuff to supply dietary fiber and minerals.

Keywords: Sargassum horneri, Akamoku, arsenic, seaweed, brown alga

Further collaborators:

144/1032

EDIBLE PROTEIN ENERGY RETURN OF INVESTMENT (EP-EROI) AS A TOOL TO ECO-NUTRIENT COMPARISON OF CANNED SEAFOOD PRODUCTS

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Background and objectives: Each year approximately 1.3 billion tons of edible food are wasted throughout global food supply chain generating emissions of 3.3 Gt CO2 eq. This value will be increased due to the global population is expected to increase from the current 7 billion to nearly 10 billion by 2050. These facts make that current patters of food production and consumption are increasingly considered to be unsustainable, i.e. the amount of energy used to produce, process, package, store, and transport food is seven and half times the amount of energy the food actually provides in return. In addition to cause environmental impact, wasting food involves the loss of nutrients along the food supply. The cooking way and eating habits can vary the nutrient content of food, because up to 42% of food waste is produced by households. In this context, the European Commission is conducting several improvement measures to reduce food loss and waste by 50% by 2020. The Bioeconomy Strategy aims to pave the way to a more innovative, resource efficient and competitive society that reconciles food security with the sustainable use of renewable resources while ensuring environmental protection. On the other hand, Food 2030 initiative have four priorities: (i) nutrition for sustainable and healthy diets, (ii) climate smart and environmentally sustainable food systems, (iii) circularity and resource effi-

ciency of food systems, and (iv) innovation and empowerment of communities.

Methods: In this framework, this work develops a methodological approach, which assess and compares both the environmental impact of a food product and its energy content returned to consumer. The environmental impact is evaluated with the standardized methodology, life cycle assessment (LCA). On the other hand, the nutrient properties of the product are analyzed by means of the protein content along the life cycle chain.

Results: Both metrics can be expressed in terms of energy consumption (Cumulative Energy Demand) and energy content (protein content) by means of the Edible Protein Energy Return of Investment (Ep-EROI).

Conclusions: This methodology can be applied to all food chain products; however, this paper is focused on canned anchovy products.

Keywords: European anchovy; protein content; environmental impact; food supply chain.

ACCUMULATION PROCESSES OF NUTRITIONALLY BENEFICIAL MINERALS IN A BROWN ALGAE, HIJIKI (SARGASSUM FUSIFORME), DURING GROWTHFUSIFORME), DURING GROWTH

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Background and objectives: The brown algae Hijiki, Sargassum fusiforme, is an important foodstuff for Japanese, and serves as a rich supply of minerals and dietary fiber. Warming of the earth elevates the ocean-water temperature year by year, and exerts ecological influences. Hijiki also seems to change their regular growing processes, becoming chlorotic earlier than before. To know the physiological changes during their growth, we studied the accumulating processes of several nutritionally beneficial minerals in Hijki plants during their growth from the primary leaf stage to their chlorotic state. Although the accumulation of arsenic (As) occurred in plants during their growth, arsenic (As) could be mostly removed during the pre-cooking process of the commercial dried Hijiki products.

Methods: Hijiki plants were harvested at the seashore of Kushimoto, Wakayama Prefecture, Japan. The fresh samples of Hijiki plants were lyophilized and decomposed with conc perchloric acid - conc nitric acid, or with conc sulfuric acid - conc nitric acid. The ashed samples were dissolved in 1N hydrochloric acid, and the concentrations of arsenic (As), calcium (Ca), iron (Fe), magnesium (Mg), manganese (Mn), potassium (K), and zinc (Zn) in

the plant tissues were determined by atomic absorption spectrophotometry .

Results: The concentration of calcium (Ca) per tissue weight increased gradually coming to a rather constant value before the appearance of genital organs on the plants, although the concentration of arsenic (As) continued to increase. Until that time, the concentrations of zinc (Zn) and manganese (Mn) continued to increase further. The concentration of iron (Fe) and magnesium (Mg) increased gradually, expressing a strong correlation between them, but the concentration of magnesium (Mg) was not uniform in the chlorotic plants.

Conclusions: From the viewpoint of nutritional value, matured plants of Hijiki had better be harvested, but to keep good quality of the products, fine days under the sunshine should be selected, even before complete maturation.

Keywords: Hijiki, Sargassum fusiforme, mineral accumulation, growing process.

FOOD LOSSES AND FOOD SECURITY AND NUTRITION: ESTIMATING THE POTENTIAL OF A RESPONSIBLE FOOD PRODUCTION AND CONSUMPTION

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Background and objectives: Food and nutrition security is a complex concern, related to health through malnutrition, but also to sustainable economic development, environment, and trade. Europe and Central Asia as a region has achieved the Millennium Development Goal hunger target of reducing by half the proportion of people affected by hunger. At the same time, large amounts of food are being wasted, food that still may contain important nutrients and micronutrients. An estimation of macronutrient and micronutrient loss resulting from food waste may be helpful for people trying to prevent food waste by engaging the public and

companies and increasing awareness on this subject. Estimation of the impact of food waste on health and nutritional issues can be performed by calculation of nutrient losses resulting from food waste.

Methods: A comparison of loss of nutrients by losing and wasting food, with the recommended daily intake (RDI) of that specific nutrient or micronutrient has been calculated in this work. Two parameters are needed to perform such a calculation: i. amounts of wasted products, and ii. nutritional data describing the macronutrient and micronutrient composition.

Results: Taking as a case study the food losses in Spain, preliminary results shows that the estimated amount of vitamin C that is lost in Spain in a year as a result of food waste may contain the equivalent of 1.9 billion "recommended daily intake portions" which is equivalent to the amount of vitamin C that is needed by 5.3 million people a day.

Conclusions: Reducing food waste has enormous potential for reducing the resources we use to produce the food we eat. Being more efficient will save money and lower the environmental impact of food production and consumption, contributing to a global nutrition security.

Keywords: Food loses; food security; environmental friendly nutrition

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144/1039

NON-DESTRUCTIVE RIPENING INDEXES OF PRICKLY PEAR (OPUNTIA FICUS-INDICA) FOR AN OPTIMAL FREEZE-DRYING

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Background and objectives: Prickly pears (Opuntia ficus-indica va. Burrona) are climacteric fruits and usually are marketed in fresh. Freeze-dry can be used to obtain innovative foods with higher added value that can help to improve the Mexican economy

of semiarid zones. It is known that some variations in raw material characteristics determined the quality in the final product. Our aim was to non-destructively select raw material with the optimal ripening conditions to freeze-dry prickly pear slices in order to obtain the best-rehydrated products. By accumulated growths curves, the ripening index was determined during pre-harvest of 300 fruits that were obtained from the central Mexican zones.

Methods: Each week, the change of color, texture, acidity, pH, chlorophyll content, reducing and total sugars content were evaluated. The fruits were selected by their peel color using a* parameter, for freeze-drying experiments under laboratory conditions. ANOVA (a=0.05) was used to determine the effect of two slice thickness (1 and 1.5 cm) and two plate temperatures (15 and 30oC), in relation with; pulp drying time, rehydration coefficients of freeze-dried products, color and texture of rehydrated products.

Results: The fruit ripening process began on day 90 after full bloom, where the soluble solids/tritiable acidity ratio (r=0.75) as well as fruit texture (r=0.78) correlated in a positive way with a*, making it possible to differentiate fruits in the different ripening stages. The fruits with a* value of -7.6± 0.43 (111 days after flowering) were selected as an optimal raw material for freeze-drying. Drying time was significantly reduced in a 1 cm slice thickness and 30oC of plate temperature. These results compared with fresh slices, showed that dried slices had higher L* and a* intensity. However, the rehydration coefficient was low with a loss on texture, as well as reduction on L* and a* after rehydration.

Conclusions: Fruit peel color makes it possible to non-destructively differentiate fruits during ripening. Freeze-dried slices of prickly pears are a healthy snack and are a marketing option, due to do not show signs of retraction and their flavor is preserved.

Keywords: Freeze-dry, prickly pear, ripening index, rehydration, color

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144/1069

DETERMINATION OF MAGNESIUM IN SPINACH UNDER DIFFERENT COOKING METHODS

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Background and objectives: Magnesium is necessary for about 300 biochemical reactions of the body, with a requirement of 260 mg/d for a healthy adult. Therefore the aim of the study was to determine how the content of magnesium in spinach varies under different cooking processes.

Methods: To carry out this experience it was used 10 kg of spinach, acquired and processed on the same day. For the sampling, each plant was divided into 5 equal parts, obtaining 5 lots submitted to different cooking techniques: Lot 1: raw spinach, which was reserved for analysis; Lot 2: spinach cooked by boiling; Lot 3: sauteed spinach; Lot 4: steamed spinach; Lot 5: spinach

cooked using microwave. It was determined the centesimal composition of raw and cooked product applying official laboratory techniques. The magnesium content was determined by atomic absorption spectrometry on ash dilution. In order to establish if there is statistically significant differences. It was applied analysis of variance (ANOVA) for a level of significance alpha ≤ 0.05.

Results: The loss of humidity was statistically significant for sauteed spinach (73 g%) and cooked with microwave (60 g%). The fat content is increased from 0.3 g to 12.58 g in sauteed spinach, which represented a 5.4 times more caloric intake. The magnesium content was 64 ± 3 mg% in raw spinach; by boiling 52 ± 2 mg%; sauteed 86 ± 3 mg%; steamed 63 ± 3 mg% and microwave 99 ± 4 mg%.

Conclusions: Spinach processed with microwaves presented the greatest loss of weight and volume (-70%), but concentrated in a 50% the magnesium content, in relation with the loss of humidity. The one cooked by boiling had the greatest loss of magnesium (leaching of minerals). Steamed spinach maintained the content of magnesium. The sauteed one had a loss of weight and volume of 18%, and also it concentrated 35% magnesium respect to raw spinach, but increased its caloric value.

Keywords: Magnesium, cooking techniques, nutritional composition, caloric intake.

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144/1097

ENRICHMENT EFFECT TO FINAL COMPOSITION OF COMPLEMENTARY FEEDING PREPARATIONS

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Background and objectives: Nutrition during childhood is key for diseases prevention in adult life. Complementary feeding carries the risk of micronutrients inadequate intake.

Homemade meals elaboration implies vitamins losses in different cooking procedures. Using enriched weaning food would cover nutrient recommendations. The study aims to evaluate Retinol and Ascorbic Acid's concentrations variation secondary to cooking procedures, on meals intended for children, using micronutrients enriched infant cereal as an ingredient.

Methods: Exploratory experimental study analysed Ascorbic Acid and Retinol in two recipes with different cooking procedures. These vitamins were selected as indicators of lability between hydrosoluble and liposoluble vitamins. The recipes were elaborated as homemade meals under replicable conditions.

Retinol was analysed through HPLC and Ascorbic Acid by capillary electrophoresis.

Results: Retinol and Ascorbic Acid were detected in cooked and enriched samples, and consequently pre and post-cooking samples were analysed.

Retinol increased its concentration in post-cooking samples due to water loss secondary to evaporation (11% between non-enriched, 14% among enriched). Between cooked samples, enriched sample presented an 18% increase versus non-enriched one, whereas among raw samples it was 15%.

Ascorbic acid content increased due to enriched cereal addition. Cooking generated a partial loss (less than 15%). In all samples, variations were related to initial concentrations and cooking methods that included different heat transfer and O2 partial pressure.

Vitamin loss is partial and predictable, obeying to a natural chemical behaviour rather than the procedure itself: solutes with higher concentrations are the most affected by changes in environment conditions.

Conclusions: Complementary feeding is one of the critical moments for micronutrients intake. Partial and predictable vitamin losses in homemade preparations turn micronutrients enriched cereal into a useful tool to fortify children's meals, ensuring an adequate micronutrients supply.

Keywords: Retinol, Ascorbic Acid, complementary feeding, homemade meals

Conflict of Interest Disclosure: The study was funded by Danone Nutricia ELN.

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144/1117

HARNESSING AGRICULTURE FOR NUTRITION OUTCOMES: EXPERIENCE FROM TANZANIA

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Background and objectives: The causal pathway between food production, consumption, knowledge and improved nutrition outcomes is neither direct nor simple and depends on a complex interaction of a range of factors. The Harnessing Agriculture for Nutrition Outcomes (HANO) project was designed to explore the linkages between household agricultural production with dietary patterns and nutrition. The project was implemented from

December 2012-present in Lindi and Ruangwa districts in Lindi region Tanzania, with an aim to prevent chronic malnutrition among children under two years by combining nutrition interventions with a range of agricultural activities.

Methods: To assess the project's impact, an end line evaluation will be undertaken at the end of the project in May 2017 using the Qualitative Impact Protocol (QuIP). Data will be collected from a sample of the intervention villages using semi-structured interviews with 30 households and 4 focus groups – using blindfolded, independent researchers. The questionnaire makes no reference to the project, but is designed to capture information on wellbeing domains expected to have been impacted according to the project's theory of change. The narrative data collected is then analysed against the project's theory of change to identify unexpected as well as anticipated drivers of change, and the interaction of the intervention with these drivers.

Results: QuIP sets out to generate differentiated evidence of impact based on narrative causal statements elicited directly from project beneficiaries. Evidence of attribution is sought through respondents' own accounts of causal mechanisms rather than by relying on statistical inference based on variable exposure. Data is presented according to whether it a) explicitly attributes impact to project activities, (b) makes statements that are implicitly consistent with the project's theory of change, (c) refers to drivers of change that are incidental to project activities. This data can then be triangulated with routine monitoring data in 'unblindfolding' workshops, assessing what the findings mean for future project design.

Conclusions: We hope that conducting a 'deep-dive' using the QuIP methodology will help to provide much richer information on the causal impacts of different activities and drivers of change in Lindi and Ruangwa districts. The results of the evaluation will be presented.

Keywords: agriculture, nutrition, QuIP, evaluation
Further collaborators:

144/1213

THE SENSORY ACCEPTABILITY OF TWO BIO-FORTIFIED IRON/ZINC BEAN VARIETIES BY PRE-TEENS FROM RURAL- AND SEMI-RURAL AREAS IN THE ANDEAN REGION OF COLOMBIA

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Background and objectives: Iron and zinc deficiency are mayor public health problems, mostly affecting vulnerable popu-lations such as young children and women of reproductive age in low- and middle- income countries. Biofortified beans with substantial concentrations of iron and zinc were introduced in Colombia in 2016. These beans have the potential to reach vulnerable populations and to improve their nutritional statuses, considering beans are staple crops and frequently consumed in Colombia. Successful implementation however, depends on the acceptability of these newly bred varieties. Therefore we studied the sensory acceptability of two biofortified bean varieties high in iron and zinc and a commonly eaten local bean variety.

Methods: Two biofortified bush-beans varieties known as BIO-101 and BIO-107 were included, with iron and zinc concentrations between 8.2 -8.3 mg/100g and 4.3-4.4 mg/100g, respectively. Schoolchildren (n=174), aged between 10-15 years old, from (semi-) rural areas in the departments of Cauca and Valle del Cauca were asked to evaluate these varieties and a local bean variety. The three bean varieties were presented as blind-labeled samples of 20 grams and assessed on color, size, smell, taste and texture using a five-point facial likert scale.

Results: The overall mean scores were 3.88 ± 0.64, 3.79 ± 0.74 and 3.81 ± 0.76, for BIO-101, BIO-107 and the control sample respectively and these scores did not significantly differ from each other ($p>0.05$). The children in Cauca (n=61) slightly preferred BIO-107 over the control sample ($p <0.05$), but not over BIO-101, based on color, smell and taste. The children in Valle del Cauca (n=113) slightly favored the control sample over BIO-107 ($p<0.05$), but not over BIO-101, regarding size, smell and taste.

Conclusions: Overall, all varieties are well and equally accepted, which seem to have promising implications for the implementation and impact of biofortified iron/zinc beans.

Keywords: Biofortification; Beans; Micronutrients; Sensory acceptability; Hedonic

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144/1249

LABELING AND REPORTING OF SALT/SODIUM IN PACKAGED FOODS

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Background and objectives: Packaged foods report salt in the ingredients list and sodium content in nutrition facts panel. Information on salt and/or sodium content can be used to select low sodium foods to reduce the risk of hypertension and resultant coronary heart diseases. Therefore, the aim of the present investigation was to evaluate the accuracy and reliability in reporting of salt/sodium content on labels of packaged foods.

Methods: A total of 1,020 packaged foods (29=food categories, 10=food groups) were surveyed from supermarkets (n=4)

and grocery-stores (n=4) in Vadodara, Gujarat, India and the labels were studied for compliance with the legislations laid down by Food Safety and Standards Authority of India (FSSAI). One hundred and fifty four packaged foods were analyzed for sodium content by AOAC 969.23 method using Flame Photometer (Model: Elico CL 361).

Results: Results revealed that 11% of the products had multiple and alternative sources of salt/sodium (common salt, rock salt, sodium-carbonate/caseinate/molybdate, monosodium glutamate) in ingredients list, making them high in sodium content. Ready-to-cook/eat products had the highest percentage (4.4%) of products listing multiple sources of salt followed by snacks (2.9%), wheat and oats based products (1%), bakery products (0.9%), confectionery (0.5%), food adjuncts (0.3%), milk based products (0.1%). When MSG (a source of sodium) and salt were considered together, ready to cook/eat products were found to have highest percentage (4.5%) of Salt+MSG. Four percent of the products had multiple sources of MSG (namely, hydrolyzed-vegetable protein/corn solids, yeast extract, etc). Multiple MSG sources were highest in ready-to-cook/eat products (2.1%) followed by wheat and oats based products (1%), snacks (0.6%) and food adjuncts (0.2%). Ingredient claims like "no added salt" and "No MSG" were not substantiated by any of the product's ingredients list. Products with higher analyzed values for sodium than those reported on the label were found to have multiple/alternate sources of sodium in the ingredients list.

Conclusions: There is lack of accuracy and reliability in reporting of salt/sodium and MSG information on packaged food labels. There is a need to improve compliance with legislation for labeling of packaged foods laid down by FSSAI for improved Public Health and Nutrition outcomes.

Keywords: Salt, Sodium, Mono-sodium glutamate (MSG), Food Labeling, Packaged Foods.

Further collaborators:
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144/1273

TRANS FATTY ACIDS: AFTER 14 YEARS OF BRAZILIAN LEGISLATION ARE THE LABELING ADEQUATED?

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Background and objectives: The excessive intake of trans fatty acids (TFA) has been related to the development of cardiovascular diseases. Recent researches show the Brazilian popula-

tion diet exceeds the recommendation for TFA, by high consume of processed food. According to Resolution RDC 360/2003 of the National Health Surveillance Agency/Ministry of Health, it is required the grade of TFA on labeling of packaged foods, this is a strategy for chronic diseases prevention. The World Health Organization warned of the need of less TFA consume, which culminated in the recommendation for its elimination in 2004. The result of this control will be the improvement of the health of the population. Considering the legal requirements and the consumer's right to obtain reliable information, the objective is to address aspects about TFA, emphasizing food labeling and Brazilian legislation.

Methods: SciELO and Lilacs databases were used, with the terms "trans fatty acids" and "hydrogenated fatty" alone or in conjugated with "labeling", "regulation" or "legislation". The search was from 2003 to 2017, were included original articles and excluded researchers outside Brazil or reviews, were selected 10 originals articles.

Results: Several categories of industrialized products were evaluated for the TFA content and their labeling. Among them are snacks, fast foods, pasta, cereals, dairy products, infant formulations, vegetable oils, among others. All the articles analyzed have concluded that industrialized product labels require greater scrutiny and the need to revise national legislation on the amount of TFA to be declared. The TFA content is higher in 56% of the analyzed articles compared to the declared on the label and exceeds the limit allowed by the legislation.

Conclusions: After 14 years of implementation of the legislation in Brazil, the indication of TFA on labels and their use by the industry are still inadequate. Need for revision of the legislation in the indication of the content of TFA in the label and change of the nutritional information for a percentage of the food instead of the portion in grams. Increased vigor in the regulation and monitoring of nutrition labeling will be beneficial to consumer health, thus reducing the risk of developing chronic diseases and public health expenditures.

Keywords: Trans fatty acids. Industrialized foods. Legislation. Nutritional labeling. Public healthy

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144/1286

DEVELOPMENT OF NUTRITIONAL AND HEALTHY BAKERY PRODUCTS BY INCORPORATION OF QUINOA

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Background and objectives: Today, nutrition is located as part of the prevention or reduction of certain diseases. The ob-

taining and characterizing new ingredients with high technological potential, high nutritional value and bioactive compounds, opens up a promising field of competitiveness to the food industry with which to be able to establish itself in the food market. Consumption of whole grain or wholemeal can play an important physiological role in maintaining general well-being and health, not only because of its fibre content but also because it contains numerous bioactive components. Quinoa grains (Chenopodium quinoa) are characterized by a high concentration of proteins with excellent amino acid profile in addition to a high content of minerals, vitamins, unsaturated fatty acids and antioxidants. The objective of this research has been to develop new bakery products by replacing flour with whole quinoa flour from Bolivia (white, red and black varieties), to evaluate its functionality as a bakery ingredient.

Methods: The nutritional, technological and sensorial quality of the developed products was determined in terms of moisture, starch, proteins, dietary fibre, ash, polyphenols, colour parameters and sensorial analysis.

Results: The incorporation of quinoa increased significantly the content of dietary fibre (soluble and insoluble), proteins, lipids and minerals. The colour of the crust and crumb was significantly modified with quinoa variety in comparison to control sample. Polyphenolic profile by HPLC showed the presence of more polyphenol classes in quinoa flours than in wheat flour. Their inclusion produced breads with increased polyphenol content and DPPH radical scavenging activity always in levels significantly higher compared to the control. The sensory analysis indicated that the substitution of 25% of flour for quinoa did not significantly affect the overall acceptability of bread, with slightly better scored products with quinoa than control sample.

Conclusions: Whole quinoa flour could be a good replacement for wheat flour in bread formulations, increasing the product's nutritional value and bioactive compounds with only a small depreciation in bread quality at 25g/100 g of flour substitution. The inclusion of quinoa flours had a positive effect on the technological and sensory value of the bread products, and therefore its inclusion is recommended.

Keywords: quinoa, bakery products, dietary fibre, polyphenols, minerals

Further collaborators:

REDUCTION OF SODIUM CONTENT, INCREASE OF DIETARY FIBER AND YEAST, AND NUTRITIONAL INFORMATION: DO THEY AFFECT THE ACCEPTABILITY OF OPTIMIZED BREAD REGARDING CONSUMERS IN BUENOS AIRES, ARGENTINA?

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Background and objectives: A reduction in salt (NaCl) intake and an increase in fiber promote the prevention of cardiovascular diseases. In Argentina, the daily salt intake is higher and dietary fiber is lower than the recommendations. Bread is one of the main sources of sodium in the diet and can carry dietary fiber. Variations in the addition of salt and fiber in the formulation of bread may require changes in amount of yeast. The nutritional information or label may influence its acceptability.

The objectives of this study have been: develop healthful optimized bread and evaluate its sensory acceptability blind and with label.

Methods: The optimized bread was successfully made: 35% less of NaCl added, 50% more of yeast and 75% more of fiber than white bread (in a previous study 15 prototypes had been evaluated using response surface methodology).

112 students and educational and non-educational staff of Facultad de Medicina, Odontología, Farmacia y Bioquímica, and Veterinaria of Universidad Buenos Aires tested it in two stages: blind and with label. Consumers evaluated appearance, smell, texture (crumb's elasticity), taste; and overall acceptance according to a 10-point scale (I=dislike extremely and 10=like extremely). An interval of 7 days was allowed between stages. Participants also answered: willingness to consume and day time in which they would consume it.

Results: The optimized bread was successfully developed. Participants were mainly students (92.8%), 82% female and median age 22 years (RI: 6).

The acceptability average values for attributes and overall acceptance were very good (all above 7). No differences were observed among the age groups. The average scores of willingness to consume were also very good (7 for blind stage, 7.3 with label), no differences between stages. Breakfast (29.7%), lunch (23.3%) and in-between meals (19%) were the most preferable moment to consume it. Cheese was most chosen for being consumed with the bread in-between meals.

Conclusions: It was possible to develop an optimized bakery that obtained good values of acceptability in the evaluation stages. This bread would appear to be an adequate strategy to increase the amount of dietary choices to prevent cardiovascular diseases.

Keywords: acceptability test – sodium reduction – dietary fiber – bread – optimization

144/1294

CONTRIBUTION OF TRANS FATTY ACIDS BY FOODS MOST PREFERABLY CONSUMED BY A GROUP OF STUDENTS

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Background and objectives: The selection of food for college students is determined by socio-cultural characteristics, economic availability and feasibility of access to them, which in general have high fat contents, and all would indicate that also trans fatty acids (TFA) from the partial hydrogenation of oils. The WHO recommends that consumption not exceed 1% of VT of trans fatty acids (TFA) as a strategy for prevention, reduction and control of cardiovascular diseases. Therefore, the aim of the present work was to identify the foods most preferably consumed by university students of the Biochemistry career of the Faculty of Chemical Sciences of the National University of Asunción and determine in them the content of total AGT.

Methods: In 51 university students, we carried out a cross-sectional study and applied a Food Consumption preference (FCP) survey based on the LATINFOODS categories. For the quantification of total TFAs, food samples were taken from canteens and we used the Infrared Spectrometry (IR) method according to the specifications of the official methods of AOAC (994.14. and 965.34).

Results: The average age of university students was 22.7 ± 2.8 years, 84% were female. Of the 60 foods in the FCP, we observed that the sandwich (with ingredients such as bread, butter, ham and cheese) was the food most frequently consumed in the week, followed by whole-grain crackers, baked goods and fried pies. The total TFA contents of industrial origin were: 2.64±0.24gTFA/100g in whole-grain crackers (brand A), 2.49±0.50gTFA/100g in whole crackers (brand B), 3.80±0.26 gAGT/100 g in the semi-defatted doughs, 3.20±0.14gAGT/100g in the frying pastry disks and 2.81±0.22gAGT/100g in sandwiches.

Conclusions: The AGT content varies by food group and serving size. All foods analyzed contain significant amounts of TFA (≥0,2g/portion) and it was observed that TFAs of industrial origin account for 15 to 39% of the fat in the foods analyzed. The results obtained alert the need to reinforce the strategies to reduce the content consumption of TFA in order to prevent cardiovascular diseases.

Keywords: Trans fatty acids, contents, foods, preferential consumption, students.

144/1398

EFFECT OF GLYPHOSATE ON ACID LACTIC BACTERIA

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Background and objectives: Glyphosate is a broad spectrum systemic herbicide that is among the most widely used pesticides in the world. Due to its antimicrobial effect, its association with intestinal dysbiosis has been proposed, related to the etiology of intestinal inflammation, obesity, among other pathologies. The objective of this work was to evaluate the effect of glyphosate on five species of bacteria.

Methods: The microorganisms used were Bifidobacterium animalis, Lactobacillus acidophilus, L. rhamnosus, L. Casei and L. paracasei. Each single bacteria was reactivated in MRS broth, scattered on the surface of Petri dishes containing MRS agar, then sterile filter paper disks containing 15 μL of the herbicide (0.24%) were arranged on each plate. After incubation (36ºC / 72 hours), the sensitivity was verified by the absence of growth around the disc. To obtain the growth curve, MRS broth tubes with increasing concentrations of the herbicide (0 to 0.03%) were incubated in a the same conditions previously described, with agitation, and the measurement of optical density (OD) in spectrophotometer (600nm) was carried out on each one hour, by 8 hours and after 24 hours.

Results: All the microorganisms tested showed sensitivity to the herbicide, both in the broth culture and in the agar diffusion assay. When bacteria were cultured without inhibition they showed a shift from the latency phase to the exponential phase after 4 hours of incubation, whereas in the presence of the herbicide containing glyphosate (0.03%, 0.0015% and 0.0075%), even after 24 hours of incubation there was no change in OD of broth cultures.

Conclusions: The present work confirms the susceptibility of the five strains of probiotics to the glyphosate herbicide even when the contact with low concentrations were used.

Keywords: acid lactic bacteria, glyphosate, herbicide, dysbiosis.

144/1401

THE IMPACT OF SOLAR MARKET GARDENS ON CHILD GROWTH, IRON AND VITAMIN A STATUS IN THE KALALÉ DISTRICT OF NORTHER BENIN

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Background and objectives: Developing a sustainable agricultural system to improve the nutritional status of children is a challenge in Sub-Saharan Africa where irrigation is labor intensive and crops are rainfed. The objective of this study was to evaluate how Solar Market Gardens (SMGs), a labor-saving solar power drip irrigation system at the village level, impacts the nutritional status of chidren.

Methods: The study was conducted in 8 intervention villages and 8 control villages using traditional hand-irrigation. Baseline and 1-year follow-up data were obtained for the same child (12-59 months of age) per household from 134 randomly-sampled control village households (C-H), 126 control village women group households (C-WG), 229 randomly sampled intervention village households using traditional irrigation (I-H) and 185 intervention village women's group households with SGMs (I-WG). Anthropometric measures and blood samples were collected to determine the impact of the SMGs on child growth, iron and vitamin A status by determining the impact estimate (IE) using difference-in-difference analysis.

Results: At baseline, children were 22.2 +/- 12.4 months of age, 23% were underweight, 36% were classified as stunted and 12.1% with wasting. Low hemoglobin concentrations (< 11g/L) were present in 80%, and 27.2% had a serum retinol < 0.70 mol/L. For all children, the I-WG households had a significant increase (p<0.05) in hemoglobin (IE 0.32) and weight-for-age z-scores (WAZ, IE 0.31) compared with all households, and a slight increase (p<0.10) for serum retinol (using RBP) compared with I-H. For children < 36 months of age at baseline, children from I-WG had a significant increase (p<0.01) for their WAZ (IE 0.44) and their height-for-age z-score (HAZ, IE 0.47) compared with all groups, and a slight increase (p<0.10) in their weight-for-height z-scores (WHZ, IE 0.41) compared with all groups and for serum retinol compared with I-H (IE 0.10).

Conclusions: SMGs appeared to have significantly supported the nutritional status of children in year 1 of the intervention. However, more time may be needed to obtain the full impact of SMGs. Measures of increased crop production, food security, income, and women's empowerment are potential mechanisms for the improved nutritional status.

Keywords: irrigation, horticulture, children, growth, micronutrients

144/1423

TOXICITY OF LEACHATE FROM PLASTIC PACKAGING IN TWO BIOLOGICAL MODELS

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Background and objectives: Plastic occupies first place in the market of packaging for the food sector, guaranteeing better presentation to foodstuffs. However, to improve their aesthetic or technological features, metallization or addition of pigments to plastic packaging is employed, many of which may contain heavy metals as contaminants. The objective of this work was to evaluate the toxicity of plastic packaging leachates using the germination of lettuce seeds (Lactuca sativa) and Caenorhabditis elegans, a nematode widely used to evaluate the anthropogenic action.

Methods: Low density polyethylene packages, laminated or not pigmented, were chopped and kept in contact with solutions for leaching at different pH and time conditions. After filtration, an aliquot of the solutions obtained in each condition was used for analysis of metals (Cd, Cu, Pb and Cr) by atomic absorption spectrophotometry. Another aliquot was reserved for the biological assays, which included the germination of lettuce seed, which were placed in Petri dishes, on filter paper moistened with the solutions. After the incubation, the effect on the germination index was evaluated by measurement with a pachymeter. The conditions those caused, the greater interference on the seeds germination, were applied to observe the fecundity of the nematode C. elegans, put in contact from the embryonic stage.

Results: It was observed that the seeds placed in contact with the leachate obtained from laminated plastic packing presented alterations in their length, and reduction in egg production in C. elegans. The migration of cadmium to the aqueous medium was higher in the neutral leachate. But the interference in the metabolism of the studied organisms showed the greatest impact after the contact with the experimental condition obtained an acidified leachate from laminated plastic packaging.

Conclusions: The lack of correlation observed on better condition to metals migration and the one that showed the higher impact on organisms, points that probably others compounds from plastic polymer matrix has interfered on biological models, strengthening the perception about the limitation of chemical measurements. This finding is a worrying indicator, since a large number of foods in this type of packaging present a pH about 4.5, remaining stored for several months.

Keywords: Caenorhabditis elegans, Lactuca sativa, plastic packaging, heavy metal.

144/1537

ACCUMULATION PROCESSES OF NUTRITIONALLY BENEFICIAL MINERALS IN A BROWN ALGAE, HIJIKI (SARGASSUM FUSIFORME), DURING GROWTH

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Background and objectives: The brown algae Hijiki, Sargassum fusiforme, is an important foodstuff for Japanese, and serves as a rich supply of minerals and dietary fiber. Warming of the earth elevates the ocean-water temperature year by year, and exerts ecological influences. Hijiki also seems to change their regular growing processes, becoming chlorotic earlier than before. To know the physiological changes during their growth, we studied the accumulating processes of several nutritionally beneficial minerals in Hijiki plants during their growth from the primary leaf stage to their chlorotic state. Although the accumulation of arsenic (As) occurred in plants during their growth, arsenic (As) could be mostly removed during the pre-cooking process of the commercial dried Hijiki products.

Methods: Hijiki plants were harvested at the seashore of Kushimoto, Wakayama Prefecture, Japan. The fresh samples of Hijiki plants were lyophilized and decomposed with conc perchloric acid - conc nitric acid, or with conc sulfuric acid - conc nitric acid. The ashed samples were dissolved in 1N hydrochloric acid, and the concentrations of arsenic (As), calcium (Ca), iron (Fe), magnesium (Mg), manganese (Mn), potassium (K), and zinc (Zn) in the plant tissues were determined by atomic absorption spectrophotometry.

Results: The concentration of calcium (Ca) per tissue weight increased gradually coming to a rather constant value before the appearance of genital organs on the plants, although the concentration of arsenic (As) continued to increase. Until that time, the concentrations of zinc (Zn) and manganese (Mn) continued to increase further. The concentrations of iron (Fe) and magnesium (Mg) increased gradually, expressing a strong correlation between them, but the concentration of magnesium (Mg) was not uniform in the chlorotic plants.

Conclusions: From the viewpoint of nutritional value, matured plants of Hijiki had better be harvested, but to keep good quality of the products, fine days under the sunshine should be selected, even before complete maturation.

Keywords: Hijiki. Sargassum fusiforme. mineral accumulation. growing process.

144/1573

NUTRITION SENSITIVE AGRICULTURE FOR IMPROVING FOOD SECURITY: A CASE FROM ANF4W

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Background and objectives: Since 2014, the ANF4W project in Bangladesh has been training small-scale farming households in agronomic bio-fortification of rice with zinc, and providing female farmers with training in homestead food production, nutrition education, gender empowerment and nutrition sensitive agriculture. This study was conducted to evaluate the factors influencing food security among participants.

Methods: A panel survey was conducted among 332 female farmers, consisting of 156 households that had been participating in the ANF4W program for 2 years, and 176 households that had been participating for one year. We used the Household Food Insecurity Assessment Scale (HFIAS) to assess food security, dichotomizing values into 'food secure' and 'food insecure'. We ran a logistic regression model to test associations between food security and household size, women's decision-making ability in the household, self-reported years of experience in home gardening, length of involvement in the project, size of cultivated land, and dietary adequacy of female farmers.

Results: We found that years of experience in home gardening (OR -0.006, p<.05) and women reporting that they have decision making power about major household purchases (OR -1.068, p<.05) were positively and significantly associated with households being food secure. No other variables were found to be significantly associated with food security.

Conclusions: More experienced home gardeners have greater resilience against food insecurity, but this experience was not a result of project participation. It is possible that the length of time for both groups was not sufficient to show a difference or an impact; further, longer term investigation is needed. Households where women have a greater role in major household purchases are more likely to be food secure, suggesting that there are benefits to agriculture and nutrition programs focusing on empowering women beyond the sphere of agricultural production.

144/1654

QUALITY CHARACTERISTICS, CONSUMPTION PATTERNS AND NUTRIENT PROFILE OF YELLOW FLESH CASSAVA VARIETIES AND THEIR PRODUCTS

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Background and objectives: Cassava is a popular root crop in the world which contributes to the staple of most populations in the subtropics and contributes significantly to food and nutrition security in deprived populations since both roots and leaves are eaten. Additionally, cassava leaves are excellent source of proteins, vitamins (B1, B2, C) and essential minerals (iron and zinc). Yellow-fleshed varieties with high carotenoids content have been developed with the aim of combating hidden hunger. The study aimed at determining the carotenoid content of fresh cassava roots, processed products (gari and kokonte) from the roots, including the iron and zinc contents of the cassava leaves.

Methods: Fifteen(15) varieties of fresh yellow flesh cassava (YFC) roots and leaves were obtained from the Crop Research Institute. 5 of samples 301, 303, 305, 307, and 315 were chosen by the processors' analysis. Total carotenoids was determined using the ICHECKTM carotene device. The TCC of gari and kokonte were determined as described by BioAnalyt (2014). Iron and zinc contents were determined using AOAC(2005) methods. A consumer acceptability was done using 5 a point hedonic scale for gari samples in terms of their overall acceptability, appearance, aroma, flavour, and mouthfeel

Results: The processor's TCC of the fresh YFC samples ranged between 10.12 mg/kg to 4.68 mg/kg. Gari from sample 301 had the highest TCC of 7.67 mg/kg whereas sample 305 had the least value of 4.82 mg/kg however that in kokonte was too small to be detected. Boiled cassava had highest TCC of 2.16 mg/kg and least of 1.24 mg/kg for samples 315 and 305 respectively. The iron content of fresh cassava leaves was between 3.89 ± 0.01 µg/g and 1.51 ± 0.01 µg/g for samples 310 and 308 respectively. The zinc content of cassava leaves ranged from 0.42 ± 0.04 µg/g for sample 310 to 0.05 ± 0.01 µg/g for sample 308. More than half of the respondents (51.2 %) were willing to accept the yellow flesh cassava as well as use it.

Conclusions: Thus YFC has potential in enhancing Food and Nutrition security in Ghana and beyond by curbing hidden hunger as judged by the preliminary studies.

Keywords: Cassava, bio-fortification, food and nutrition security, carotenoids

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144/1684

NUTRITIONAL VALUE OF SNACKS COMMERCIALIZED IN PRIVATE UNIVERSITY IN SÃO PAULO CITY

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Background and objectives: The brazilian population's eating habits indicates that the consumption of processed foods and ready meals increased, and traditional foods such as rice and beans reduced their participation in the daily calories of brazilians' intake. High consumption of fast foods, including snack foods, has worried public health officials about the prevalence increase of noncommunicable chronic diseases. The objective of this work was to determine the chemical composition of samples of snack foods marketed in private university (São Paulo-SP).

Methods: Approximately 500g of 4 different kinds of snacks were collected: 2 fried (rissoles, "coxinha"), and 2 baked snacks (esfiha, croissant). The snacks weighted 150g each. The percentages of moisture, proteins, lipids, ashes and carbohydrates of the samples were determined by chemical analysis. The total dietary fiber was estimated based on the brazilian table of food composition.

Results: The moisture of the analyzed samples ranged from 45.98 ± 0.09 to 73.46 ± 0.12. The rissoles had the highest ashes concentration (1.95 ± 0.03) and the croissant the lowest (0.66 ± 0.00). The sample "coxinha" had the highest lipid concentration (6.38 ± 0.11), and croissant the lowest (3.13 ± 0.03). However, the croissant showed the lowest protein concentration (3.70 ± 0.04), and "coxinha" , the highest (8.58 ± 0.03). The total dietary fiber content did not reach 1% in all samples analysed. The concentration of carbohydrates, obtained by difference, was approximately 18% in all samples, except for the esfiha that was almost 38%.

Conclusions: The results revealed that the snacks had high lipid, and low dietary fiber concentration. Therefore, the daily consumption of these foods is a nutritionally inadequate option.

Keywords: food composition, snack foods

144/1704

BIOACCESSIBILITY AND TOTAL CONTENT OF TRACE ELEMENTS IN DIFFERENT VARIETIES OF COOKED RICE

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Background and objectives: Rice (Oryza sativa) is a crop of great, economic and social importance worldwide. At present, the study of trace elements in foods, both beneficial to health and potentially toxic, has been prioritized, and rice grain is being one of the cereals characterized by a selective accumulation of these elements. The total concentration of the different trace elements in food to be consumed, allows estimate the dose of exposure, while the soluble fraction present in the intestinal lumen after the digestive process, shows its bioaccessibility, so this is a more precise nutritional evaluation of the food. The objective of the present work was to determine the total and bioaccessible concentration of iron (Fe), copper (Cu), manganese (Mn) and zinc (Zn) in samples of different varieties of cooked, lyophilized and ground rice.

Methods: The bioaccessible fraction was determined by an in vitro solubility method, the total and solubilized minerals, after ashing, were determined by Flame Atomic Absorption Spectrophotometry.

Results: The results were ranges of total values (μg / g) of Cu: 1.45-5.59; Mn: 2.45- 13.61; Zn: 8.82-12.93 and Fe: 6.50-15.28, while the percentages of solubilized and bioavailable minerals were Cu: 24.01-79.30%; Mn: 5.30 - 27.31%; Zn: 6.70-22.53% and Fe: 24.80-92.60%.

Conclusions: It is concluded that, both, the total content of minerals as the soluble fraction to be used by the organism, are influenced by the different physical and chemical characteristics of the studied varieties, so the brown rice, with high fiber content, has showed the lowest bioaccessibility percentage values of these studied trace elements.

Keywords: Bioaccessibility, rice, varieties, minerals, soluble fraction.

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144/1748

THE IMPACT OF SOLAR MARKET GARDENS ON DIETARY DIVERSITY, WOMEN'S NUTRITIONAL STATUS AND COMPONENTS OF WOMEN'S EMPOWERMENT IN THE KALALÉ DISTRICT OF NORTHER BENIN

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Background and objectives: Rainfed agriculture poses growing production risks with increased climate variability and change in Sub-Saharan Africa (SSA), largely due to low use of irrigation and fertilizer. However, to date, few studies have analyzed the impact of irrigation interventions on nutrition, health, and women's empowerment, despite the large potential of irrigation to increase agricultural production. The objective of this study was to evaluate the impact of Solar Market Gardens (SMGs) on dietary diversity, women's nutritional status and components of women's empowerment in the Kalalé district of Northern Benin.

Methods: The study was conducted in 8 intervention villages and 8 control villages using traditional methods. Baseline and 1-year follow-up data were obtained for childbearing age women (15-45 years old) from 185 SMGs women's group (WG) households and randomly selected 229 non women's group (NWG) households, 126 control women's group (CWG) and 234 control non women's group (CNWG) households. Collected nutrition-related indicators included household (HDDS) and women (WDDS) dietary diversity score, body mass index (BMI), prevalence of thinness (BMI<18.5 kg/m2), anemia, iron (ID) and vitamin A (VAD) deficiencies, while women's empowerment measures included decision making, physical mobility, male household involvement, self-confidence, economic independence and group membership components. The Impact estimate (IE) of the SMGs was determined using difference-in-difference between WG and control households (NWG, CWG, and CNWG).

Results: The SMGs women's group households were associated with a significant increase in HDDS (IE 0.36), WDDS (IE 0.47), and a significant reduction in anemia prevalence (IE -0.77), whereas there was no significant impact on BMI, thinness, ID and VAD (p>0.05). SMGs women had also greater self-confidence (IE 0.58), decision making (IE 0.74), and group membership (IE 0.66), but no impact was observed with physical mobility, male household involvement, and economic independence components of women's empowerment.

Conclusions: Solar Market Gardens have the potential to improve women's nutritional status and components of women's empowerment in the Kalalé district of Northern Benin. However, the lack of impact on BMI, iron and vitamin A deficiencies, and economic independence components of women's empowerment

points out the urgent need for behavior changes communication interventions to improve women nutrition status.

Keywords: irrigation; dietary diversity; women's nutrition status; women's empowerment; Benin

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144/1773

MATERNAL AFLATOXIN LEVELS IN PREGNANCY AND LOW BIRTH WEIGHT PREVALENCE IN BANKE, NEPAL

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Background and objectives: Aflatoxin exposure (AFB1) has been linked to poor growth patterns in infants and young children; however, little is known of the relationship of aflatoxin exposure in pregnancy and low birth weight (LBW). This study estimated the prevalence of LBW (< 2.5 kilograms) and assessed the association of aflatoxin exposure in pregnancy and LBW prevalence.

Methods: Data from newborn infants enrolled in an ongoing USAID-supported birth cohort study in Banke, Nepal, was used for this analysis. Only infants measured within 72 hours of birth were included in this analysis (n=1484, 96% of total recruited). Data on AFB1, socio-demographics, anthropometry and health were collected during the pre-natal visit. Binary logistic regression was used to identify potential risk factors associated with LBW. Statistical analyses were conducted with Stata® SE version 14.

Results: Approximately 20% of the infants were born with a LBW. The average AFB1-lysine adduct levels in maternal serum were 3.4 (±8.4) pg/mg for women with LBW infants and 3.1 (±8.1) pg/mg for women with normal birth weight infants. Significant bivariate associations were found between: LBW and maternal aflatoxin levels, maternal schooling, dietary diversity score, wealth quintile, short stature (<145 centimeters), hemoglobin, mid-upper arm circumference (MUAC) and female child. After adjusting for socio-demographic variables and potential confounding factors, findings showed the odds of a LBW infant increased with increases of AFB1 albumin adducts (OR=1.14; 95% CI: 1.01-1.28 p=0.031). Moreover, the odds of having a LBW infant decreased with each additional year of education (OR=0.95; 95% CI: 0.91-0.98, p=0.001), each unit increase in dietary diversity score (OR=0.84; 95% CI: 0.76-0.93, p=0.001) and each centimeter increase in MUAC (OR=0.89; 95% CI: 0.83-0.94, p=0.000). Short maternal stature (OR=2.05; 95% CI: 1.45-2.89, p=0.000) and female gender (OR=1.42; 95% CI: 1.08-1.85, p=0.011) increased the odds of LBW.

Conclusions: The results indicate a high prevalence of LBW among the study population and confirm that aflatoxins may increase the risk of adverse birth outcomes such as LBW. Findings suggest that in addition to increased education and improved maternal anthropometry, interventions to reduce LBW should encourage improvements to safe and balanced diets before and during pregnancy.

Keywords: aflatoxin, low birth weight, Nepal

144/1815

COMMUNITY LEVEL EFFECTS OF A TARGETED, HOMESTEAD FOOD PRODUCTION INTERVENTION

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Background and objectives: Helen Keller International Bangladesh implemented the Making Markets Work for Women (M²W²) project in two sub-districts of the Chittagong Hill Tracts (CHT). The goal of the project was to eliminate extreme poverty through introducing sustainable agricultural and improved animal husbandry and building marketing skills. We seek to measure the impact of this project on income, food security, and diets, as well as elements of behavior change along the pathway among the population in these areas as a whole.

Methods: We used propensity score matching methods to identify 24 control villages that were the most similar to 24 of the 72 villages M2W2 worked in, based on distance from the road, ethnic makeup, population size, literacy rates, quality of housing, and quality of sanitation facilities. From each of these 48 villages we surveyed 30 households three times in order to estimate the

impact of the project. The first survey was after two years of the intervention (October 2015), followed by two rounds of data collection in the year following the scale down of the intervention. This analysis only utilizes the first survey round.

Results: In treatment villages, an average of 36% of surveyed households were directly involved in the program (range 6 to 94%). In treatment communities, a greater proportion of households were involved in agriculture (90% vrs. 76%, p<0.02), had livestock (82% vrs. 71.9, p<0.05), had savings (58% vrs. 38%, p<0.01), had daily percapita expenditure above the poverty line (52% vrs. 42%, p<0.01), and had more months of adequate food provisioning (11.4 vrs. 11.0, p<0.02). There was no significant impact on women's dietary diversity (4.2 vrs. 4.1, p<0.25) and on mean percapita expenditure (79 vrs. 74 taka, p<0.40).

Conclusions: There is evidence of some project impact both along the causal pathway and in increasing food security, limited impacts in improving income, and no significant impact in improving diet. Future work will use difference-in-difference analysis to examine differences in the trajectory of change between treatment and control communities, and participant and non-participant households in treatment communities over a longer time period.

Keywords: food security, dietary diversity, evaluation, impact pathways

Further collaborators:

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144/1817

BUTYROPHILIN ECTO-DOMAIN OF MILK FAT GLOBULE MEMBRANE PROMOTES MUCIN PRODUCTION FROM THE INTESTINAL EPITHELIAL CELLS

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Background and objectives: Butyrophilin (Btn) was first discovered as a transmembrane protein in milk fat globule membrane. This archetypal Btn (Btn1a1) is also known to modulate the production and the secretion of milk fat globules in the epithelial cells of mammary glands. Recently the primary sequence of the ecto-domain of Btn1a1 was found to have a homology to that of the co-stimulatory B7 molecule, so that many homologs of Btn1a1 have been identified so far. Btn and Btn-like proteins are expressed on the surface of intestinal epithelial cells as well as T cells. The aim of this study is to examine how Btn1a1 functions on the epithelial cells in the gastrointestinal tract.

Methods: The ecto-domains of human, murine, and bovine Btn1a1 were expressed as fusion proteins with immunoglobulin Fc fragment, respectively. The gene coding the ecto-domain of Btn1a1 was subcloned into the expression vector pFUSE-hIg-G1e3-Fc and Expi293 mammalian cells were transfected with the expression vectors. The Btn1a1 fusion proteins secreted into the culture supernatant were purified by a protein G column. HT29-MTX-E12 cells were cultured for 21 days to differentiate into mucin-producing cells. RNA was extracted from HT29-MTX-E12 cells to quantitate the gene expression level of mucins by real-time PCR after Btn fusion proteins were added. Lectin assay was used to quantitate mucins secreted in the culture supernatant.

Results: Expression level of the genes muc5ac and muc17 significantly increased 0.5 to 2 hours immediately after the addition of a fusion protein regardless of species-specificity of Btn1a1. The level of secreted mucins was markedly promoted by the addition of any kind of fusion protein in the dose and time-dependent manner.

Conclusions: Considering that mucins can exert as a barrier against bacteria and viruses infected, we suggest that mucosal homeostasis of the infants may be physiologically controlled by Btn1a1 molecules in milk fat globules.

Keywords: butyrophilin; milk fat globule membrane; mucin; intestinal epithelial cell

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144/1839

MAINSTREAMING NUTRITION INTO REGIONAL AGRICULTURE INVESTMENT POLICY AND STRATEGY OF THE ECONOMIC COMMUNITY OF WEST AFRICAN STATES (ECOWAS) 2016-2025

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Background and objectives: With persistent high levels of undernourishment and malnutrition in West Africa, it is necessary to invest in every sector that could contribute to reverse the situation. Agriculture remains a very important sector, which can significantly influence the nutrition status of West African population. It is important to ensure that any agricultural strategy or interventions are tailored to have nutrition objectives and impacts. West Africa's agriculture has shown some improvements in its performance, resulting in a drastic reduction of undernourishment-from 24% in 1990-1992 to 10% in 2014-2016. ECOWAS and its member states have embarked on a multi-sectoral planning exercise that will lead to the formulation and implementation of a new and second phase of ECOWAP (2016-2025) that will better integrate nutrition aspects.

Methods: Strong advocacy at political and technical levels, as well as sharing of guidance materials and best practices were undertaken by relevant institutions, including, the Food and Ag-

riculture Organization of the United Nations (FAO) and the New Partnership for Africa's Development (NEPAD). In addition, FAO provided technical assistance to better mainstream nutrition into the ECOWAP 2016-2025 process. This was supported by strengthened partnerships and coordination at regional and national level

Results: This collaborative work between ECOWAS and regional and national stakeholders have led to the elaboration of the ECOWAP Strategic Orientation Framework 2016-2025 and the Regional Agricultural and Food and Nutrition Security Investment Program (RAFNSIP) 2016-2020, with a stronger integration of nutrition (from objectives to interventions, indicators and budget). Concerning national support, activities are being carried out to ensure a better integration of nutrition into their National Agricultural and Food and Nutrition Security Investment Plans. through effective engagement of multi-sectoral training workshops.

Conclusions: The progress made so far highlights the necessity to develop strong commitment and ownership by Regional Economic Communities, and to strengthen partnerships both at regional and national levels. The need to also build capacities of all stakeholders to develop more agricultural policies/programs and investments with a "nutrition lens" is fundamental to ensure that agricultural transformation plays a stronger role in combating food insecurity and malnutrition.

Keywords: Mainstreaming, Nutrition, RAFNSIP, RECs, ECOWAS

144/1852

INCREASING CONSUMPTION POTENTIAL BY REDUCING LOSS AND WASTE OF FRUITS AND VEGETABLES THROUGH GENETIC IMPROVEMENT

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Background and objectives: Fruits and vegetables are important sources of nutrients and are associated with the reduction of risk from non-communicable diseases. Despite these benefits, there is a gap in consumption. The World Health Organization equated 5.2 million deaths globally in 2013 to inadequate fruit and vegetable consumption.

There are many contributing factors to the lack of consumption including spoilage, lack of availability, taste and other consumer preferences. Through genetic improvement methods, such as breeding, and improved management practices, these issues are beginning to be addressed, and continue to improve as the science advances.

Methods: In this study we assessed the market needs and opportunities for addressing food loss and waste for fruit and vegetable products. Results of our findings on key areas of impact and gaps will be presented. In addition, detailed examples with be provided to illustrate the findings. For example, tomato transportation losses in India are estimated at 40% after harvest due to the lack of cold storage and inadequate infrastructure, which is devastating in a country where nearly half of the children are malnourished and underfed. By using breeding techniques, researchers addressed two contributing factors to the spoilage to tomatoes – shelf life and the firmness needed to make the journey to market – while still maintaining flavor and color quality consumers demand. Over a two-year period more than 500 tomato genotypes were evaluated for transportability traits. Analysis was done on the firmness, color, brix and acidity.

Results: This led to two tomato hybrids being commercialized. These tomatoes feature a 12-14-day shelf life, much improved over the 5-7-day range before the tomatoes would typically spoil. This has allowed tomatoes to be accessible to almost all of India, rather than just the central regions, close to the farms.

Conclusions: By developing strong genetic traits that disable challenges from farm to table, consumers can access the produce that is important for their nutritional needs.

Keywords: Fruit Vegetable Consumption Genetic Improvement

Conflict of Interest Disclosure: Authors are Employees and stock holder of Monsanto Company

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144/1962

DIFFERENTIAL PREDICTORS OF HOUSEHOLD DIETARY DIVERSITY IN RURAL SMALL HOLDER FARMING COMMUNITIES IN MALI, SIERRA LEONE AND DEMOCRATIC REPUBLIC OF CONGO

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Background and objectives: Studies have shown that dietary diversity is associated with socio-economic status and household food security. Conducting household dietary diversity surveys within agricultural projects is important for targeting as well as to assess the impact of these projects on food and nutrition security. Household dietary diversity survey was conducted in household that were part of the Support to Agricultural Research for Development of Strategic Crops in Africa (SARD-SC), is a multi- national CGIAR-led project, whose overall objective was to enhance food and nutrition security and contributing to reducing poverty in selected Regional Membership Countries (RMCs) in Africa.The main objective of conducting the household dietary diversity score in this case was to assess the impact of the project on household food access but also to determine the predictors of dietary diversity. We present herein the results of the predictors of dietary diversity.

Methods: The household dietary diversity questionnaire was administered to the person who was responsible for meal preparation for the household the previous day. The respondent was asked about all foods eaten inside the home during the previous day and night, by any member of the household. Foods were then classified and scored into 12 food groups and an overall score obtained.

Results: Mean HDDS were 4.5, 4.4 and 4.9 in Mali, Sierra Leone and DRC respectively. In investigating the predictors of HDDS in Mali, proportion of household (HH) members working on farm, proportion of HH members working off farm, proportion of time women spend farming, number of parcels operated, parcel size and whether a farmers household received fertilizer subsidies or not and household income were predictors of HDDS (P<0.05). In addition to this, predictors of HDDS in Sierra Leone were the proportion of household members aged 15-65 years (P<0.05). Proportion of family members working on farm was not a significant predictor of HDDS. The only significant predictor of HDDS in Zanzibar was proportion of HH members working on farm.

Conclusions: Different factors influence HDDS in different settings. A thorough understanding f these factors is important for program design and optimal targeting.

Keywords: Household dietary Diversity, Agriculture, Nutrition

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144/1981

MODERATE AND SEVERE FOOD INSECURITY WAS ASSOCIATED WITH STUNTING AMONG PANAMANIAN CHILDREN UNDER FIVE YEARS OLD IN RURAL COMMUNITIES

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Background and objectives: The Panama Agricultural Research Institute (IDIAP) has implementing a national project using high nutritional quality crops. The prevalence of Stunting among children under five years old in indigenous communities is a current public health problem in Panama. There is no evidence in Panama about the association between food insecurity at household level and stunting prevalence. Objective: to explore the association between food insecurity at household level with stunting in children under five years old in Panamanian rural communities.

Methods: A cross-sectional study with 135 children under five years old in five geographically-dispersed rural areas (indigenous: Nole Düima and Müná; and non-indigenous: Soná, Olá, and Los Pozos). Data was collected from June-September 2015. Food insecurity was defined using the Latin America and the Caribbean Food Security Scale (ELCSA), adequate food provision monthly-based (AFPMB); anthropometric measurements (weight and height were using to calculate haz and baz according with WHO2008 growth standards); and sociodemographic data were also collected. Univariate statistical analyses, principal components analysis for categorical data, and multivariate logistic regression area, age and sex controlled with robust standard errors were used to assess the association between stunting prevalence with moderate and severe food insecurity and AFPMB.

Results: Age mean and standard deviation (SD) was 33.7±18.2 months, (50% female and 55% from indigenous area). Mean and SD for HAZ was 1.16±1.34, a significantly difference were found in indigenous (-1.73±1.14) than in non-indigenous (-1.73±1.14) (ttest, p<0.05); for BAZ was 0.67±0.99, a significantly difference were found in indigenous (0.98±0.91) than in non-indigenous (0.29±0.96) (ttest, p<0.05). Also, the prevalence of food insecurity (moderate and severe) was significantly higher in indigenous (84.9%) than non-indigenous (31.2%) (proportional test, p<0.05). Principal component analyses show relation among area (indigenous vs non-indigenous), food insecurity and AFPMB. After controlling by area, sex and age, stunting prevalence was significantly associated with food insecurity OR=4.4 (CI95%=1.1-17.9), AFPMB OR=4.5 (CI95%=1.2-17.4), and indigenous area OR=5.2 (CI95%=1.7-15.7).

Conclusions: moderate and severe food insecurity was strongly associated with stunting among children under five years old living in indigenous area. Comprehensive nutritional interventions should incorporate strategies to promote dietary food diversification using biofortified crops in vulnerable groups.

Keywords: HAZ, BAZ, Stunting, Biofortified Crops, children
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144/2048

INCREASING PRODUCTIVITY OF SMALLHOLDER FARMERS THROUGH IMPROVED TOOLS AND EDUCATION

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Background and objectives: The Food and Agricultural Organization of the United Nations has identified advancements

in productivity of smallholder farmers as critical to improve food security and nutrition, reduce poverty and increase employment. To achieve enhanced productivity, programs have been developed with the aim of empowering farmers with tools and agronomic knowledge. Two programs in Africa and India will be shared.

Methods: In Africa, the Water Efficient Maize for Africa (WEMA) is a partnership with Bill and Melinda Gates Foundation that is bringing royalty-free improved seed to drought susceptible areas. Over the next 10 years, farmers are expected to see an 20-35% increase in grain production due to improved drought hybrids and biotechnology that deliver insect protection and water utilization traits.

Rural isolation and limited agronomic resources makes it challenging for smallholder farmers to evaluate and address agronomic challenges. Building on the rapid adoption of smartphones in India, the FarmRise program is launching this year to a limited area. This is an android based solution designed to bring smallholder farmers weather information, agronomic advice and market pricing designed to make them more productive and profitable. Climate Corp, who is leading this project, is currently seeking partners to create additional resources including equipment leasing and government services, such as insurance and credit options. FarmRise intends to create a platform for startups to participate and expand the target geography to reach Asia, Africa and grow across India.

Results: Progress from the seven years of WEMA to date will be shared along with the early findings from the FarmRise program.

Conclusions: The primary focus of these programs is grower empowerment through access to agricultural tools and knowledge. Over time the increased productivity is expected to translate to income and other social benefits.

Keywords: Smallholder Farmers Increased Productivity Empowerment

Conflict of Interest Disclosure: Employees and Stockholders of Monsanto Company

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144/2060

BIOACTIVE COMPOUNDS IN URUGUAYAN WHEAT GENOTYPES

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Background and objectives: Wheat is a major crop, and its products are an important component of the human diet. Epidemiological studies show that the consumption of whole grain decreases the risk of developing chronic diseases of high prevalence. The beneficial properties are attributed to a combination of natural and synergistic action of bioactive compounds present in whole grains, that reduce oxidative stress. The objective of this research is to generate information in the content of phenolic compounds (Cf), tocopherols (Tc), phytosterols (Fo) and carotenoids (Ct) in differents genotypes and locations.

Methods: Twenty two "wheat bread" genotypes (Triticum aestivum) of INIA (National Institute of Agriculture Research), of short (CC) and long cycle (CL) were evaluated, cultivated in Uruguay, in 2013, in 2 locations. The average content and the coefficient of variation (CV) were studied in each component. Stadistical differences between the averages, by cycle and location were measured with the test of Student.

Results: The average values in the wheats of CC and CL content were: 921 and 979 μg / g of Cf; 48.2 and 59.3 moles / ng of Tc; 16.1 and 12.2 (area) of Fo and 11.2 and 94.8 (area) of Ct, respectively. CV values ranged from 8.8 to 105%, corresponding the highest values to Fo and Ct. Significant differences ($p<0,05$) were observed among genotypes (CC and CL) grown in the same location, in the average content of Ct, and the content of Tc, only in varieties of CL. Significant differences were found also, between the averages of the genotypes corresponding to each locality, in the content of Ct y Tc (CC and CL).

Conclusions: The results of this study have demonstrated a wide variation between the bioactive compounds in the studied genotypes. Although more research is required to analyze the effect of the environmental conditions, the differences between genotypes suggest that it may be possible to develope varieties of wheat with high concentration of beneficial compounds for the health of consumers.

Keywords: wheat, whole grain, health, nutrtion.

144/2106

INSIGHTS FROM THE SEQUENCING AND ANNOTATION OF THE STEVIA REBAUDIANA GENOME AND THEIR APPLICATION IN AGRONOMY AND HEALTH

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Background and objectives: Obesity is a global health issue affecting millions and reducing sugar intake with non-caloric sweeteners is one potential path to reducing energy consumption that can have a positive health impact. The leaves of the Stevia rebaudiana (Bertoni) plant produce steviol glycosides (SGs) which include stevioside, rebaudiosides (Reb) A, B, C, D, E, F, M, dulcoside A, rubusoside and steviolbioside. SGs are 200-350 times sweeter than sugar but contribute no calories, therefore making stevia a leaf crop of significant economic value. The food industry has a very positive outlook on the opportunities for stevia-derived ingredients in zero or calorie-reduced products. Consequently, the

stevia ingredient market is expected to cross \$700M. High yields, desired quality traits, resistance to pests and diseases, and dependable economic returns are key characteristics of any domesticated commercial crop. Such basic characteristics are generally selected over many generations through intensive plant breeding efforts to create improved varieties. Although systematic cultivation of stevia started in the 1970s in China, South America and Japan, only recently crop improvement efforts have been focused on making stevia more scalable and an economically sustainable crop.

Methods: Despite limited understanding of genetics, biology and physiology of stevia, recent demand for SGs requires rapid improvement of stevia cultivars currently used in commercial cultivation. To rapidly facilitate this, we have sequenced, generated a chromosomal level genome assembly, and fully annotated the genomes of three commercial stevia varieties with improved levels of minor rebaudiosides.

Results: This data has been further integrated into a comprehensive bioinformatics database for visualization and analytics of all available genomic, transcriptomic and metabolomic stevia datasets. This interface will enable specialists from multiple disciplines, such as chemists, biochemists and geneticists, to mine this database to understand and improve existing SG biosynthesis pathways through traditional breeding or discover new pathways or compounds for similar non-GMO improvement.

Conclusions: This information can be used to enable improved traditional stevia breeding for improved agronomic and sustainability benefits and to improve the production of SGs to enable reduced sugar intake, which can contribute to improved health.

Keywords: stevia, genome, breeding, agronomy, steviol-glycosides

Conflict of Interest Disclosure: Dr(s) Stephen Schauer, Tengfang Huang and Fayaz Khazi work at Keygene.

Dr Priscilla Samuel works at the Global Stevia Institute which is funded by PureCircle Ltd.

Dr Avetik Markosyan works at PureCircle Ltd that funded the genome research.

144/2114

THE MODAL SALIENT BEHAVIORAL, NORMATIVE AND CONTROL BELIEFS ABOUT NUTRITIONAL CLAIMS ON PREPACKAGE FOOD PRODUCTS

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Background and objectives: Consumers make purchasing decisions very quickly, so, brief messages, related to nutritional content, printed on food product labels can stimulate their decisions. These messages are known as nutritional claims. There are few studies that evaluate the use of nutritional claims in the moment of food purchase and the consumer beliefs. This study iden-

tified the modal salient beliefs about the use of nutritional claims on prepackage food products among nutrition students.

Methods: The exploratory qualitative research were conducted with 13 nutrition students in November 2015, considering the Theory of Planned Behavior. A focus group was used to identify consumers' salient beliefs. The discussion was recorded with two recorders and data transcription was then conducted to allow content analysis of the focus group, by two independent evaluators. Modal salient beliefs were considered those mentioned at least, 75% of the total number of citations.

Results: All students were single and female with an average age of 20.2 ± 1.2 years. Two modal salient behavioral beliefs were identified and considered as a disadvantage of using food label: "products are more expensive to have these nutritional claims" and "nutrition content are not specific as it should be". Considering the modal salient control beliefs, most nutrition students did not mention factors that facilitate or impede them at the purchasing moment. However, one student mentioned the "facility in accessing the nutritional claim" as a factor that facilitates the use of nutritional claims in the moment of food purchase. In regard of modal salient normative beliefs, only one belief was identified: "food product producers". Prepackage food producers were mentioned as the people who would approve the use of nutritional claims since it could help consumers to buy their products.

Conclusions: Six modal salient beliefs were identified. They are important to explain the participant's behavior of using nutritional claims on prepackage food products. Considering the consumer's beliefs is relevant to develop actions and measures that aim the health education to increase their knowledge about nutritional claims.

Keywords: Food label. Consumer behavior. Behavioral research.

144/2157

FAMILY ORCHARD-GARDENS AND BACKYARD POULTRY AS AL ALTERNATIVE FOR IMPROVING FOOD SECURITY: UNDERGRADUATE STUDENT'S EXPERIENCE IN A MAZAHUAS COMMUNITY IN MEXICO

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Background and objectives: Challenge based learning allows students to submerge in real life problems while developing knowledge and skills. The Mazahuas are an ethnic minority in

Mexico, with high prevalence of food insecurity, marginalization and poverty. Most families possess ground for growing vegetables and fruits, and keeping poultry. However, their current practices are not enough to ascertain an adequate nutrition. This context represented a great opportunity to set the goal for nutrition and sustainability engineering undergraduate students to analyze food security, family orchard-gardens and backyard poultry practices in eight Mazahua families, to identify strategies in order to improve food security in a different environment.

Methods: During an intensive week in September 2016, 40 nutrition and sustainability-engineer undergraduate students visited a Mazahua community to assess food security, agricultural and poultry activities of eight families. The evaluation was conducted using context-adapted questionnaires from FAO: Food Security Scale for Latin America and the Caribbean (ELCSA) and Revisions of Poultry Development. Data was analyzed to stablish food insecurity level, agricultural and poultry activities. Students put forward strategies to improve food security in the evaluated families.

Results: All families presented food insecurity, have a family orchard-garden and sufficient cultivation ground. Only five families grow enough food for selling and self-consumption. Products losses occur mainly due to weather changes and lack of water. All households have livestock, but only 4 families are able to obtain animal products sufficient for selling and self-consumption, and there is little or no control on the animal's diet. Students proposed strategies to improve current practices, including vegetables exchange among farmers, "nopal" wall for preventing crops freezing, use of waste for improving animal's diet and incrementing egg production for hens.

Conclusions: Real-life experiences are an excellent opportunity for students to understand concepts related to their filed work and to promote adequate practices in family orchard-gardens, livestock and backyard poultry in order to improve food security by increasing food variety, enhancing animal production and improving orchard care. At the same time, the experience allowed students to understand the importance of multidisciplinary work.

Keywords: Family orchard-gardens, backyard poultry, food insecurity, marginalized communities.

Program (PNAE – Programa Nacional de Alimentação Escolar in Portuguese). The aim of this study was to discuss how the interface between family farming and school feeding has being built in Santa Catarina state, southern Brazil, in terms of the factors that represent obstacles to its consolidation and also on those that are mechanisms for addressing and overcoming those limitations, from the perspective of different social actors involved in the process.

Methods: In order to collect data, a semi-structured interview technique was used, applying specific guides for each category of social actor. For data analysis, one adopted the technique of thematic content analysis, from two previous categories: barriers and coping mechanisms in the construction of the family farming interface with school feeding. The Ethics Committee for Research Involving Human Subjects approved this study (Opinion No. 1,207,443).

Results: The group of the research subjects consisted of 35 social actors involved in the studied interface: managers (8 technical managers, nutritionists responsible for PNAE); farmers (9 family farmers); consumers (10 members of the School Feeding Council/CAE, teachers, principals and school cooks); members of the Technical Assistance and Rural Extension/ATER (8 technicians and rural extensionists). The barriers identified were the cost of goods, bureaucracy, insufficient technical assistance, resistance to changes, weaknesses in the organization of farmers and public managers. The coping mechanisms observed in facing those obstacles were dialogue, intersectionality, investment, training activities and organization. These mechanisms have encouraged the establishment and strengthening of trustful relationships that promoted awareness of all parties about the importance of PNAE and contributed to making the necessary adjustments to meet the program requirements, guided by its goals and guidelines.

Conclusions: We conclude that public policies as PNAE can provide favorable changes for farmers and the students and their communities, contributing to local development and for achieving higher levels of food security and nutrition both in rural as in urban spaces. Acknowledgements: CNPq/Brasil (445595/2014-0).

Keywords: Local Development, Rural Development, Programs and Policies for Nutrition and Nourishment.

144/2320

BARRIERS AND COPING MECHANISMS IN THE INTERFACE BETWEEN FAMILY FARMING AND SCHOOL FEEDING FROM THE PERSPECTIVE OF DIFFERENT SOCIAL ACTORS IN SOUTHERN BRAZIL

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Background and objectives: Family farming came to school as a public policy in Brazil, linked to the National School Feeding

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144/2327

FAMILY FARMING AND SCHOOL FEEDING: PERCEPTIONS OF SOCIAL ACTORS ON THE LEGISLATION AND ITS IMPLEMENTATION

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Background and objectives: In Brazil, Law 11.947/2009 determines that 30% of funds transferred to municipalities by the Federal Government to support the National School Feeding Program (PNAE) must be applied in purchasing from family farming

food that promote healthy eating. The study aimed to identify perceptions of different social actors on the Law 11.947 / 2009 and its implementation.

Methods: This is a qualitative research with 35 social actors involved in school feeding in Santa Catarina state, southern Brazil: 8 nutritionists; 9 family farmers; 10 members of the School Feeding Council; 8 rural extensionists. The Ethics Committee for Research Involving Human Subjects approved this study.

Results: The Law emerged as an element of strengthening family farming, by providing social valuation and income generation for the segment, resulting in a greater possibility of family permanence in the field. Local development was perceived as a positive repercussion of the Law, as it increases the economic situation of the municipality and the farming families. Therefore, the Law was perceived as a vector for healthy eating, family farming strengthening and local development. Regarding the implementation of the Law, different factors were pointed out as being involved in this process: initiative, mobilization and participation. The initiative was, mainly, from the nutritionists. The mobilization of the other actors took place by dissemination mechanisms, mapping the local production and encouragement to the family farmers become suppliers. In the scope of participation, there was a certain passivity of some actors, such as the members of the School Feeding Council, who were generally not very active. We also observed some distancing from the rural extensionists, which revealed a lack of articulation with other sectors involved. Thus, it was verified the centrality of the process is placed in the nutritionist. In addition, it is worth noting that farmers do not perceive themselves as actors in the process, which certainly limits the production of more expressive advances in the implementation of the Law.

Conclusions: We conclude that encouraging the participation and leadership of all the actors involved is strongly recommended. Acknowledgements: CNPq/Brasil (445595/2014-0).

Keywords: Key words: Local Development, Rural Development, Nutrition Programs and Policies.

144/2360

GRAIN LEGUME CULTIVATION AND CHILDREN'S DIETARY DIVERSITY IN SMALLHOLDER FARMING HOUSEHOLDS IN RURAL GHANA AND KENYA

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Background and objectives: Boosting smallholder food production can potentially improve children's nutrition in rural

Sub-Saharan Africa through a production- own consumption and/or an income-food purchase pathway. Rigorously designed studies are needed to provide evidence for nutrition impact, but are often difficult to implement in agricultural projects. Mixed method design is used more frequently in project evaluations as the triangulation of complementary methods may add to the rigor in evaluations. Structural equation modelling (SEM) may be a relevant new and additional method in this field.

Methods: In the framework of a large agricultural development project supporting legume production (N2Africa), we studied the potential to improve children's dietary diversity by comparing N2Africa and non-N2Africa households in a cross-sectional quasi- experimental design followed by structural equation modelling (SEM) and focus group discussions in rural Ghana and Kenya.

Results: We found no evidence that participating in N2Africa is associated with improved children's dietary diversity, mainly due to methodological limitations. For soybean, SEM indicated a relatively good fit to the posteriori model in Kenya but not in Ghana, and in Kenya only the production-own consumption pathway was fully supported with no effect through the income-food purchase pathway. Results: **Conclusions:** These findings confirm the importance of the food environment for translation of enhanced production into improved nutrition. This study shows that in a situation where rigorous study designs cannot be implemented, SEM is a useful option to analyse whether agriculture projects have the potential to translate in improved nutrition.

Keywords: dietary diversity, legume production, SEM analysis, children, Ghana

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144/2399

PRODUCTION OF ORANGE-FLESHED SWEET POTATO (IPOMOEA BATATAS) INTERCROPPED WITH MORINGA OLEIFERA IN KAFFRINE, AGRO-ECOLOGICAL ZONE OF GROUNDNUT BASSIN IN SENEGAL

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Background and objectives: Biofortification is key to improve household nutrition. In Senegal, the prevalence of vitamin A deficiency (VAD) remains high, and affects 24% of children in rural areas. To prevent VAD, an intercropping trial of orange-fleshed sweet potato, an excellent source of provitamin A, with Moringa

oleifera was undertaken for the first time in the agro-ecological zone of groundnut basin of Senegal. The objective of this study is to identify varieties that adapt better to the agro-ecological conditions of the Kaffrine region and which gives better results in association with Moringa oleifera.

Methods: Our study is conducted in a randomized complete block design with three replications for a varietal test of 4 cultivars of sweet potato and a growing test associated with the Moringa oleifere. The Four different cultivars of sweet potato were tested in pure stand and in association with Moringa oleifera variety PKM1. These cultivars differing in the color of the tuber flesh, Kander (orange), Yajendee (light orange), Caromex (yellow), Gandiol1 (white). Growth and physiological parameters were recorded in four steps during the plant life cycle. After 135 days, tubers were harvesting and the nutritional quality analysed to determine carotenoid composition of tested cultivars.

Results: Results showed that, the four cultivars behave well under the agro-ecological conditions of groundnut bassin. A low incidence of diseases and pests for the different cultivars both in pure and intercropping situations is observed. significant increases of tuber weight and size in intercropped plots for Kander and Yajendee cultivars compared to pure culture. Moreover, the Kander cultivar had the highest concentration in carotenoids (84.6 ± 24 mg/kg).

Conclusions: Sweet potato cultivars performed well under agroclimatic conditions of Kaffrine. There is no difference in behavior under pure culture conditions, whereas intercropping with Moringa oleifera has a positive effect on tuber development of the Kander and Yajendee varieties. Thus, this cropping system would be a promising route for the sustainable production of sweet potatoes with orange flesh in this area.

Keywords: Orange-fleshed sweet potato, moringa oleifera, Provitamin A, Senegal

Further collaborators: Supported by Académie de Recherche et d'Enseignement supérieur, Belgian cooperation

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144/2400

HEALTH RISK INDEX OF HEAVY METALS IN COMMONLY CONSUMED CONTAMINATED VEGETABLES IN OGUN STATE. NIGERIA

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Background and objectives: As long as vegetables are consumed almost raw, heavy metals accumulated in higher quantities in them get transferred into human body which can pose a life threaten risk to human health. This study thus assessed the health risk index of heavy metals (As, Cd, Hg and Pb) in contaminated vegetables present in the root, stem and leafy shoot of six leafy vegetables (Corchorus oliotorus, Celosia argentia, Telfairia occidenta-lis, Talinum triangulare, scotty bons and egg plants). Commonly grown and consumed by the populace of Ijebu Ife, Ijebu East Local Government area Ogun State.

Methods: A total of eighteen samples (three samples of leaf, stem and root) of each vegetables were randomly collected from three different gardens at the study area. Concentration of the metals were determined using Atomic Absorption Spectrophotometer. Daily intake of vegetables were determined from the consumption pattern of the vegetables using direct weighing, and the daily intake of metals (DIM) were calculated through the contaminated vegetables using the relationship given by Cui, Zhu, Zhai, Huang, Qui &Liang, 2004: DIM =Cmetal X Dintake of vegetable/ Average body weight of respodents. Health Risk Index (HRI) were thus calculated Using the formular : HIR= DIM/ ORD(Oral Reference Dose by WHO/FAO). If HIR is lesser than 1, the exposed population is considered to be save (Hassan et al, 2012).

Results: The range of various metals concentration of Pb, As, Cd and Hg were 0.103-0.141, 0.095-0.163, 0.085-0.118, 0.0000-0.014 in leaf, 0.113-0.165, 0.103-0.181, 0.103-0.141, 0.0003-0.018 in stem and 0.121-0.172, 0.114-0.194, 0.111-0.149, 0.0005-0.024 in root respectively. The results of the findings showed that the ORD of mercury for all vegetables is above the WHO/FAO permissible limit of 0.0001 and as such the HRI is greater than 1. The high permissible intake were also noticed by some of the metals in some vegetable.

Conclusions: consumption of average amount of these contaminated vegetables might pose a health risk for the consumers due to high concentration of metals especially mercury as the value obtained were above the provisional tolerable intake (PTDIs) by joint WHO/FAO .

Keywords: Heavy Metals Concentration. Vegetable, Health Risk Index.

144/2419

ACCEPTANCE OF SOAKED AND GERMINATED CHICKPEA-BASED DISHES

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Background and objectives: Chickpeas are important sources of protein, folate and minerals. However, they contain anti-nutrients which form complexes with minerals such as zinc, iron and calcium, rendering them less available or unavailable for absorption. The level of these anti-nutrients may be reduced by applying food processing techniques such as soaking and germination applicable at household level. Sensory evaluation of the processed dishes is key in determining whether the dishes prepared by applying these strategies will be accepted and utilized by consumers. Thus, we evaluated the effect of soaking and germination on sensory attributes of chickpea-based dishes.

Methods: We applied different times of soaking (6, 12, 18 hour) and germination (24, 48, 72 hour) to three chickpea varieties grown in Ethiopia, namely Habru, Mastewal and local. Sensory attributes including appearance, odour, texture, taste and overall acceptability were assessed using 9- and 5-point hedonic scales in phase 1 and 2, respectively. Phase 1 was carried out at Hawassa University School of Nutrition, Food Science and Technology with fifteen panellists recruited from the school. The evaluation was carried out in triplicate. Consumer acceptance tests were conducted in phase 2 in chickpea-growing communities with 30 participants.

Results: The overall acceptability of chickpea-based dishes ranged from 5.6 ± 1.6 to 7.1 ± 1.5, that is from "neither like nor dislike" to "like moderately". The highest value for sensory attributes was observed for a Habru-based dish prepared from seed soaked for 18 hours. The lowest score for appearance was seen for a Mastewal-based dish prepared from seed soaked for 6 hours. From germinated chickpeas, Habru germinated for 24 hour received the highest score for appearance, texture, odour and overall appearance.

Conclusions: Compared to ordinarily cooked dishes, there was no significant difference in sensory attributes for most chickpea-based dishes.

Keywords: Sensory evaluation, soaking, germination, chickpea

144/2533

BRAZILIAN FOOD LAW: AN INTEGRATIVE LITERATURE REVIEW

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Background and objectives: One of the branches of law is in charge of legislating on food-related issues in Brazil. In a country with great territorial extension and still marked by much informality in several sectors of the production chain, it is necessary to act rigorously through a law on the production of foodstuffs to guarantee the protection of consumer health. Objective: To emphasize the elementary importance of the legal mechanisms acting in consonance with inspection agencies in the food production chain in the national territory.

Methods: This study is an integrative literature review. The search was carried out on the SciELO platform (Scientific Electronic Library Online), with the descriptors Legislation, Food and Brazil. The platform returned 65 results, the search was filtered searching for texts strictly related to the subject and incomplete texts were duplicated, before the year 2012 or published in a language other than Portuguese, English or Spanish. There remained only nine texts. The research was complemented with textbooks.

Results: Brazil has a broad legislative mechanism for the production, packaging, transport, conservation and commercialization of food products. One of the main obstacles to the fulfillment of all determinations is the difficulty of inspection in such a large territory. Added to this is the lack of knowledge of many operational procedures by the producers. It is noted that some themes also acquire bioethical connotations, as in the case of transgenics.

Conclusions: This legislative branch will ensure an increase in the quality of national food production, given that the country is quite heterogeneous. Patent registration benefits greatly from such legislation, and any crimes of this scope end up being inhibited.

Keywords: food law; inspection; national food production

144/2590

PEDIATRIC NUTRITIONAL CARE BASED ON FOOD SAFETY: BASIC CONTROLS

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Background and objectives: Preventing foodborne infections in inpatients is a mission of the Food and Nutrition Area, supporting their nutritional care. The prevention of food infections is performed using a self-control system of risk assessment of the assisted population and hazards analysis in production and service, keeping the processes controlled and verified according to the protocol. The system requires that three basic controls work effectively: health, hygiene and hygienic habits of staff (based on training), institutional kitchen and equipment hygiene and water safety.

Aim: To evaluate the effectiveness of basic controls over the period 2014-2016

Methods: A descriptive, retrospective, cross-sectional study of microbiological records of hand swabs, food contact surfaces and monthly public water sampling was conducted.

The swabs that verify handwashing of handlers are performed while they were doing their routine activities, surface swabs after sanitizing, and tap water samples are taken. Samples are microbiologically analyzed by accredited laboratories, their results collated with the criteria of the protocol. The following levels are considered acceptable: for hands: <10 CFU/ hand for coliform, absence / hand for S. aureus, E. coli and Salmonella ssp / Shigella ssp. Criteria for surfaces are <1 CFU / cm2 for enterobacteriaceae, <10 CFU / cm2 for mesophilic aerobic bacteria, absence for Listeria monocytogenes . Criteria for water are <0.5 NTU for turbidity (WHO criteria for immunosuppressed people), <3 CFU / ml for mesophilic aerobic bacteria, absence in 100 ml for E. coli and Pseudomona aeruginosa.

Results: All the data of hand swabs from handlers (n: 88) were adequated to criteria. Of the 94 surface swabs, 97% were adequated and 3% acceptable. Thirty samples of water yielded 100% satisfaction for coliforms and Pseudomona aeruginosa, 90% for mesophilic aerobic bacteria and 78% for turbidity.

Conclusions: Tap water, regarding turbidity, did not meet the consumption criteria for immunosuppressed patients, but is safe for healthy people according to the Argentine Food Code. In our institution tap water is used for hygiene processes. For drinking and food preparation it is subjected to heating to 100°C. Basic controls are efficient allowing for proper nutritional, dietary and infectious care of pediatric patients.

Keywords: nutrition, food-safety, infection prevention

144/2656

CONDITIONS OF VULNERABILITY OF THE LIVELIHOODS IN NATIVE COMMUNITIES OF PARAGUAYAN CHACO THREATENED BY DROUGHT

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Background and objectives: This research was executed in the Paraguayan Chaco, an extended territory, characterized to have a population relatively small and disperse (3% of country population) which have the human development index (HDI) most lower of the country. The population of this region is compound of original native people, Mennonite settlers, and Latin population. The objective was performing one line of base to characterize the conditions of vulnerability of the livelihoods in native communities of Paraguayan Chaco threatened by drought.

Methods: The type of investigation was descriptive with analytical components and quali-quantitative focus. The study zone covered two departments (President Hayes and Boquerón), where were selected 68 hamlets of 15 native communities, through stratified probability sampling, determined in base geographical criteria. The universe of study corresponded 2.312 homes (11.352 peoples).

Results: The most relevant results are:

Livelihoods: The qualification of the human resources in terms of the alphabetism rate is found in 60.8%. The schooling rate stood at in 51.4%. Houses are precarious and overcrowded, assented in ancestral lands. Employment is shortage and poorly paid.

Food security and nutritional status: Food comes from forage, the agricultural production, purchase and donations. Access, consume and stability of the food, present variations throughout the year, in wintertime. In terms of evaluation nutritional status (EEN) children less than 5 years old, were found low size for the 26% and the risk of low size 13%. Age group of 6-18 years old, BMI values is adequate for the 59%. The malnutrition by excess

is predominant in adults (51%). For its part, level of food security in homes, measured through the Latin American and Caribbean Food Security Scale (ELCSA), categorized 98% families with children under 18 years old with food insecurity.

Access and availability of water: The water supply is diverse; most used are cutwater, community cistern. Lack of water in 92% of homes, especially in winter.

Resilience: most of pressing events they face are mainly food scarcity, employs, medical care and medicines.

Conclusions: With all displayed can be concluded that indigenous families of sample had high levels of vulnerability of their livelihoods, compromising for consequence food security, health and development of themselves.

Keywords: vulnerability of the Livelihoods, Food security, Resilience.

Further collaborators:

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144/2705

NUTRITION-LED AGRICULTURE: SYNERGIES BETWEEN AGRICULTURAL AND NUTRITION INTERVENTIONS IN SENEGAL

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Background and objectives: The Yaajeende Agriculture and Nutrition Development Project is a USAID funded initiative implemented since 2011 by NCBA CLUSA and partners. Taking a food systems approach, the project's goal is to improve the economic and nutritional status of the very poor in four rural regions of Senegal. Yaajeende employs a "Nutrition-Led Agriculture" approach, which promotes improved production, trade and local consumption of nutritious foods. Yaajeende also emphasizes institutional capacity building and private sector strengthening to effectively integrate agriculture and nutrition and to contribute to sustainability. These institutions include citizen working groups, mother-to-mother groups, livestock rearing groups, and networks of "community based service providers" who are linked to private sector suppliers. The project is based on a theory of change that posits that mutually supporting interventions of nutrition and agriculture will be more efficacious in improving nutritional status than either component on its own; this theory has largely been confirmed after seven years of field level implementation.

Methods: An external mid-term evaluation1 during the fifth year of implementation utilized a mixed-method approach involving a non-experimental quantitative strategy and qualitative techniques. On the quantitative side, a population-based survey

was administered to 2,720 households in treatment and control villages across 19 rural communes. A multi-stage cluster sampling approach was used to select households that participated in the project baseline survey (2011) along with households from 27 new intervention villages.

Results: The mid-term evaluation supported the original hypothesis that households benefiting from both project components have improved or suffered less in the context of food insecurity compared to those who benefit from neither or from only one. At least two high order outcomes have shown improvement:

- 7 percentage points decrease (p=0.008) in stunting among beneficiaries.
- Treatment effect of about 2.9 percentage points in poverty reduction in high-intensity areas (but no evidence of synergy in the high-intensity group (p=0.01)).

Conclusions: While the outcomes of the study revealed variability across households and regions, Yaajeende's combined effects were generally synergistic across many key indicators, supporting the hypothesis that impacts on poverty and malnutrition are stronger when the agriculture and nutrition interventions are conducted simultaneously with a target population.

Keywords: Agriculture, nutrition, poverty, synergy, evaluation.

Further collaborators:

Yaajeende is supported by USAID through Cooperative Agreement No. 685-A-00-11-00002-00

144/2726

FORTY YEARS OF INNOVATED INDUSTRIAL BASED AGRI-TECH IN SUSTAINABILITY FOR ZERO FOOD WASTE

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Liaqat Corp Pvt. Ltd.

Background and objectives: Being seed/food industry, funder to small scale farmers since 1975, we were distributor of EU/USA seed companies for Pakistan. Our funding to farmers is at buy-back, suffered losses in agriculture initially, INNOVATED KITCHEN based nutri- research in drying for production lines at sourcing sites of farming/ fruit/vegi/grain markets, factories, infrastructure, seasonal stations etc.

Methods: Prior to 1975, we used to manage nutrition losses by manual sun-drying , have developed multiple value added manual to mechanized processing sheets to eradicate spoilage as per sourcing. This type of NUTRITECH gave positive results. In processing of agri-nutrition, a wide range of techniques were developed. In-kitchen processing trials achieved positivity in converting manual processing lines to mechanized , partial drying was experimented to eliminate perishability by mobile drying units, all challenges were resolved scientifically.

Results: To reduce nutritional losses, food/ agriculture system was reshaped by introduction of value added multiple intermediate drying technologies. All spoilage was salvaged by technical drying solutions leading sustainability , developed food/agriculture partnerships for nutritional security. All elaborated processes were applied by sustainable drying technology. Environmental issues were faced technically. Industrial based affordable accessibility is being applied at sourcing sites, to gain nutritional positivity. Our future-based research balanced nutritional values. Female drying encouraged our nutri-productivity. Due to instant check on spoilage by female labour, Nutritional losses are being instantly stopped by our teams.

Conclusions: Our qualitative/quantitative INNOVATED drying impacted funding, improved lost NUTRI conditions ,delivered field farming productivity, pre/postharvest LOSSES were improved , by value added technologies, focused at loss sourcing . innovated game changing NUTRI technologies facilitated food/ Agri partnerships, clusters has been enhanced in surrounding largely with industrial/future based technologies. Practical researched network has been shared by Agri/NUTRI stakeholders . our 40 years of innovated ind based nutri/ tech is ready to start saving nutritional values by 2017-18, instead of 2050 with partnership of ICN.

Keywords: innovated reshaped processing lines, innovated production sheets as per sourcing sites, cost-effective processing lines, sustainability by eradication of losses at sourcing sites, reduction of perishability instantly

Conflict of Interest Disclosure: Low income women are integral part of nutritional security as , domestically trained in processing .SDGs has been converted to our in-house INNOVATED tech,reshapd EU/USA processing/production lines at less cost of 15 times,with equal outputs,consumer/oriented tech followed by smallholders.

Further collaborators:

IAEA/FAO/FOOD IRRADIATION since 1992

Ministry of Defence, Rawalpindi

SKAL Certification (INSTA FOODS) 2004

IFOAM/TIPI/Organic Research EU exclusive representative in Pakistan

WUR/Illinos University requested for the member of cluster team/IAB

144/2772

IMPACT OF SANITIZING AGENTS ON THE MICROBIOLOGICAL AND PHYSICAL-CHEMICAL QUALITY OF CUCUMBERS

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Background and objectives: The washing step associated with the use of sanitizing solutions is the only one processing step that reduc-

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es the number of microorganisms, and it is important that the stage not cause losses for the sensorial and nutritional characteristics. Sanitizing is an essential step in assigning greater safety and shelf life to minimally processed products and fresh produce and, as future restrictions on the use of chlorine are desirable, there is a need to evaluate alternative methods. The aim of this study was to evaluate the effectiveness of alternative sanitizers to chlorinated compounds in removing natural contaminants, removal of Salmonella enterica Enteritidis and evaluate the effects on the chemical characteristics of cucumbers.

Methods: Treatments with 1 and 2 % acetic acid and 1 and 2 % lactic acid, 3 % hydrogen peroxide, 200 mg/L sodium hypochlorite and 200 mg/L sodium dichloroisocyanurate were evaluated. The control was samples without sanitization. After each treatment, a microbiological analysis was conducted for the samples. The analysis examined the impact of the treatments in reducing aerobic mesophilic bacteria and molds and yeasts as well as Salmonella enterica Enteritidis inoculated on the surface. The values of pH, total titratable acidity, total soluble solids, phenolic compounds, antioxidant capacity were also determined.

Results: The reduction of aerobic mesophilic bacteria was between 1.10 – 2.08 log CFU/g in cucumbers. The molds and yeasts contamination was between 0.88 – 1.58 log CFU cucumber samples, respectively. After the sanitization treatments with hydrogen peroxide and 2 % lactic acid reductions of 2.71 log CFU/g and 2.34 log CFU/g, , respectively, were achieved. Cucumbers presented no significant difference (p> 0.05) for pH values, total titratable acidity and total soluble solids/total titratable acidity ratio. In the evaluation of the impact of the sanitizers on the total phenolic compounds of cucumber it was observed that there was no significant difference between the non-sanitized and treated samples. This indicates the preservation of the nutritional characteristics of the vegetables after the sanitization treatments.

Conclusions: The results of this study show the potential of the proposed strategies to replace chlorinated compounds in the sanitization step of fresh produce.

Keywords: Sanitizers, fresh vegetables, Salmonella, quality, safety

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NUTRITION, SAFETY, AND TRUST: THE CASE OF INFANT FORMULA CONSUMPTION IN URBAN CHINA

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Background and objectives: Nutrition and safety are essential to consumers regarding their food for daily need. Yet for av-

erage consumers, nutritional value is mostly regarded as credence attribute as they can hardly verify this attribute even after purchase (Grunert, 2005). This indicates consumers' need for trust in food before consumption, especially in the context of high involvement. This research explores the role of consumer trust in the case of uncertainty concerning food safety and nutrition in the context of infant formula consumption in urban China.

Methods: This is a longitudinal qualitative research based on an initial face-to-face semi-structured in-depth interview with 28 pregnant women living in urban China, and a follow-up interview with the same group of mothers at the time when the babies are about 8-9 months old.

Results: For Chinese mothers, infant formula is a high-involvement food category in both functional and emotional aspects. In the wake of infant formula incidents in China in the past decade, safety has become the primary concern of infant formula for Chinese mothers. As public trust in domestic food regulation system has been damaged by past incidents and not yet rebuilt, Chinese mothers turned to food regulation systems of other countries and utilised interpersonal relationships to get connected with those more trustworthy-perceived food systems, namely, friends or relatives living overseas. In terms of the nutritional content, mothers seemed to have neither professional knowledge nor expertise to verify health claims of infant formula products. They tended to rely on word-of-mouth information from trusted acquaintances and brand reputation as cues to decide which brands can be under consideration for further purchase. Asking overseas friends and relatives to purchase infant formula from foreign markets, some Chinese mothers believe that international brands are safe and advanced in providing better nutrition for babies, while some others argue that overseas infant formula may not be perfectly suitable for Chinese babies, yet still, are willing to compromise nutrition needs in order to secure the safety of baby food.

Conclusions: In the case of uncertainty concerning food safety and nutrition, trust in food is necessary for consumers to proceed food consumption practice.

Keywords: Consumer trust, food safety, infant formula consumption, urban China

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DIETARY DIVERSITY AND SCALING UP THE PRODUCTION IRON AND ZINC- RICH YELLOW POTATOES YELLOW POTATOES IN COLOMBIA

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Background and objectives: Food insecurity among rural Colombian households is high, reaching 90% in some regions. Almost all farmers from the Colombian-Andean region rely on po-

tatoes as their staple food and as their main income source. In this presentation, we discuss an ongoing project in Nariño, a region dependent on potato farming, that has high rates of food insecurity, malnutrition, and nutritional deficiencies, particularly iron and zinc. Our aim is to increase the availability of more nutritious potatoes for Colombian consumers through a strategy that integrates agriculture and nutrition.

Methods: We will introduce three varieties of yellow potatoes with better agronomic properties (i.e. higher yields, better resistance to blight) and higher zinc and iron content compared to potatoes currently being grown. These potatoes can provide up to 0,5 mg iron and 0,3 mg zinc per 100g potatoes. These potatoes have potential to impact nutritional status, as the Institute of Medicine recommended dietary allowances for women of reproductive age are 18 mg and 8 mg for iron and zinc, respectively.

Results: Potatoes are a staple food for Colombians, therefore the introduction of novel high-mineral potatoes maybe part of a sustainable option to combat micronutrient deficiencies when it is part of a diverse diet, alongside increased consumption of locally produced fruits and vegetables from home gardens. Although the iron and zinc in the novel potato varieties is not as bioavailable as animal-source foods, Colombian consumers do not always have the economic resources to purchase these foods. This strategy therefore, becomes a successful experience of a local agriculture sensitive to the nutritional needs of vulnerable communities of a region or a territory.

Conclusions: To date, we conducted a baseline survey and one follow-up survey measuring: the production and consumption of the varieties of yellow potatoes among the families of the project; dietary diversity of project households (dietary diversity score through 24-hour Recall); and monitoring the nutritional situation of children under 5 years of age in project households; This last will be measured through anthropometric measurements such as: weight and height and biochemical measurement such as: iron status (hemoglobin, ferritin, transferrin) , zinc and vitamin A.

Keywords: Yellow Potatoes, Food Security, Nutrition, Dietary Diversity

Further collaborators:

Note this is an abstract for special symposium 144/155 - Research and Scaling Up Nutritionally Sensitive Agricultural Innovations Track 8: Agriculture, Food Science and Safety

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144/2921

DEVELOPMENT OF THE NATIONAL FOOD SAFETY STANDARD: MULTI-NUTRIENTS SUPPLEMENTARY FOOD FOR PREGNANT AND LACTATING WOMEN

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Background and objectives: Since the national food safety standard for complementary supplements was issued in 2008, yingyangbao as a complementary supplement has been widely used in the poverty rural areas, yearly covering 1.27 million children aged 6-24 months. Because the nutrition conditions during the first 1000 days of life is critical for future potential health, it is necessary to develop the products to improve the nutrition status for pregnant and lactating mother, and the associated national food safety standard should be regulated.To develop the food safety national standard for applying complement supplements to pregnant and lactating mothers.

Methods: The related international materials were investigated including standards, technology, reporting results for the effectiveness of micronutrient interventions, as well as the nutrition and dietary status of pregnant and lactating mother in China. The CAC standard, WHO guidelines and related standards in China have been compared. The micronutrient exposure was evaluated. In addition, the experts in this research areas attended meetings for discussions, and social opinions were also considered.

Results: This standard stipulates the supplement food for pregnant and lactating mothers as special dietary to provide high quality proteins, vitamins and minerals. The maximum of daily portion is 50 g, among which the protein accounts for 18% to 35%. Iron, vitamin A, vitamin D, folic acid, vitamin B12, totally five micronutrient is compulsorily to be added in, the other 14 micronutrients is optional. The daily portion could provide 50% of RNIs of micronutrient. This standard also limits the amount of pollutants, mycotoxin, microorganism, urease and so on.

Conclusions: The standard of "the National food safety standard: Multi-nutrient Supplementary Food for Pregnant and Lactating Women" (GB 31601-2015) was issued in November, 2015, by Health and Family Planning Commission in China, and officially implemented in November, 2016.

Keywords: Pregnant women, lactating mothers, first 1000 days of life, nutritional supplements, standard

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144/2957

ECONOMIC EVALUATION OF A NOVEL HOME-STEAD FOOD PRODUCTION PROGRAM IN RURAL CAMBODIA

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Background and objectives: Background: For over 20 years Helen Keller International has implemented homestead food production (HFP) programs in developing countries to improve the nutritional status of women and children, household food security and income. The HFP model encourages year-round food production through home gardens and animal husbandry. Although, HFP has been successful in increasing household food production, economic assessment of this program has been limited. In order for program implementers to allocate limited resources efficiently, there is a need for a rigorous economic assessment of HFP programs.

Objective: To (1) identify factors associated with household income in rural, Cambodia, (2) to systematically measure and monetize food production from gardens and fishponds, and explore the cost-effectiveness of HFP in Cambodia in a cost-benefit analysis (CBA), using data from a randomized control trial (RCT), (3) explore the sensitivity of the CBA results and alternative scenarios for program implementation.

Methods: Factors associated with household income, were examined using a generalized linear mixed model at a univariate and multivariate level. Food production was estimated from multiple longitudinal data sources. The program benefits (food production) were monetized using local village market values, while costs were determined through a micro-costing analysis. A CBA was carried out from the project iii perspective and the net monetary benefit in each study arm was estimated and compared to control households. Lastly, the sensitivity of the CBA results was tested in a one-way sensitivity and scenario analysis.

Results: Assessment of baseline household income revealed that in rural Cambodia fishponds and pigs were associated with income. Households in the HFP program produced more food, relative to the control. The results from CBA show that home gardens are a cost-effective HFP intervention. The results from the scenario analysis suggest that the addition of fishponds to gardens may also be cost-effective if implemented outside a RCT.

144/2990

POTENTIAL CONTRIBUTION OF YELLOW FLESHED CASSAVA PRODUCTS TO VITAMIN A INTAKE IN WOMEN AND CHILDREN

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Background and objectives: Background: Introduction of yellow fleshed cassava has resulted in the production of analogous foods of the white fleshed varieties. With Pro-vitamin A content (especially β-carotene) degrading quickly when subjected to usual traditional processing methods. It is important to understand the possible contribution of these new foods to dietary intake.

Objectives: Evaluation of the β-carotene concentrations in local staples namely eba (Dough cooked from fried cassava granules) and fufu (dough cooked from cassava mash), lafun (Dough cooked from milled chips). Comparing these concentrations with usual dietary intake in women and children and calculate the possible contribution to vitamin A intake

Methods: Matured roots of four Cassava varieties (TMS01/1371, TMS07/593, TMS07/539 and NR07/0220) were processed into eba, fufu and lafun. The fresh roots and products were analyzed for their β-carotene contents using HPLC. Mean portion sizes (in grams) of products from white fleshed variety were compared with concentrations in the similar products from yellow cassava varieties to calculate possible contribution to RDA of Vitamin A intake.

Results: The β-carotene concentration in eba was highest in TMS01/1371 at 3.79μg/g. In fufu it was the highest in NR07/220 at 5.38μg/g. In lafun it was the highest in NR07/220 at 3.19μg/g. The lowest values were found in TMS07/593 at 0.08 μg/g, 0.85 μg/g and 1.52 μg/g in lafun, fufu and eba respectively. The portion sizes ranged from 236g in eba to 267g in lafun in children while the portion sizes ranged from 225g in fufu to 633g in lafun in women. Contributions to RDA of Vitamin A show that for children fufu can give 18% contribution through NR07/0220 followed by eba giving 11% in TMS01/1371 followed by 8% in fufu from TMS07/0539. In women, eba from TMS01/1371 was highest at 16% followed by NR07/0220 providing 10% from lafun.

Conclusions: The varying potential of the varieties is evident. The information can be valuable when questions regarding bio-availability and bioefficacy of these local food products are raised.

Keywords: Beta-Carotene, Cassava, Eba, Fufu, Vitamin A

144/2992

B -CAROTENE RETENTION IN YELLOW CASSAVA IS NOT ONLY DEPENDENT ON GENOTYPE BUT ALSO ON PROCESSING METHOD

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Background and objectives: Carotenoid losses in yellow cassava during food processing is of particular interest since pro-vitamin A content (especially β-carotene) degrades quickly when exposed to sunlight or to different forms of processing. It is well known that retention ability is genotype dependent. The study therefore sought to evaluate the retention capacity of β -carotene in recently released cassava varieties when processed into local staples namely Eba (Dough from Cassava granules) and Fufu (dough cooked from cassava mash).

Methods: Matured roots of four Cassava varieties (TMS 01/1371, TMS 07/593, TMS 07/539 and NR 07/0220) were harvested and processed into Eba and Fufu. The fresh roots and products were analyzed for their β-carotene contents. Percentage true retention was used to evaluate retention. Precautions were taken to avoid unnecessary carotenoid loss during processing.

Results: Beta-carotene content of the fresh roots ranged from 5.32μg – 7.8μg, the processed product, Eba had retention ranging from (0.05% - 16.6%). TMS 01/1371 had the highest retention while TMS 07/539 had the lowest retention. The processed fufu had retention ranging from (6.9% - 24.7%). NR 07/0220 had the highest retention while TMS 07/593 had the lowest retention.

Conclusions: The varying retention ability of the varieties is evident. While this is expected, it is observed that some varieties may offer more significant contribution to nutrient intake than others. This can maximize the potential contribution to pro-vitamin A intake and ultimately vitamin A intake for women and children.

Keywords: Beta-Carotene, Cassava, Eba, Fufu, Retention

144/3018

CONCEPT OF FOOD AND NUTRITIONAL SECURITY FROM THE COMPLEXITY

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Background and objectives: Food and nutritional security are inherent to life; since the beginning of humanity, there is an interest in guaranteeing self-sufficiency of food that has remained a priority issue for organizations and governments. The concept today relates food and nutritional security with availability, access, consumption, use and quality and safety of food.

The objective of this investigation was construct a concept of food and nutritional security from a perspective of complexity.

Methods: This research is qualitative of an exploratory, descriptive nature; is a genealogical investigation from bibliographic searches of publications in databases, review of public policy guidelines and action plans proposed in declarations of world food summits from 1974.

Description, interpretation and construction-ofconstruction were carried out; a systemic and complex hermeneutics of the relations that make up the food-nutritional security network was applied and emerging thoughts were identified.

Results: A genealogy of the famines was a source of systemic elements that contribute to the understanding and interpretation of hunger in its historical moments and contexts. Hunger occurs in situations of conflict when the dominated countries lose their autonomy for food supply and this forces them to generate mechanisms to provide a solidarity response by food aid.

A detailed review and identification of the interrelationships in global declarations for the eradication of hunger and Malnutrition, originating from food summits since 1974; their contributions to the conceptual transition of food and nutritional security. Despite the efforts the purpose of reducing the hungry people, is far.

Food-nutritional security of "new time" is the environmental adventure of nurturing life, it is the biological and social relations, the warp of food-nutritional, man-ecosystem in a network of complex relationships in feedback loops between peoples and land, peoples and their ecosystemic and cultural contexts.

It constitutes a framework of knowledge that connects both the natural sciences and the social sciences such as, anthropology and ecology.

Conclusions: A critical look that gives way to a perspective from the reorganization of knowledge towards a complex, systemic vision, as a network of networks; Which invites us to interpret the language of discourses in new ways, expanding possibilities of observing and interpreting the transition towards food-nutritional security.

Keywords: Food nutritional security; complexity; concept
Further collaborators:
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144/3593

N-GLYCOLYLNEURAMINIC ACID LEVELS IN RED MEAT OF 7 ANIMAL SPECIES: GUIDELINE FOR HUMAN CONSUMPTION

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Background and objectives: Many studies have shown that red meat-derived sialic acid (Sia) N-glycolylneuraminic acid (Neu5Gc) promotes inflammation and cancer progression (1). However red meat are a good natural source of protein and iron. Our aim was to quantify the Neu5Gc, N-acetylneuraminic acid (Neu5Ac) & 2-keto-3-deoxy-D-glycero-D-galactonononic acid (KDN) level in conventional rad meat of thigh muscle in cattle, goat, sheep, pig, deer, horse, kangaroo and estimate the level of dietary consumption of the non-human Neu5Gc from different species rad meat and its potential for inflammatory diseases.

(1). Samraj AN. A red meat-derived glycan promotes inflammation and cancer progression. Proc Natl Acad Sci U S A. 2015 Jan 13;112(2):542-7

Methods: Neu5Ac, Neu5Gc, KDN were determined in the muscle meat of 7 different animal species (n=3) by UHPLC using DMB derivatization.

Results: Sia concentration in the red meat of 6 tested animal species varied from Neu5Ac 168~661μg/g protein, Neu5Gc 0~166 μg/g protein; KDN 0~4 μg/g protein and total 207~814 μg/g protein respectively. There was significant difference in concentration of Neu5Gc ($P= 0.022$), but not for Neu5Ac, KDN and total Sia in the muscle meat of 7 animal species. The predominate form of each family Sia was conjugated including Neu5Ac (70~95%), Neu5Gc (85~99%) and total Sia (55~90%), which is the bioavailable form and can be digested and incorporated into human tissue. Although, KDN concentration was negligible to absent in all animal species muscle meat, free KDN was the predominant form. Neu5Gc concentration in the muscle meat from high to low was in goat, cattle, pig, sheep, horse and deer. Interestingly Kangaroo muscle meats were devoid of any Neu5Gc.

Conclusions: The conventional red meat contained the relatively high concentration of bioactive form Neu5Gc, except kangaroo meat that did not contain any Neu5Gc. Therefore kangaroo meat is a much safer source of red meat in terms of Neu5Gc intake. Our new findings may aid in reducing the risk of cancer, cardiovascular and inflammatory diseases among the red meat consumption population by recommending that they choose low Neu5Gc containing meat.

Keywords: Neu5Gc, red meat, sialic acid

Annals of Nutrition& Metabolism

Track 1: Advances in Nutrition Research

SSS_144/1061

NUTS AND DRIED FRUIT CONSUMPTION AND HEALTH: NEW INSIGHTS

DRIED FRUIT CONSUMPTION AND OSTEOPOROSIS (BONE HEALTH)

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Osteoporosis is characterized by a loss of bone mass and quality leading to an increased risk of fractures. Postmenopausal women are at the greatest risk of developing osteoporosis.. A search for promising non-pharmacological alternative therapies for osteoporosis is important as medications used for osteoporosis can be associated with side effects and low compliance. Nutrition can reduce the risk of developing osteoporosis and therefore play an important role in bone health. In terms of nutrition, dried plum has been shown to be one of the most efficacious interventions for preventing and reversing bone loss in a rat model of osteoporosis and in postmenopausal women. The purpose of this presentation is to provide an overview of the efficacy of dried plum for preventing and reversing bone loss associated with ovarian hormone deficiency and to highlight possible mechanisms of action. Our follow-up study demonstrated that postmenopausal women taking dried plums during our one year clinical trial conducted five years earlier retained bone mineral density compared to the control. Overall, these findings suggest that dried plum is a promising functional food therapy for postmenopausal bone loss with the potential for a long-lasting bone-protective effect.

Keyword: Postmenopausal women, dried fruits, prune, dried plum, osteoporosis

Conflict of Interest disclosure: This symposium was sponsored by International Nut and Dried Fruit Council Foundation (Spain)

SSS_144/152

5TH YINI SUMMIT–FERMENTED FOODS AND HEALTH: THE INTERSECTION OF GUT MICROBIOTA AND FERMENTATION MICROBES

THE GUT MICROBIOTA: THE INTERSECTION BETWEEN DIET AND HEALTH?

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Over the past decade, our understanding of the composition of the gut microbiota has been advanced through the use of next generation sequencing approaches. More than 50 bacterial phyla have been detected in the human gut but, the gut microbiota are dominated by ~ 1000 microbial species belonging to the Bacteroidetes and the Firmicutes phyla. These microbes encode a substantially larger number of genes than the human host and interact with the host through specific receptors on gut epithelial, neural and immune cells as well as through the production of hormones and metabolites that signal to the host to influence health and disease. Studies in germ-free animals have shown that the gut microbiota are essential for normal gastrointestinal, immune, metabolic and cognitive development and function. Clinical and epidemiological studies have linked an imbalance of the normal gut microbiota, or dysbiosis, to gastrointestinal conditions such as inflammatory bowel disease and irritable bowel syndrome, as well as extra-intestinal diseases such as obesity, type 2 diabetes, and atopy. There is broad interest in better understanding how microbial dysbiosis is associated with non-communicable diseases as well as to develop strategies to manipulate the gut microbiota to improve health outcomes through diet. Two common approaches are the provision fermentable substrates (fibers and prebiotics) or live microbes (probiotics). Probiotics can be administered as supplements of single or multiple microbial species or by consumption of fermented foods containing live microbial species, such as yogurt. This presentation will focus on how dietary intake impacts the gut microbiome and the potential benefits of probiotics on the gut microbiome and disease.

Keywords: Gut microbiota, non-communicable diseases, diet, probiotics

Conflict of Interest disclosure: Dr. Donovan serves as co-Chair of the Yogurt in Nutrition Initiative (YINI) and received travel support and an honorarium to present at the IUNS meeting.

YOGURT INTAKE AND PREVENTION OF CARDIOMETABOLIC DISEASES: THE ROLE OF FERMENTATION PRODUCTS

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A healthy dietary pattern has been identified as a pillar for the prevention of weight gain and cardiometabolic diseases (CMD). A growing body of evidence suggests that yogurt consumption is linked to healthy dietary patterns, lifestyles and reduced risk of CMD, particularly type 2 diabetes (T2D). However, to date, there have been few to no randomized clinical trials (RCT) investigating yogurt intake in relation to cardiometabolic clinical outcomes. Furthermore, there has been little attempt to clarify the mechanisms that underlie the potential beneficial effects of yogurt consumption on CMD. Yogurt is a nutrient dense dairy food and has been suggested to lower weight gain and prevent CMD by contributing to intakes of protein, calcium, bioactive lipids and several other micronutrients. In this presentation we will focus on recent evidence that dietary proteins are key regulators of immunometabolic factors and the gut microbiota. In addition, fermentation with bacterial strains generates bioactive peptides from dairy proteins resulting in a potentially greater beneficial effect of yogurt on metabolic health compared with non-fermented dairy products such as milk. I will outline potential mechanisms that can underlie the inverse associations between yogurt intake and incidence of CMD and that are related to its bacterial constituents and bioactive peptides released during fermentation and compared with other fermented or non-fermented dairy products. A review of current gaps and challenges in identifying such mechanisms, and a perspective on future research needs that are necessary to validate the proposed role of yogurt in protecting against CMD will also be provided.

Keywords: Yogurt, proteins, fermentation, peptides, gut microbiota, health benefits

Conflict of Interest disclosure: Grants from and consulting for Danone Nutricia Research, Thetis Pharma, Consulting for Valbiotis.

IMPROVING YOUR DIET WITH FERMENTED FOODS: HARMONIZING DIETARY GUIDELINES INCLUDING FERMENTED MILKS

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Microbes are an essential part of our environment and food. Beneficial microbes derive mainly from fermented foods which have a long history of safe use The species Lactobacillus has been defined as the 5th most important factor for human evolution due to the importance of lactobacilli in food fermentation and health promotion by strengthening intestinal mucosal barrier. Yogurt is defined as milk fermented with Streptococcus thermophilus and Lactobacillus delbrueckii subsp. bulgaricus (Codex Standard Number 243/2003) with the organisms viable through the shelf-life.

Yogurt and fermented milks are a significant sources of viable bacteria and fermentation products which enhance nutritional quality and palatability of milk and provide metabolites, enzymes (eg. lactase) and flavor components. In Europe, only one health claim has been approved for beneficial microbes: yogurt improves the handling of lactose. Five EU member states have national nutrition guidelines or recommendations that include either probiotics or yogurt with live bacteria. A recent report demonstrates that yogurt is recommended as a good source of nutrients in many countries (14 EU member states recommend yogurt as a recommended part of local diet and nutrition). Five of them explicitly mention probiotic beneficial effects and four give examples of probiotic bacteria. Several physiological effects of probiotics are well established. Yogurt and yogurt with probiotics, have benefits to humans: yogurt is easily digestible with live microbes. The inclusion of yogurt in food based dietary guidelines has been suggested and knowledge on health benefits suggest opportunities for evidence-based dietary guidelines with yogurt and yogurt with probiotic bacteria.

Keywords: Dietary guidelines, fermented foods, fermented milks

Conflict of Interest disclosure: Prof Salminen serves as member of the Yogurt in Nutrition Initiative (YINI) and received travel support and an honorarium to present at the IUNS meeting

HEALTH BENEFITS OF FERMENTED DAIRY FOODS: MICROBIOTA AND BEYOND

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Increased consumption of yogurt, kefir, and other fermented dairy products has been driven, in part, by the health benefits these products are thought to confer. For example, epidemiological studies have shown that yogurt consumption is generally associated with reduced risks of type 2 diabetes (T2D), metabolic syndrome, and heart disease, and improved weight management. Although these products are good sources of protein, calcium, and other nutrients, the live microorganisms present in these products are now considered responsible for many of these health benefits. Included are the yogurt starter culture organisms, Streptococcus thermophilus and Lactobacillus delbrueckii subsp. bulgaricus, as well as strains of Bifidobacterium and Lactobacillus added specifically for their probiotic properties. The physiological mechanisms by which these microbes interact with the gut microbiota and contribute health benefits are now the subject of considerable interest. One major topic of research for establishing a role for these

organisms is the well-known phenomenon of colonization resistance. Specifically, the healthy human gastrointestinal tract contains a diverse, complex, and stable microbiota that is resistant to colonization by exogenous microorganisms. These could include pathogenic organisms as well as bifidobacteria and lactobacilli that are added to fermented milk products as probiotics. Nonetheless, clinical studies have reported several health benefits from yogurt consumption for several conditions. Among the most well established effect is the role of yogurt bacteria on improving lactose digestion in individuals with lactose maldigestion, mediated via in vivo expression of the lactose-hydrolyzing enzyme β-galactosidase. However, clinical evidence has also emerged showing that consumption of yogurt containing probiotics also improves both intestinal and extra-intestinal health. Examples include infectious diarrhea, respiratory infections, and improved immune and anti-inflammatory response. More recently, the effect of probiotics and probiotic yogurts on behavior and the microbiota-gut-brain axis has become an active area of research.

Keywords: Yogurt, probiotics, gut microbiota, health benefits

Conflict of Interest disclosure: Partner, Synbiotic Solutions; Grants from Mead Johnson Nutrition; Consulting with Danone, Prenexus; Board of Directors, ISAPP

SSS_144/1012

CHRONONUTRITION: CHRONOBIOLOGY INFLUENCE ON FOOD INTAKE AND METABOLIC HEALTH

AN INTRODUCTION TO CHRONONUTRITION: IS WHEN YOU EAT AS IMPORTANT AS WHAT YOU EAT?

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In the last 20 years the role of the time of food ingestion has shown to be a main factor for metabolic balance and weight gain. Why the time? How does this influence energy balance?

Research in chronobiology using experimental animals as well as clinical studies have evidenced that the efficiency and the response of organs involved in digestion and nutrient metabolism varies along the 24 hours. This confers a dynamic and economic system that increases the metabolic activity during hours when individuals are expected to be awake and lowers this activity in order to save energy during rest and seep hours. The circadian system transmits time signals and coordinates all involved organs so that they can give high or low orchestrated responses. The main entraining signal from the environment to the circadian system is the light-dark cycle, however the cycles of feeding –fasting have proven to be powerful time signals for several organs and brain systems that coordinate metabolism.

Recent research indicates that ingesting food at the time when the circadian system indicates a sleep stage elicits conflicting energy training signals and disrupts the expression of circadian rhythms. Also ingesting food at the wrong time has a bad metabolic outcome favoring the development of overweight, and metabolic syndrome. This condition is promoted by night-work, jet-lag and "social" jet-lag, affecting a wide proportion of individuals.

In my conference I will present experimental studies where the mechanisms linking the circadian system with the metabolic outcome is discussed. The relevance of feeding patterns, will be discussed in the context of different experimental models for night-work, jet-lag and social jet-lag, and their consequence on body weight and indicators for metabolic syndrome. The impact of a disrupted feeding pattern on the circadian system will also be discussed. The main message is that the time of food ingestion can disrupt the circadian system and that a homeostatic condition can only be achieved when the time of feeding is orchestrated with the temporal signals for sleep and wakefulness given by the circadian clock.

Data presented have been supported by CONACyT 239403 and DGAPA-PAPIIT IG200417.

Keywords: Circadian rhythms, obesity, nught-work, chrononutrition, metabolism

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Conflict of Interest disclosure: This symposium was sponsored by Kellogg Nutrition & Health Institute

THE HUMAN CIRCADIAN TIMING SYSTEM AND ITS INFLUENCE ON METABOLIC PROCESSES

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Obesity and diabetes have obtained epidemic proportions and contribute significantly to cardiovascular disease and mortality. Most research and clinical attention has focused on the importance of what we eat and how much we exercise in these developments. However, in recent years it has become clear that also other modern life style changes such as the timing of food intake, of physical activity and of sleep importantly impact metabolism and cardiovascular risk factors. This presentation will focus on the role of the endogenous circadian system, and its interaction with a disturbed timing of the behavioral/environmental sleep/wake, rest/active, fasting/feeding, and dark/light cycles on cardiometabolic function. For example, the circadian system and circadian misalignment (i.e., the misalignment between the circadian system and the

behavioral/environmental cycle) influence glucose metabolism, energy expenditure, food intake, weight regulation, inflammation, and cardiovascular function in humans. These new observations provide possible mechanistic evidence for the adverse cardiometabolic effects observed with shift work, late night snacking, and circadian-related gene variants. Given the high prevalence of sleep restriction, sleep disorders, and shift work, as well as the increasing rate of diabetes and obesity, there is an urgent need to increase our understanding of the impact of sleep, circadian rhythm, and their disturbances on cardiometabolic function and disease. The objectives of my talk will be to (a) discuss the effects of the human circadian system and circadian misalignment on glucose control, metabolism, inflammation, and cardiovascular function; (b) present data on the effect of melatonin and its interaction with type 2 diabetes risk variant MTNR1B on glucose control; and (c) discuss the evidence for the importance of not just what you eat, but also of when you eat for health and disease.

Keywords: Circadian misalignment, circadian rhythms, metabolism, glucose, weight regulation

Conflict of Interest disclosure: Speaker fees from Bayer Healthcare, Sentara Healthcare, and Kellogg's.

CHRONIC FORCED CIRCADIAN DESYNCHRONIZATION AFFECTS LOCOMOTOR ACTIVITY, BODY WEIGHT AND METABOLISM IN MICE

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Circadian rhythms control our daily activities; indeed, circadian disruption in animal models and humans has a profound effect on our behavior and physiology. Chronic desynchronization results in changes in mood, immune and endocrine variables (among many others) and even susceptibility to disease. In addition, metabolic functions are synchronized by the circadian clock setting daily patterns of food intake, nutrient delivery, and behavioral activity.

We have developed a murine model of chronic circadian desynchronization and found that it induces significant changes in locomotor behavior, resulting in two independent bouts of daily activity (i.e., internal desynchronization). Moreover, we studied the impact of chronic jet-lag (CJL) on metabolism, and tested manipulations aimed to overcome potential alterations.

We recorded weight gain in C57Bl/6 mice under chronic 6 h advances or delays of the light–dark cycle every 2 days (ChrA and ChrD, respectively). Indeed, ChrA, but not ChrD, induced forced desynchronization of locomotor activity rhythms in mice. Body weight was rapidly increased under ChrA, with animals tripling the mean weight gain observed in controls by day 10, and doubling it by day 30 (6% vs. 2%, and 15% vs. 7%, respectively). Sig-

nificant increases in retroperitoneal and epididimal adipose tissue masses (172% and 61%, respectively), adipocytes size (28%), and circulating triglycerides (39%) were also detected. Daily patterns of food and water intake were abolished under ChrA. In contrast, ChrD had no effect on body weight. Wheel-running, housing of animals in groups, and restriction of food availability to hours of darkness prevented abnormal increase in body weight under ChrA. Our findings suggest that the observed alterations under ChrA may arise either from a direct effect of circadian disruption on metabolism, from desynchronization between feeding and metabolic rhythms, or both. Direction of shifts, timing of feeding episodes, and other reinforcing signals deeply affect the outcome of metabolic function under CJL. Such features should be taken into account in further studies of shift working or other disrupting schedules in humans.

Keywords: Circadian rhythms; Desynchronization; Metabolism

Conflict of Interest disclosure: This symposium was sponsored by Kellogg Nutrition & Health Institute

Track 2: Nutrition Through Life Course

MICRONUTRIENTS FOR OPTIMUM HEALTH

VITAMINS AND MINERALS DEFICIENCIES: THEIR ROLE IN CHRONIC NON COMMUNICABLE DISEASES

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Micronutrients are essential to sustain life and for optimal physiological functions. Hidden hunger is a global health issue. Micronutrients deficits coexist. It presents with no clinical symptoms but can interfere with an optimal health and lead to several chronic diseases. Micronutrients intervene in immunity, inflammation, oxidative damage, are cofactors and coenzymes in several metabolic pathways, modulate genomic stability processes, act as glycation inhibitors, anti oxidants and have a protective effect on bone health, diabetes mellitus and cardiovascular disease. Suboptimal levels of micronutrients are associated with metabolic anomalies that can be prevented: molecular damage associated to aging, repair failure caused by chemical and physical changes like cross linking, advanced glycation end products (AGEs), free radicals (oxidative damage) and changes in the cellular / matrix structure / function. There are many risk groups for developing vitamin and mineral deficiencies: women, pregnant women, people who carry out diets for medical or cosmetic reasons, athletes, dancers, older adults, vegans, bariatric patients, and even lonely people. In fact each adult can suffer during the course of his life from any deficiency because modern diet patterns in general show a low correlation with the current dietary guidelines recommendations. Food consumption is a biomarker of diet quality and a strong determinant of health disease processes. There is an association between consumption of specific food or nutrients with increased risk or a protective effect for developing chronic diseases like obesity, type 2 diabetes, and osteoporosis. Aging process is inevitable. But the damage can be maintained at a sub patogenic level to prevent chronic diseases. The treatment of vitamin and mineral deficiencies is one of the most extraordinary development-related scientific advances of recent years. Probably no other public health strategy available today offers an opportunity to improve lives and accelerate development at such a low cost and in such a short time. Eliminating hidden hunger will not be easy. Challenges lie ahead. Much still needs to be done to ensure that people around the world gain access to nutrient-rich foods and diversified diets. Meanwhile two other strategies are at reach: fortifying foods and multivitamin-mineral supplementation.

Keywords: Hidden Hunger, Aging, Chronic Diseases.

Conflict of Interest disclosure: Dr. Monica Katz has an agreement with Bayer SA, a manufacturer of multivitamins

STATUS AND NUTRITIONAL GAPS IN ARGENTINA: UPDATED EVIDENCE

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The first National Nutrition Survey in Argentina was conducted eleven years ago; the study represented a complete diagnosis of the prevalence of different forms of malnutrition, children and women dietary patterns and insufficient intake or excess of different nutrients. After the survey, only studies with a more limited representation have been carried out. The three editions of the National Risk Factors Survey (ENFR), included indicators about food patterns and anthropometric measures in the adult population, and reported a high prevalence of overweight and obesity (57,6%) and low intakes of nutrient rich foods.

A dietary pattern with low intakes of high nutrient-dense foods combined with high consumption of high caloric density ones is associated with the development of obesity, especially if accompanied with low caloric expenditure patterns.

The analysis of these aspects of diet quality has been the focus of our studies in the last seven years, through two lines of research: we analyzed the food gaps of general population, measuring each food group consumption against the recommendation of dietary guidelines and expert organizations (WHO). We also described the nutritional gaps, both in the local market available foods and in the consumption pattern of the population. The nutritional gap is the difference between the nutrient profile of nutrients to limit or to promote and its standard values developed from nutrient density recommendations.

In general population (2012) the most significant gaps for low consumption were in vegetables, fruits and grains and whole grains (average -66%); Also in dairy products (-39%) and on the other hand excesses gaps were described in sugars, flour, bakery and very refined cereals and meats (in all cases above 50%). When nutrient profile was aplied to foods, the main nutritional gaps were found in sweetened beverages, sweets, processed meats and cheese.

The results on food gaps for deficits were also analyzed in another study, in this case a representative national survey in a sample of 1000 adults over 18 years old (2015). Only 17% of the population reported they reached the recommended consumption of three or more groups of food guides simultaneously.

Both lines of research allow us to conclude that the high prevalence of overweight in children and adults in Argentina is accompanied by malnutrition caused by inadequate intakes of essential nutrients due to low consumption of their food sources.

Based on this background, we will present model scenarios oriented to calculate the improvement in diet quality (NRFI and NutriScore methods) in children and adults through different mix of increase in the consumption of essential nutrients food source and decrease in nutrients to limit ones.

Keywords: Nutritional quality, food guides, micronutrients.

Conflict of Interest disclosure: Sergio Britos has an agreement with Bayer SA, a manufacturer of multivitamin

VITAMIN D AND IMMUNE FUNCTION

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Inadequate levels of vitamin D due to deficiency and insufficiency are a global health issue for over one billion individuals. This includes regions of North and South America, Africa, Europe, Australia and Asia where one would assume that sun exposure is sufficient for efficient cutaneous vitamin D synthesis. The modern lifestyle of many populations limits synthesis via UVB exposure due to extended time spent indoors and the use of topical sunscreens. Older individuals are particularly prone to low vitamin D serum levels as cutaneous synthesis is less efficient due to age related changes of the skin and their reduced levels of outdoor activity. Insufficient vitamin D levels are associated with poor bone health, impaired muscle function, cardiovascular disease, cancer, autoimmune disorders and infectious diseases. Since the early 19th century, both environmental (i.e. sunlight) and dietary sources (cod liver) of vitamin D were identified as treatments for tuberculosis. The discovery that vitamin D induces antimicrobial peptide gene expression and the expression of other genes involved in immune function has greatly renewed interest in the ability of vitamin D-containing supplements to improve immune function by raising overall serum levels. The importance of vitamin D throughout the course of infection from the initial exposure to the pathogen through the resolution of tissue damage and inflammation indicates that individuals need to maintain adequate levels of vitamin D for an optimal immune response against both bacterial and viral infections. The prevalence of vitamin D deficiency both globally and in the Latin American region is strongly associated with increased risk for respiratory tract infections in adults and children. Several studies indicate that vitamin D deficiency may contribute to increased severity and duration of infection. Research findings support a role for vitamin D in immunity and protection against respiratory tract infections. A very recent systematic review and meta-analysis of individual participant data from randomized controlled trials showed that vitamin D supplementation protected against acute respiratory tract infection overall. Those patients that were severely deficient and started taking supplemental vitamin D daily or weekly benefited the most over those who received bolus doses. While many observational studies link low vitamin D levels and respiratory tract infections and numerous trials show that supplementing with vitamin D can lower one's risk of getting a respiratory infection, the results are mixed. Carefully designed studies to address supplementation dosing intervals and levels, and protective serum vitamin D levels will help determine if taking vitamin D supplements can protect against respiratory tract infections.

Keywords: Vitamin D. immune. deficiency. infection. respiratory

Conflict of Interest disclosure: Paid consultant for Bayer Consumer Health AG

Track 3: Public Health Nutrition and Environment

SSS_144/1045
ROLE OF MICRONUTRIENTS FOR PUBLIC HEALTH

THE ROLE OF MICRONUTRIENTS FOR PUBLIC HEALTH

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According to the World Health Organization (WHO), "in almost every country, the proportion of people aged over 60 years is growing faster than any other age group. This population ageing can be considered as a success story for public health policies and for socioeconomic development, but it also challenges society to adapt, to maximize the health of people." Life-long health promotion, with an emphasis on the fundamental role of nutrition and essential micronutrients to reduce risk of chronic disease, can prevent or delay the onset of non-communicable diseases, such as heart disease, diabetes, osteoporosis, Alzheimer disease, and others. Nutrition is recognized as being an important factor in optimal health throughout the life course and the United Nations declared the Decade of Action on Nutrition.

Nutrition is a complex topic in itself, and so are its fields of application. Nevertheless, a significant scientific and medical consensus exists as to the importance of an appropriate level of micronutrient intake throughout the life course to foster health, and prevent the onset of diseases. A balanced diet rich in fruits and vegetables can provide the essential micronutrients according recommendations; however, a major part of the population does not follow or achieve the recommendations. Food fortification and the use of supplements are proven, cost efficient and safe ways for an adequate intake of essential micronutrients. To increase the recognition of the importance of micronutrient interventions, policy makers, health insurers and other stakeholders should give a healthy diet, including the use of supplements, a higher priority. The health benefits of fortification or supplementation with micronutrients are evident; examples on health and reduction of health care costs will be presented.

Subsequent to these lectures the DSM Nutritional Sciences Award will be presented, whereas the award 2017 is dedicated to Human Nutrition, with special emphasis on vitamins, carotenoids, polyunsaturated fatty acids, enzymes, pre- and probiotics and naturally occurring bioactive compounds. Scientists from all parts of the world, who have made major contributions to fundamental or applied research in this field, were nominated for the award. An international judging committee has reviewed the nominations and select the winner. We are pleased to welcome the winner for a keynote lecture, followed by an award ceremonial and reception.

Keyword: Micronutrients, public health, healthy aging, health economy

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SSS_144/153

EATING PATTERNS AND DIETARY INTAKE OF INFANTS, TODDLERS AND CHILDREN: INSIGHTS FROM CROSS-COUNTRY ANALYSIS

INTRODUCTION TO FITS AND KNHS: METHODOLOGICAL CHALLENGES IN DIETARY INTAKE COLLECTION AMONG INFANTS, TODDLERS AND CHILDREN IN AUSTRALIA, CHINA, MEXICO, RUSSIA AND THE US

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Background and objectives: The Feeding Infants and Toddlers Study (FITS) and the Kids Nutrition and Health Study (KNHS) are large-scale cross-sectional surveys designed to explore nutrient intakes, food sources of nutrients, eating patterns and key behaviors related to energy intake and expenditure in infants and children in different countries around the world.

Methods: In each country, dietary intake is assessed using trained interviewers and multiple-pass 24-hr recalls on one or more days. The FITS and KNHS use data from national nutrition and health surveys when available, but when data do not exist for our age groups of interest, we collect data using similar methods. To date, a common analysis approach has been applied across data from the following countries: Australia, China, Mexico, Russia and the United States (US).

Results: Although many countries that conduct national nutrition surveys employ 24-hr recalls for individual-level intake estimations, other aspects of the survey methodology differ considerably. Some do not collect intake information on infants or young children. Food composition tables vary, limiting accurate intake estimates to only a few nutrients in some places. Different countries use different age classifications and different food grouping schemes, making comparisons across countries more difficult. Not all surveys record details about the meals or times when foods are consumed. As much as possible, the FITS and KNHS have standardized reporting of age categories and food groupings so comparisons can be made. In addition, we have imputed missing values to complete data sets for nutrients of interest. When national survey data did not include the age categories needed, we have supported primary data collection to fill gaps in knowledge.

Conclusions: This presentation provides an overview of the individual studies and country data that comprise the current FITS and KNHS. The following presentations in this symposium will cover important nutritional issues in diets of infants, toddlers and children, including complementary feeding practices, intakes of total and added sugars, and the role of snacking in the diets of children.

Keywords: Dietary intake, child nutrition, survey

COMPLEMENTARY FEEDING AND THE TRANSITION TO FOODS OF THE FAMILY TABLE IN CHINA, MEXICO, RUSSIA AND US

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Background and objectives: Timely introduction of appropriate complementary foods is essential for optimal growth and development of infants and young children. The aim of this study is to describe and compare complementary feeding practices in four culturally diverse regions represented by China, Mexico, Russia and the United States (US).

Methods: Dietary intake data on infants and toddlers aged 6-23 months in China, Mexico and US were from the Maternal Infant Nutrition Growth (MING) study 2012 (n=906), the Mexico National Health and Nutrition Survey 2012 (ENSANUT) (n=767) and the Feeding Infants and Toddlers Study 2008 (FITS) (n=1430) respectively. Dietary intake data on infants and toddlers aged 7-23 months in Russia were from the Russian National Nutrition Survey 2013 (n=3294). In each study, trained interviewers collected 24-hour dietary recalls from parents or caregivers on behalf of their children. The percentage of infants and toddlers consuming foods from specific food groups and the average amount consumed (per capita) was estimated and presented for 3 age groups.

Results: The percentage of infants consuming breast milk was generally low, ranging between 33-58% at 6-8 months and 33-43% at 9-11 months. Several large differences in complementary food consumption were observed. In China, cow's milk consumption was very low whereas infant formula/growing-up milk was highly consumed (270-317g/d). Rice was a main grain consumed at all ages. In Mexico, infant cereal consumption was low, while a substantial amount of cow's milk was consumed before 12 months of

age. Sugar sweetened beverages were highly consumed in all age groups and the amount increased significantly with age (64-219g/d). In Russia, infant cereal consumption was low whereas white potatoes were highly consumed as a vegetable. Consumption of sugar sweetened beverages in Russia appeared to be the highest (114-242g/d) across the 4 countries. In the US, consumption of vegetable and fruit baby foods resulted in higher overall vegetable and fruit intakes among infants compared with other countries. However, vegetable consumption was significantly reduced after 12 months of age. 100% fruit juice was a main beverage and highly consumed at all ages.

Conclusions: In this study, early feeding of relatively high amounts of empty calorie foods, such as sugar sweetened beverages and sweets and high consumption of low-nutrient dense food such as rice or white potatoes was observed. This compromises intakes of more nutritious foods such as vegetables and fortified infant cereals. In addition, early introduction of cow's milk was found in Mexico. These findings provide culture-specific and food based information for healthcare professionals to understand the improvement needs in their country and offer more targeted guidance on complementary feeding practices.

Keywords: Complementary feeding; China; Mexico; Russia; US

INTAKE OF TOTAL AND ADDED SUGARS AMONG CHILDREN IN AUSTRALIA, CHINA, MEXICO, RUSSIA AND US

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Background and objectives: Sugar consumption is high across the world. However, it is unclear to which proportion added sugars contribute to total sugars, and how intakes differ across geographies. Targets to limit consumption have been set by various national and international organizations. The aim of this study was to assess differences in intakes of total- and added sugars in 4-13y old children in China, Mexico, the US, Australia, and Russia. The secondary aim was to identify main sources of total- and added sugars in the diets of these children.

Methods: Secondary data analysis was conducted using the 2011 China Health and Nutrition Survey, 2012 Mexican National Health and Nutrition Survey, 2009-2012 US National Health and Nutrition Examination Survey, 2011-12 Australian National Nutrition and Physical Activity Survey, and the 2013 Russian National Nutrition Survey. Total- and added sugar intakes were calculated using the US Food Patterns Equivalents Database for China, Mexico, and the US; and using the respective national food composition databases for Australia and Russia.

Results: US children had the highest mean intakes of added sugar (76g/d), followed by Russian (68g/d), Australian (59g/d), Mexican (55g/d), and Chinese (9g/d) children. Intakes of total sugars followed a somewhat similar order, with Russian children having a mean intake of 127g/d, followed by US children with 124g/d, Australian children with 121g/d, Mexican children with 92g/d, and Chinese children with 26g/d. The top food sources of total sugar in China were fruits and vegetables, contributing to 42% of intake among Chinese children. Beverages (such as sugar-sweetened beverages, fruit drinks, and milk-based beverages) were the top sources of total sugar in other countries, contributing to 50% (Mexico), 44% (US), 33% (Australia), and 33% (Russia) of the total sugar in diets of children in these countries.

Conclusions: Despite very distinct geographies and cultures, it appears that in all countries studied except China, beverages are the major source of total sugar intakes. This strengthens the need to have global public health and industry efforts towards this specific product category, as it is a high contributor to sugar intakes in children in many countries.

Keywords: Total sugars, added sugars, children, food sources

THE ROLE OF SNACKING IN THE DIETS OF CHILDREN IN AUSTRALIA, CHINA, MEXICO AND US

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Background and objectives: Eating between main meals or "snacking" is becoming more prevalent world-wide. Eating patterns and snacking behaviors are strongly influenced by culture. Our objective is to evaluate the similarities and differences in snacking habits among children from Australia, China, Mexico and the US.

Methods: National survey data were used for the comparisons across countries, including the National Nutrition Survey 2011-12 (Australia), the China Health and Nutrition Survey 2011 (China), the Mexican National Health and Nutrition Survey 2012 (ENSANUT; Mexico), the Feeding Infants and Toddlers Study 2016 (US)

and National Health and Nutrition Examination Survey 2009-2012 (NHANES; US). Trained interviewers collected 24-hr dietary recalls from parents or caregivers (for younger children) or from the children themselves. Snacking occasions were either defined by the participants (China, Mexico, US) or by time of day of consumption between meals (Australia).

Results: Snacking frequency varied widely across countries, with only 11.4% of 4-8y and 7.5% of 9-13y consuming snacks in China, in contrast to 98.9% of Australian children 2-16y consuming snacks. Snacking prevalence was intermediate in Mexico with 69.3% of 4-8y and 66.7% of 9-13y consuming snacks on any given day. The frequency of snacking in the US approached Australia (96.6% and 94.8% for 4-8y and 9-13y, respectively). FITS 2016 data demonstrated that snacking patterns appear in the toddler/preschool years, stabilizing to provide approximately 25% of energy from snacks from 3y. US children continued to get 25% of energy from snacks from 4-13y. Snacks contributed 11.4% of daily energy for Chinese 4-8y olds and only 7.5% for 9-13y. In Mexico, snacks contributed 15.2% of energy for 4-8y and 14.9% in 9-13y. In contrast, 33.6% of daily energy came from snacks among children in Australia. Foods consumed during snacks also varied widely: Chinese children most frequently consumed fruits and dairy; Mexican children preferred salty snacks, candy, and fruit; children in the US consumed milk and sweet bakery (mostly cookies); and children in Australia consumed fruit/vegetable juices or drinks and bread or rolls.

Conclusions: Despite differences in survey methodology, a common analysis approach provided valuable insights into snacking behaviors around the world. Snacking habits and foods consumed as snacks are important contributors to energy in the diets of children, but amounts and foods consumed vary considerably among the countries studied. In addition, we found that many of the foods typically consumed as snacks are needed to help children meet dietary recommendations, but there is still room for improvement in many snacking choices for children.

Keywords: Snacking, children, dietary intake.

Conflict of Interest disclosure: All authors are employed by NESTEC, SA (Nestlé Research Center). Funding for these studies was provided by NESTEC.

SSS_144/149

THE ROLE OF FAMILY/PARENTS IN NURTURING HEALTHY EATING HABITS IN CHILDREN

THE ROLE OF FAMILIES IN NURTURING HEALTHY EATING HABITS IN CHILDREN

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With the increasing development of a 'global' world, many social, economic and cultural issues arise as the family structure evolves from a more traditional model. Busy parents struggle to balance work and family life, resulting in less time to prepare and share mealtimes together as a family, and less time to enjoy quality moments together.

Across the world, the incidence and prevalence of overweight and obesity are reaching alarming levels . A growing body of evidence indicates that the family environment plays an integral role in children's and adolescents' weight status and unhealthy weight-related behaviours.

Childhood is a formative period for the development of children's healthy eating habits; consequently, it is a crucial time to build the most optimal foundations for positive and sustainable health behaviours.

The home environment is a critical source of positive influence, with the family having a great impact upon the shaping of children's first choice foods, therefore a family-centred approach is of crucial importance.

Danone Institute International (DII) gathered experts (dieticians, nutritionists, pediatricians, psychologists, sociologists, and public health professionals) to work together in collecting data, to develop a unique perspective on the topic.

It clearly emerged that to positively impact children's healthy eating, it is essential to shift the emphasis from "what we eat" to "how we eat".

Three key levers, supported by a strong body of evidence, all related to the family, have been identified, which all have a special emphasis on the pleasure of eating: Positive parenting, Eating together and a Healthy home food environment.

With three distinguished experts in the field, this symposium aims to share a consensus on key recommendations, by identifying relevant and innovative strategies to support families in making positive decisions for nurturing healthy eating in children.

Keywords: Healthy eating habits, children, eating together, healthy home food environment, food parenting

Conflict of Interest disclosure: This symposium was sponsored by Danone Institute International (France)

PARENTAL SOCIALIZATION OF HEALTHY EATING HABITS AMONG CHILDREN

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Developmental theory posits that parents socialize their children by encouraging them to internalize the goals and values that parents deem important. The goal of most parents is that, by early adulthood, their children will be making appropriate choices in their daily lives. When it comes to healthy eating, the parenting environment remains the first and most fundamental context in which children's eating behaviors are socialized. Child eating socialization is characterized by at least three broad areas of food parenting: 1) coercive control, 2) structure, and 3) autonomy

support. Food parenting used by parents of young children may not be appropriate for older children and adolescents. During a child's early years, more guidance is needed as parents teach children basic eating skills, promote appropriate food preferences, and support child eating self-regulation. During the elementary school years, when children experience a wider range of food environments, parents change their behaviors to more developmentally appropriate practices to promote healthy eating in children. During adolescence, parents continue to guide eating behaviors by supporting autonomy in their children with the hope that the youth will internalize the norms and values accepted within the extended family.

A recent literature review highlighted the food parenting practices that either foster or hinder the development of healthy eating habits in children. In younger children (preschool through kindergarten), the use of coercive control is common. Collectively, coercive control strategies with young children have been shown to be related to higher consumption of unhealthy foods. In contrast, the use of structure (i.e., monitoring) and autonomy support (i.e., encouragement and praise) were shown to be related to healthier child eating habits. In elementary school aged children, the use of coercive control continued to be seen; however, the use of these food parenting practices with child food intake appeared to show little impact on intake. Structured activities (availability, accessibility, and modeling) were associated with healthier eating in this age group. It was expected that autonomy promotion (i.e., modeling, encouragement and praise) would be used extensively with older children and adolescents. However, our literature review did not show the use of these practices—at least in the empirical studies we located. We will critically review the evidence supporting associations between coercive control, structure, autonomy support, and child food intake in these age groups. In addition, we will point to gaps in the literature and discuss where future research should be targeted.

Keywords: Food parenting, healthy eating habits, autonomy support, structure, control

Conflict of Interest disclosure: I received speaker fees from Danone Institute International for this presentation

Further collaborators: Thomas G. Power

IMPROVING CHILDREN'S EATING HABITS THROUGH EATING TOGETHER

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Eating together is generally regarded as a child having a planned meal with at least one parent. While the frequency of eating together varies by geographic region, research suggests that the number of meals that children report eating with their families has been declining over the past four decades. Numerous observational studies have found that eating together has a positive sustained impact on children's dietary intake. This may because foods eaten together as a family are healthier than those consumed alone or outside of the home or the time spent together as a family allows parents an opportunity to model healthful dietary intake and eating patterns. Observational research has also found that regularly eating meals together is associated with lower risk of obesity among children and adolescents. As a result of these findings, the American Academy of Pediatrics and the European Society for Pediatric Gastroenterology, Hepatology and Nutrition recommends that families should regularly eat meals together as part of childhood obesity prevention strategies. One key limitation of these findings from observational studies is that families who eat meals together may differ from those who do not eat together on characteristics, such as family functioning or level of chaos in the home, which may influence child diet and weight outcomes. Failing to appropriately account for these potential confounders may result in biased estimates of the impact of eating together. To address this limitation of observational research, researchers have begun to design and test interventions to increase the frequency of families eating together. The focus of this presentation is to critically review the observational and intervention research on eating together. We will present key research findings on the associations between eating together and children's behavioural and health outcomes. We will also discuss results from existing intervention studies and their implications for future intervention efforts.

Keywords: Eating together, family meals, healthy eating, obesity prevention, children

Conflict of Interest disclosure: I have received speaker fees from Danone Institute International for this presentation.

HOW TO CREATE A HEALTHY HOME FOOD ENVIRONMENT

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The home food environment is the most proximal influence over youth eating behaviors and has a strong influence on the habituation of food practices that continue into adulthood. The home environment includes both physical and social factors that youth are exposed to. The physical environment includes the availability of and accessibility to foods in the home. The provision of healthy foods available at home and parental role modeling of healthful eating habits increases the likelihood that youth in the family will be willing to eat and enjoy a greater variety of healthy foods. Research suggests that not only is it important for families to provide healthy foods to their children but it is also important to help teach children how to be more intentional about what, when, where and how they eat. The social environment includes myriad factors that youth are exposed to by observing and interacting with the adults and other children living in the home. This social environment includes role modeling by parents and other household members, family rules around eating and meal time, and cues and reinforce-

ments for eating behavior. Creating a healthy home food environment requires a consideration of how to positively impact both the physical and social environments of homes. Using this framework, this session will discuss the interventions that have been tested to positively influence the home food environment and the best practices that have emerged from the empirical literature to date. We will also discuss the potential for future intervention efforts.

Keywords: Home food environment, family-based interventions, obesity prevention healthy eating habits

Conflict of Interest disclosure: I received speaker fees from Danone Institute International for this presentation.

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MINDFUL EATING APPLIED TO SNACKING: A BEHAVIORAL APPROACH SUPPORTED BY RECENT SCIENTIFIC FINDINGS (DRAFT)

SNACKING IN DIFFERENT PARTS OF THE WORLD: A MARKER OF DIETARY ANARCHY OR A USEFUL CONTRIBUTOR TO DIET QUALITY AND WEIGHT CONTROL?

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The present "epidemic" of obesity has been attributed to a growing trend for snacking (Murakami, 2015). Dietary surveys in various parts of the world reveal that "snacks" (eating occasions at other moments than main meals) do bring a significant amount of energy and nutrients to the daily diet. Even in countries where the traditional pattern of three "main meals" is maintained, most individuals snack at least once daily. One daily snack is frequent in France (mostly at the occasion of the traditional afternoon "goûter") but up to 8 or 12 habitual daily snacks have been reported in Scandinavian countries (Bellisle, 2014; Lund, 2014). In the USA, snacks have increased in frequency over the last decades and three or more snacks a day now bring over 23% of the daily energy in men and women (Kant, 2015). Snacks can represent between 4% (China) and more than 50% (Finland) of daily energy intake (Lund, 2014; Duffey, 2014). Clearly, the important contribution from snacks to the daily intake can affect body weight control and quality of the diet. A review of the abundant literature about snacking reveals at least two contrasting pictures (Bellisle, 2014; Hess, 2016). In many studies, snacking is presented in a favorable way, highlighting its contribution to the daily intake of valuable micronutrients and the flexibility it confers to adjust the daily energy intake to fluctuating energy needs. By contrast, other reports view snacking as a source of excessive energy intake, facilitating weight gain, with little contribution to the quality of the diet (1). The potential value of snacking is obviously modulated by the selection of good nutritional quality foods, but also by other types of factors, for example: eating in the absence of hunger in response to external non-physiological cues, irregular as opposed to regular

snacking, snacking while watching television or screen. Evidence exists that paying attention to the act of eating facilitates both satiation and satiety, perhaps by optimizing the sensory experience of ingestion and facilitating the memory processes that contribute to inhibiting further eating. The regularity of snacks can make them small "meals" that occur predictably in the daily schedule. The French "goûter" ingested by all children and many adults in the middle of the afternoon not only allows them to cope with the very long time interval between lunch and dinner, but generates the physiological responses usually triggered by regular meals. Physiological cues typically present at the outset of a "main" meal (among which a small decline in glycemia) are also present at the beginning of a regular "goûter", preparing the organism to respond to the nutrient load. Such physiological responses are not present when snacking is triggered by external cues in the absence of hunger. The potential beneficial effects of snacking (intake of valuable micronutrients, facilitated adjustment of intake to needs) take place when snacking is a regular, mindful eating event as opposed to an irregular, externally triggered, impulsive behavior.

Keywords: Snack, energy intake, diet quality, weight control, mindfulness

Conflict of Interest disclosure: The author is a member of scientific advisory councils for Cereal Partners Worldwide, European Food Information Council, General Mills, Nomad Foods, CreaBio, International Sweeteners Association, and European Fruit Juice Association. Over the last 5 years, she has received honoraria and travel grants from: American Beverage Association, International Life Science Institute, Mondelez, Tate & Lyle.

EATING MINDFULLY AS A SUSTAINABLE HEALTHY BEHAVIOR: THEORY AND EVIDENCE

Kristeller, Jean.

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Mindful eating is a unique way of relating to the many food choices we face every day. Our minds and our bodies can provide us much wisdom, not only to eat in a more healthy and flexible way, without dieting, but also to enjoy our food more – not less. Although snacking is often identified as an undesirable aspect of food intake, evidence suggests that regular meals can be supplemented by snacks within healthy parameters, particularly in regard to quantity, but also related to quality of foods chosen. One of the challenges of highly restrictive diet programs, which generally curtail virtually all commercially available snack foods is that little awareness is developed regarding how to eat such foods in a more balanced, limited but sustainable way.

This presentation will provide an introduction to the basic elements of the Mindfulness-Based Eating Awareness Training (MB-EAT) program, including a brief introduction to the theory of mindfulness meditation and the mindful eating experiences used in the program (Kristeller, 2016; Kristeller & Wolever, in press). Core goals within the MB-EAT program, a structured 12 session manualized intervention, include heightening interocep-

tive awareness of physical hunger, taste, and fullness; heightening awareness of non-nutritive cues for eating, including thoughts and feelings, and external triggers such as the presence of food, and social pressure; and mindful use of nutritional information. Heightening awareness of taste satisfaction and taste satiety (sensory-specific satiety) is a core element throughout. Multiple eating awareness exercises occur across the program, including use of snack foods such as high energy dense foods, and participants' personally preferred snack foods. Rather than restricting these foods, which often results in rebound overeating, the message is to consider how to obtain maximal pleasure from smaller, rather than larger, quantities, and to make more mindful choices to reflect caloric and health needs. At the same time, healthier foods are also presented as important alternatives, but again, in a balanced rather than exclusive way.

The presentation will review research evidence from several NIH-funded clinical trials, application to a range of clinical populations, including those with binge eating disorder (Kristeller, Sheets, & Wolever, 2013; Kristeller & Wolever, 2011), type II diabetes (Miller, Kristeller, et al., 2012; 2014), and obesity-related eating patterns (Daubenmier, Moran, Kristeller et al., 2016). Our research to date suggests that individuals can bring compulsive overeating under control, improve emotional regulation related to eating, and decrease weight, and that improvement across a range of variables is associated directly with amount of mindfulness practice. The implications of this approach for helping individuals create a more balanced, sustainable, yet flexible relationship to eating and food, will be discussed.

Keywords: Mindful eating; MB-EAT; sensory-specific satiety; binge eating disorder; weight loss.

HOW MINDFULNESS CAN BENEFIT TO SNACKING?

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The growing trend for snacking among children and adults over the past forty years has been potentially identified as one of the factors contributing to the obesity epidemic. Because of the type of food being consumed (high in calorie, sugar and fat), but also the timing of consumption (between meals) and the mode of consumptions (for instance, while watching TV), a habit of snacking represents a challenge for energy balance and body weight control. By contrast, evidence exists that "mindfulness" can benefit to snacking. Mindfulness typically increases consumers' awareness of and responsiveness to internal signals of satiety, but it also increases food enjoyment and savoring. It can thus decrease the occurrence of impulse-based or mindless snacking episodes, but also promote more qualitative snacking with the aim to appreciate the sensory quality of snacks rather than satisfying an appetitive impulse.

We know that satiety is only marginally influenced by the actual quantity of energy being ingested, and is largely driven by a vast array of cognitive factors, including consumption norms, visual perception of food quantity, and monitoring of eating (Cornil 2017). Hence, behavioral research has shown how purposeful changes in food marketing and environments can promote positive eating behaviors like mindful snacking, and more generally decrease food intake without reducing satiety or satisfaction (Chandon and Wansink 2012; Wansink and Chandon 2014). Small changes in package shape and dinnerware size can have a large impact on consumers' perception of food volumes, and therefore increase the perceived (but not the actual) amount of food being eaten (Krishna 2006; Van Ittersum and Wansink 2012). Size labels (for instance, labeling the same portion size "large" rather than "normal") and assortment sizes (for instance, adding an "extra large" or an "extra small" option in the choice set) influence consumption norms, and can thereby impact the satiating power of a snack for the same actual quantity (Aydinoglu and Krishna 2011; Sharpe, Staelin, and Huber 2008). Also, subtle cues can encourage better monitoring of eating and limit mindless eating sequences, leading to faster satiation—for instance, inserting potato chips of different colors at regular intervals in a tube of chips as a way to "segment" consumption (Geier, Wansink, and Rozin 2012).

Growing research inspired by mindfulness techniques has also shown that encouraging consumers to focus on the sensory characteristics of foods can increase eating enjoyment while reducing calorie intake (Tapper 2017). This is because a higher sensory focus increases awareness of and responsiveness to satiation cues, and in particular to "sensory-specific satiety", which predicts that the first few bites of a food are the most pleasurable, then pleasure declines with each subsequent bite. Hence, positioning a snack food as a way to emphasize its multisensory qualities (taste, aromas, texture) can increase the appeal of smaller portion sizes (Cornil and Chandon 2016). This shows that mindfulness techniques applied to foods can be a viable alternative to health warnings in order to encourage consumers to snack more healthily , while preserving—and even enhancing—the pleasure of eating.

Keywords: Mindfulness, snacking, portion size, satiety

FOOD FORTIFICATION: A NEW VISION FOR AN OLD PROBLEM

STUDY OF THE CONTRIBUTIONS IN BREAD RELATED TO THE CONTRIBUTION OF FORTIFICATION LEVEL OF IRON IN WHEAT FLOUR

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[1]Master en Ciencia y tecnología de los Alimentos. Universidad de Valencia. España.; [2]Ingeniero Químico; [3]Ingeniero en Alimentos.

Flour Fortification is a very old Public Health Program in Latin America, even beginning in Chile in 1958, after the countries of North America. Although some countries have joined just a few years ago, there are already 33 countries in the Region that are fortifying wheat, corn and rice flour. Mostly wheat and corn flour are subscribed as Public Fortification programs and are monitored by the Ministries of Health of each country.

The objective of this work is to have a vision of the levels of iron found in the bread from Flour Fortification. This work will be carried out in five countries: Mexico, Ecuador, Peru, Argentina and Chile, where 180 samples will be obtained from typical high-consumption bread that is sold in bulk in the most populated and representative urban sectors of the capital area.

Once the bread samples were obtained, the iron tracer was selected as an indicator that the flour used was fortified. The analytical determination of Iron used is by Atomic Absorption Spectroscopy. A methodology based on the Official Method A.O.A.C. 999.10. In this way, we wish to show in a very simple way, what is the actual benefit of iron and establish what its contribution means on the health of people.

Keywords: Food fortification; iron deficiency; public health; Monitoring

Conflict of Interest disclosure: This symposium was sponsored by Granotec Foundation (Chile)

EPIDEMIOLOGY OF MICRONUTRIENT DEFICIENCY IN LATIN AMERICA, PUBLIC HEALTH SIGNIFICANCE

Morán, Javier.

Catholic University of Murcia (UCAM). Spain.

We reviewed at this conference the epidemiology of micronutrient deficiency in Latin America with special reference to the iron deficiency and how these deficiencies have a great impact in terms of public health.

We also review the interest of the fortification of new food matrices that allow the fortification to be carried out to all the population and particularly to children and adolescents.

Keywords: Food fortification; iron deficiency; public health

Conflict of Interest disclosure: This symposium was sponsored by Granotec Foundation (Chile)

NUTRIENT PROFILING STRATEGIES IN LATIN AMERICA AND ITS INFLUENCE ON THE CONTROL OF MICRONUTRIENT DEFICIENCY

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The increasing of overweight and the obesity epidemic, in addition to the increase of diet-related non-communicable diseases, are among the main consequences of dietary changes, in conjunction with the physical inactivity of the populations.

Within the context of interest of the Latin American countries, already affected by obesity and non-communicable chronic diseases, but still experiencing the problems of undernutrition and micronutrient deficiencies, governments and regional organizations have promoted actions of generating comprehensible, suitable, accurate and standardized information on the content of food products in order to allow the consumer to make healthier choices, promoting the consumption of more complete foods; all these actions can be reached by implementing Nutrient Profiling models.

The definition of Nutrient Profiling was proposed by the WHO in 2015 as "the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health".

There are nutrients classified as of public health relevance, some of them because of their harmful effects and high consumption (e.g. total fat, saturated fatty acids, trans fatty acids, sugars and sodium), and others for their positive effects on health but not reaching the daily recommendations (e.g. dietary fiber, unsaturated fatty acids, vitamins and minerals [vitamin D, iron, calcium, zinc, potassium]).

One of the first approaches of Nutrient Profiling was the regulation of claims; now the use has extended to other actions, for example, nutritional education conducted by health professionals, and be a guideline for consumers and assist them to make "healthier" decisions against a wide variety of products offered in the market, nutrient profiling strategies have also increased privately and publicly to establish industrial food labeling using graphs or representative symbols (logos) on the products to communicate nutritional information to the consumer or to label products as "healthy" food.

Several countries in Latin America, such is the case of Mexico, Costa Rica, The Caribbean, Ecuador, Peru, Bolivia, Brazil, Argentina and Chile, have developed initiatives that involve the use of Nutrient Profiling, as recent as 2016 a regional model of Nutrient Profiling was generated by the Pan-American Health Organization to be taken as basis for local policies in different countries.

Whether the nutrient profiling would be positively adapted by the countries taking into account the relevance of food groups, their role in the diet and the contribution of the nutrients to the overall diet of a population or a particular group within a population is an arising question.

The creation of nutrient profiling should respond to a systematic, transparent and logic methodological process, ideally agreed between the different sectors of each country or region involved (governmental organizations, public bodies, food industry and consumers' organizations). The proper use of Nutrient Profiling could lead to the Latin American consumers to select products that let them reach their micronutrient requirements and promote a more balanced diet.

Keywords: Nutrient Profiling, Public health. Nutrient information. Nutritional claims.

Conflict of Interest disclosure: The present symposium has been sponsored by Granotec

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SSS_144/69

UNITED FOR HEALTHIER KIDS: A PROGRAM TO HELP PARENTS ESTABLISH HEALTHIER EATING AND LIFESTYLE HABITS

UNITED FOR HEALTHIER KIDS PROGRAM EXPERIENCE–IS IT ON TRACK TO ACHIEVE ITS GOALS: COUNTRY EXPERIENCES FROM PAKISTAN AND MEXICO

Das, Jai.

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The multi-level United for Healthier Kids program (U4HK), initiated and catalyzed by Nestlé, is intended to provide families with children under 12 years with new tools to inspire and enable dietary and behavioral change and focused on six behaviors. It was launched in countries around the world with each country choosing the behaviors and activities that apt to the local context. We will discuss two country examples of Mexico and Pakistan to gauge the success of U4HK so far. Both the countries vary in the burden of malnutrition as Mexico has one of the highest prevalence of childhood overweight and obesity, while Pakistan has one of the highest prevalence of childhood undernutrition and stunting.

Mexico was the first country to launch U4HK and chose four behaviors including 'Manage Portions', 'Choose Nutritious Foods and Varied Options', 'Choose to Drink Water' and 'Feed your Baby Like a Baby' and 'Move More, Sit Less. Multiple partnerships were developed with the Ministry of Health, Ministry of Education, Kimberly Clark and Televisa and multiple communication channels were used to create awareness and reach large segments of the population, including digital media, mass media by broadcasting a reality show. Pakistan focused on three behaviors including

'Choose to drink water', 'Move more sit less' and 'Choose nutritious & varied options'. It utilized various channels to communicate the selected messages including digital media, mass media and school platforms and engaged celebrities to endorse the messages.

It was intended to measure the success of the program at three levels - Reach, Engage, and Impact. Initial evaluation from these two countries suggest that U4HK has been successful in reaching and engaging with its target population as in Mexico, digital media generated more than 13.5 million exposures with sufficient engagement rates and Pakistan showed greater awareness amongst mothers regarding the behaviors. A study on purchase and consumption of food patterns in Mexican families with children under 12 years suggested increase purchase and use in the healthy basket and a decrease of the unhealthy basket, with greater increase in consumption of fruits and vegetables.

U4HK is a comprehensive program designed to help parents establish healthier eating and lifestyle habits for their kids. Its strength of forming partnerships and using multiple communication channels has been effective to broaden its exposure and reach a large target audience. U4HK will also aid global understanding to design, implement and evaluate multipronged approaches to changing behaviors.

Keywords: U4HK, undernutrition, obesity, dietary behaviors

Conflict of Interest disclosure: JD is a member of the Scientific Advisory Board for United for Healthier Kids.

BEHAVIOUR CHANGE PROGRAMS DRIVING HEALTHIER DIETS AND LIFESTYLES: WHAT DO WE KNOW?

French, Jeff.

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In this presentation a summary of what we currently know about how to design programmes aimed at influencing healthy diets and related lifestyle issues such as exercise will be presented. The presentation will cover what we know about the design characteristics of successful programmes including how they should be established, developed managed and evaluated. The presentation will be illustrated using examples of both success and failure from around the world. The presentation will also explore the role of different intervention 'Types' and 'Forms' and how these different approaches can be integrated into an effective and efficient programme mix.

Keywords: Social Marketing, diet, lifestyle, behavior change

Conflict of Interest disclosure: JF is a member of the Scientific Advisory Board for U4HK

Prentice, Andrew M.

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Malnutrition in all its forms threatens the health and development of hundreds of millions of children worldwide. The prevalence of stunting and underweight is gradually declining as many countries pass through the economic transition. But the decline in undernutrition is being more than offset by a global rise in childhood overweight and obesity that heralds a future explosion in nutrition-related non-communicable diseases.

There are numerous societal and environmental drivers of the growing obesity pandemic that will require cross-sectoral approaches if they are to be reversed. Many parents lack awareness of the importance of their children maintaining a healthy body weight through appropriate diets and exercise and, even if concerned by their child's weight status may lack the life skills to implement effective change within the family.

United for Healthy Kids (U4HK) is an international programme that sets out to empower families to live a healthier lifestyle. The programme offers advice, training and participatory strategies to help parents effect healthy change in six core skills: Manage Portions; Choose Nutritious and Varied Options; Choose to Drink Water; Enjoy Meals Together; Feed Your Baby Like a Baby; and Move More, Sit Less.

U4HK represents a new model of private-public engagement that seeks to mobilise multiple governmental, non-governmental and private agencies to maximise its reach and impact. Country-specific implementation of the programme utilises the core suite of evidence-based skills but tailored to local needs. Innovative use of social media platforms provides a powerful tool for dissemination and reinforcement of key messages, interactive engagement with families and evaluation of impact.

U4HK has so far been implemented in 13 countries and has reached over 150m participants.

Keywords: Malnutrition, stunting, overweight, obesity, behavior change

Conflict of Interest disclosure: AMP is a member of the Scientific Advisory Board for U4HK

FROM PPP TO PPE: A NEW OPPORTUNITY FOR ENGAGEMENT

Drewnowski, Adam.

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Multi-sectoral initiatives involving private industry are increasingly viewed as a necessary step to improve both diet quality and population health. Public private partnerships (PPPs) have addressed a number of global nutrition challenges, ranging from biofortification and fortification to the promotion of more nutrient-rich diets and healthier lifestyles . The Food and Agriculture Organization (FAO) and the World Food Program (WFP) look to industry partners to improve the quality of the global food supply.

The traditional role of the private sector has been to provide technical assistance, knowledge transfer, and financial support for activities ranging from preventing hunger to promoting optimum health. Companies have used PPPs to alleviate hunger, promote food security, or help develop microenterprises or small businesses. Often, those activities were led by policymakers, local health jurisdictions, or international agencies, with industry assuming a secondary role.

The multi-sectoral U4HK program was created in direct response to calls by international agencies for more engagement by private companies to address the double burden of malnutrition in low and middle income countries (LMIC). Its development was consistent with the published principles on creating PPPs to address complex public health nutrition issues. The challenges, risks and benefits of PPPs have been set out in influential past work, notably by Kraak et al. (2011). While preserving those principles, the U4HK program represents a novel type of private-public engagement (PPE), distinct from the traditional PPP structure. A central feature of PPE is that the private sector takes the leading role in bringing together multiple actors, including families, schools, communities, policymakers, the media, and NGOs. Here, the rapid growth of social media has made it possible to reach families directly with messages about optimum diets and child health.

The U4HK protocols followed standard principles, such as having a clearly defined and achievable goals, clear statements of work, rules, and responsibilities, as well as an evaluation component. Details of U4HK design and implementation will be presented in this symposium.

Keywords: Public-private partnership (PPP); Private-public engagement (PPE); Social marketing

Conflict of Interest disclosure: AD is a member of the Scientific Advisory Board for U4HK and a member of the Nestlé Nutrition Council. He has received grants, contracts, and honoraria from public agencies, private industry, private foundations, and commodity groups for projects involving nutrient profiling, diet quality assessments, and health outcomes.

THE SIX HEALTHIER HABITS TARGETED IN UNITED FOR HEALTHIER KIDS

Rolls, Barbara.

PhD. Professor in Nutritional Sciences. Department of Nutritional Sciences. The Pennsylvania State University. Pennsylvania. USA.

United for Healthier Kids (U4HK) aims to create a social movement through social media platforms that target parents and carers of children up to 12 years of age. A panel of global, independent experts with different expertise in public health, behavioural psychology and nutrition, and with different geographical backgrounds advised U4HK on a framework of six healthier hab-

its to target. These are 'Manage Portions', 'Choose Nutritious and Varied Options', 'Choose to Drink Water', 'Enjoy Meals Together', 'Feed Your Baby Like a Baby', and 'Move More, Sit Less'. The habits were chosen based on in-depth evaluation of scientific evidence and were framed to affect a change in behaviours that could help minimize the risk of childhood obesity and under-nutrition. Each country in which U4HK is introduced choses which of the six behaviours will receive the most attention. The choices depend on and are tailored to the local context and the specific nutritional needs, health priorities, and available resources at each country location. Thus far, countries have chosen to activate up to 3 to 5 of the healthier habits. All countries have included 'Choose Nutritious and Varied Options' and 'Choose to Drink Water'. In this presentation, the science behind several habits and the varied ways they have been adapted and implemented by different countries will be discussed.

Keywords: Habits, dietary behaviors, under-nutrition, obesity

Conflict of Interest disclosure: BR is a member of the advisory board for United for Healthier Kids

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SSS_144/1027

NUTRIENTS AND BEYOND NUTRIENTS: SOCIAL, CULTURAL, AND ENVIRONMENTAL DRIVERS OF FOOD CHOICES GLOBALLY

WHEN IS CHOICE AN OPTION?

Fischler, Claude.

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Choice has become an omnipresent notion in nutrition and public health literature as well as in lay parlance. Consumers are told, or read in the media, that their choices of foods are detrimental to their health. They are repeatedly reminded that they have to make the right choices , i.e. the healthy choices.

Choice goes hand in hand with decision. An influential 2008 paper stated that 2.4 million deaths in 2000 can be attributed to personal decisions and could have been avoided if readily available alternative choices were made. In the paper, diet was one of the prominent sets of personal decisions involved.

The Oxford Dictionary defines decision as a conclusion or resolution reached after consideration. Using choice and decision to denote behavior implies assuming some degree of deliberation and/or intention. Assumed intentionality and free will make individual subjects the essential link in the causal chain. This in turn easily leads to holding them as solely responsible for their predicament.

Meanwhile, in recent decades, various disciplines, particularly in the social sciences (e.g. history, anthropology, sociology, social psychology), have shown that one of the most striking features of human eating is that it is an essentially social activity. In most societies, not just those labeled traditional, eating is performed collectively. It is regulated by a body of rules (etiquette) adjusting individual behavior to fundamental principles of solidarity, hierarchy, morality, propriety. Children are socialized into these rules on the occasion of meals. In more traditional societies, lone eating is stigmatized and the very notion of likes, dislikes and aversions, particularly about staple foods, is irrelevant or non-existent: to that extent, choice is simply not an option.

For several decades, in contemporary, affluent societies, individual autonomy has enjoyed ever increasing recognition in most areas of life, including eating. But even in those individualistic cultures most daily eating unfolds according to an implicit, cultural script, and social interactions can, according to context, both inhibit or stimulate food intake. Moreover, degree of individualization as well as appreciation of choice are shown to vary considerably, including across Western cultures.

The unfounded assumption that food is just another form of consumption and that what people eat essentially depends on free will, choices and decisions is not just a cause for repeated failure in nutrition education and public health campaigns. There is some indication that it helps make the problem worse by promoting anxiety, confusion and aberrant dieting.

It is urgent to integrate into nutrition the wide, cross-disciplinary spectrum of knowledge relevant to the understanding of the human omnivore's eating behavior and complex relationship to food.

Keywords: Food selection, food habits, social and cultural determinants, individualization

Conflict of Interest disclosure: CF has received funding from public agencies and private or semi-private sector to investigate structure and evolution of food and eating patterns.

TASTE RULES FOR KIDS

Orlet Fisher, Jennifer.

PhD. Professor of Social and Behavioral Sciences. Associate Director. Center for Obesity Research and Education. Temple University. USA.

Early childhood is considered to be a critical period for establishing healthful eating habits. At the same time, many of the poor dietary patterns seen among adults begin to emerge early in life. It has long been appreciated that taste plays a central role in shaping children's food preference and is rooted in biology. Preferences for sweet and savory tastes as well as rejection of bitter and sour tastes are seen well before children experience the first tastes of solid or complementary foods. From this perspective, children's love of sweets and dislike of vegetables seem a foregone conclusion. To what extent does taste actually rule when it comes to food choices among young children? While taste (and more recently temperament) predisposes children to readily prefer certain types of foods over others, the trajectory of food acceptance is fundamentally driven by experience that starts in early development. Children show the capacity to learn to accept a wide variety of foods in their diets, including vegetables which are neither particularly sweet nor energy-dense. Thus, the rules of taste are less deterministic

and more pliable than often perceived by parents and other adults who routinely feed young children. What are the essential rules for promoting acceptance of healthful food choices? Context is everything. Familiarity is one of the most fundamental dimensions of food preferences: children eat what they like and like what they know. A large body of evidence demonstrates that repeated exposure promotes liking via the accumulation of positive experiences around eating—both social and biological. Practices of caregivers, along with the broader socioeconomic environment, set the stage for these experiences. Caregivers determine which foods will become familiar to children, exhibit like and dislike of foods that children learn to model, and use practices that shape children's food preferences and choice. Children's preferences for sweets, for instance, are not only rooted in taste biology but are also socially reinforced by the use of such foods as treats, rewards, and celebration. Social context not only shapes children's understanding what and how much to eat, but also the time of day when eating should occur (e.g. snacks), the way foods are prepared and paired at a given eating occasion (e.g. a meat and a vegetable at meals), and salient qualities of those foods (e.g. healthy, treats). Practices around feeding children, in turn, reflect conditions of the local environment (e.g. availability and cost) as well as norms, values, and behaviors of family, community, and culture. For instance, snacking and eating sweets between meals is normative among US children, but uncommon in other countries. Collectively, these observations suggest that taste rules are universal but are not destiny for food choice among children. Rather, children's choices are rooted in the accumulation of day-to-day experiences—at the family table, in the school cafeteria, eating with their grandparents—and the multi-faceted social contexts in which those experiences occur. Repeated exposure to healthful foods in positive social contexts is the key rule for promoting healthful dietary patterns in early childhood.

Keywords: Children, taste, preference, acceptance, repeated exposure

Conflict of Interest disclosure: Sponsored by General Mills

COST AND CONVENIENCE IN FOOD CHOICE

Drewnowski, Adam.

Center for Public Health Nutrition. University of Washington. USA.

There is more to eating than nutrient consumption. There is more to non-communicable diseases than nutrient excess. Studies in nutritional epidemiology have tried to convince us that a single food, nutrient, or dietary ingredient could be linked to a specific health outcome, after adjusting for multiple covariates. Typically, socioeconomic variables were adjusted for, and thus removed from consideration, in order to show us the "true" relation between dietary components and health. As nutrition has come to embrace the social sciences, it has become clear that it is impossible to separate the food from the person and the person from society. The current trend is to analyze total food patterns, rather than nutrients, and their likely impact on health and well-being.

Indeed, recent dietary advice in the US has focused on total diets, with a focus on the USDA-style, Mediterranean style, DASH, and vegetarian food patterns. More attention is being paid to social inequities and to the socioeconomic determinants of both diets and health. The "new nutrition" science draws on insights from allied disciplined to illustrate the dynamics of food decision making across the world. Any attempts to improve dietary behaviors in target populations must be respectful of both cultural and social boundaries and economic constraints.

People with one type of dietary pattern may differ in several unobserved ways from people with another dietary pattern. In marketing studies, taste, cost, convenience, health, and variety are recognized as the key drivers of food choice, along with the food environment and socioeconomic status. Yet the monetary cost of diets and the geography of food retail and food consumption patterns have not yet entered mainstream nutritional epidemiology. First, linking dietary intakes from 24h recalls, food records, or food frequency questionnaires with retail prices (per 100g, edible portion) allows for the estimation of diet costs at the individual level. The monetary costs of foods is effectively treated as another nutrient vector; cost calculations follow the same principles as calculations of diets' energy or vitamin content. This procedure has permitted new studies on the relation between diet quality, diet cost and health outcome. Not surprisingly, higher diet cost was associated with better long term health outcomes.

Second, geo-location of dietary intakes data opens the door to new studies in spatial nutritional epidemiology. We have developed microsimulation modeling tools to map food related attitudes, diet quality and even obesity rates at the unprecedented census block level. Geo-positioning trackers have been used to map shopping patterns. Again, socioeconomic variables predicted the relative consumption of sugary drinks versus salad in Seattle King County. Dietary choices appeared to be driven by economics.

Within cities and countries, and across the world, there are dramatic social disparities in diet quality. This talk will consider how geography and economics influence food choice, and ultimately health. There are also opportunities to extend these procedures across regions and globally.

Keywords: Spatial epidemiology, food prices, diet costs, economics, geo-location

Conflict of Interest disclosure: Conflict of Interest disclosure: AD has received grants, contracts, and honoraria from public agencies, private industry, private foundations, and commodity groups for projects involving nutrient profiling, diet quality assessments, and health outcomes.

Track 4: Nutrition and Management of Diseases

SSS_144/129

STEVIA: AN ALLY TO SUPPORT NUTRITION AND HEALTH

HEALTH AND WELLNESS OF STEVIA

Ayoob, Keith.

EdD, RD. Nutritionist. Associate Professor of Pediatrics. Albert Einstein College of Medicine. New York City. United States of America.

According to the latest WHO report, an estimated 422 million adults were living with diabetes in 2014, compared to 108 million in 1980. Now, one in twelve adults around the world has diabetes. In addition, the prevalence of overweight and obesity is one of the most serious health challenges of the century. Worldwide obesity has doubled since 1980 with almost two billion adults 18 years and older being overweight, of that, more than 600 million being obese.

Global policy guidelines have called for healthier lifestyles in general, for adults and children, and more specifically for reductions in calories and sugar consumption. Global and national health organizations recommend reducing added sugar to less than 10% of calories, with the WHO recommending aiming for less than 5% of total calories from added sugar. Achieving this is nearly unrealistic without the use of low- and zero-calorie sweeteners.

Stevia, being calorie-free, is part of the solution towards sugar reduction and weight management while providing sweet taste and it is a relevant option for a healthy lifestyle and for the diabetic population. Stevia leaf extracts have key health and wellness benefits due to their zero contribution to caloric intake. Emerging evidence suggests stevia may have a unique role in helping diabetics manage blood glucose levels. Additionally, stevia is plant-derived, providing an option for diabetics and others who prefer a naturally sourced zero-calorie sweetener.

Keywords: Diabetes, sugar reduction, obesity, overweight, stevia

Conflict of Interest disclosure: This symposium was sponsored by International Stevia Council (ISC) & Calorie Control Council (CCC) (Belgium)

GLOBAL DEMAND FOR STEVIA AND STEVIA LABELLING WORLDWIDE

Scardigli, Maria Teresa.

Executive Director. International Stevia Council.

Increased consumer interest in calorie-reduced products combined with a stronger than ever call for natural products has boosted the demand for high purity stevia extracts. In the last 3 years stevia has become a mass volume natural sweetening ingredient and has been heavily endorsed by core brands at the worldwide level: this trend is expected to continue in the future. Such development positively impacts all the players in the stevia value chain, including stevia leaf growers and will benefit many regional economies, such as in the Latin American region. Depending on the region, product labeling requirements vary slightly but the ability to use the word "natural" or "naturally occurring" in advertising materials varies more widely. The presentation aims at giving an overview of the global demand for stevia as well as an overview of the differences in labeling across several regions of the world.

Keywords: Stevia. Sweetening ingredient. Calorie-reduced products. Latin American region. Labeling.

Conflict of Interest disclosure: This symposium was sponsored by International Stevia Council (ISC) & Calorie Control Council (CCC) (Belgium)

OVERVIEW OF STEVIA APPROVALS BY THE GLOBAL SAFETY AUTHORITIES

Roberts, Ashley.

Intertek Scientific and regulatory Consultancy.

The presentation will review and evaluate the extensive research conducted to demonstrate the safety of high purity stevia extracts and how in particular the metabolic profile for the various glycosides including those conjugated with glucose, rhamnose and xylose permit the bridging of toxicological studies conducted with stevioside and rebaudioside A to all glycosides present within the leaf. The presentation will focus on the derivation of the ADI particularly by JECFA, which has been adopted on an International basis and the current global regulatory status taking in to account various estimated exposure paradigms, within different demographic populations. In addition to the evaluation of the steviol glycosides present within the leaf, new technologies are continuously being developed including those associated with a) enzyme modified glycosides, b) bioconversion and, c) steviol glycosides from genetically modified yeast. The presentation will therefore look briefly at the differences in production processes and provide a summary of the current international regulatory status of these materials.

Keywords: Stevia, Glycosides, regulatory

Conflict of Interest disclosure: This symposium was sponsored by International Stevia Council (ISC) & Calorie Control Council (CCC) (Belgium)

APPLICATION AND INNOVATION IN STEVIA AND TASTE DEVELOPMENT

Fry, John.

Director. Connect Consulting. UK.

This presentation focusses on technological advances in understanding sensory properties of leaf-derived steviol glycosides. The objectives were to investigate the taste relationships of simple combinations of pure glycosides and to develop a predictive methodology to assist the formulation of leaf-based ingredients of improved performance. Such advances aim to satisfy expectations of global consumers for sugar reduction through zero-calorie sweeteners with sugar-like taste.

Intensive sensory investigations of purified individual glycosides allowed the creation of concentration-response curves for sweetness, bitterness and the licorice side-taste. Glycosides were then examined in pairs, looking for synergy in sweetness or suppression of undesirable tastes. Where beneficial responses were found, these pairs were supplemented further with single glycosides to create ternary and quaternary mixtures.

The data from these interactions allowed mathematical modelling of their taste relationships. The models, in turn, indicated unsuspected combinations of glycosides with potentially superior taste performance. The model combinations were then created on a laboratory scale and checked by taste panel for quality.

This approach resulted in a number of novel glycoside mixtures, including minor glycosides, that maximised sweetness while minimizing unwanted side-tastes. Key to this success were critical concentrations of rebaudiosides A, B, D and, surprisingly, stevioside.

With this knowledge, natural leaf extracts of different composition could be selected and blended to produce ingredient-grade materials of outstanding taste. The performance of these leaf extracts, verified in consumer products, allows greater degrees of sugar reduction (70%+) than earlier types, such as those based on about 80% rebaudioside A content. The latter were limited to about 30-50% sugar reduction in a 10% sucrose equivalent sweetness intensity beverage.

Keywords: Stevia, innovation, synergism, taste, sensory

Conflict of Interest disclosure: The author is an external consultant to Cargill Inc.

Further collaborators: Anne Brockhoff . Technische Universität München § German Institute of Human Nutrition Potsdam-Rehbrücke

Ting Carlson, Nicole Cuellar-Kingston, Hanna Drake, Nicole Falk, Brian Guthrie, Betsy Jones, Nathan Knutson, Paula Krogmann, Allison Leibovich, Tim Lindgren, Tommy Mao, Melinda Montgomery, Kris Mortenson, Michael Mortenson, Ravi Nana, Andrew Ohmes, Wade Schmelzer, Sean Smith, Paige Ties, Christopher Tyler, Nese Yurttas. (Cargill Inc.Consultant, Calorie Control Council)

Caroline Hellfritsch, Thomas Hofmann. (German Institute of Human Nutrition Potsdam-Rehbrücke)

Wolfgang Meyerhof, Frauke Stähler. (Technische Universität München)

PHYTOCHEMICALS & NON-COMMUNICABLE DISEASES

NON-NUTRIENT PHYTOCHEMICALS & NON-COMMUNICABLE DISEASES

Li, Duo.

Qingdao University. China.

Malnutrition is sharply decreased, and over or imbalanced nutrition and lifestyle related disorders are dramatically increased during past two decades globally. Food and medicine arise from the similar origins. In the early era, people experienced sickness, diarrhea, unconsciousness, even death due to ingestion of poisonous plants, while some ailments were alleviated or relieved after eating certain plants. Over time, we have learnt to identify and classify plants based on their characteristic features, as well as developed knowledge about herbal medicines. During the past century, scientists have isolated and identified thousands of compounds from natural sources, and exploited their usage and the relationships between these compounds and their molecular mechanisms. Numerous preparations of natural products are commercially available on the market worldwide. Substantial functional foods and nutraceuticals have been developed such as omega-3 fatty acid, flavonoids and isoflavones, isothiocyanates, carotenoids, dietary fiber, probiotics, prebiotics, phytosterols, polyphenols, alkaloids, terpenoids, saponinoids, polysaccharides, peptides, curcumin, parthenolide, cucurbitacins, 1,8-cineole, pseudopterosins, catechins, capsaicin, conjugated linoleic acid, fucoxanthin, soy isoflavone, glabridin, astaxanthin and cyaniding-3-glucoside, lyprinol, bromelain, marine sponge natural products and Boswellia serrata gum resin etc. They are widely used to adjunctive prevent and treat lifestyle-related continually increasing non-communicable diseases such as diabetes, cardiovascular diseases, cancers, mental disorders, senile dementias, body weight control etc.. However, some functions are need to be confirmed by randomised controlled clinical trial, and detailed mechanism need to be explored.

Conflict of Interest disclosure: This symposium was sponsored by Sunwins Commodity Sales Co., Ltd & Qingdao University (China)

XANTHINE OXIDASE INHIBITORY CONSTITUENTS OF CELERY SEEDS

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Apium graveolens is a well known herb of family apiaceae. The seeds, i.e. celery seeds are used as flavoring agents and as an an-

ti-rheumatic formulation and showed significant effects on arthritic pain relief, for treating rheumatic conditions and gout. According to our bioassay, the 50% ethanol extract of celery seeds showed moderate inhibitory activity on XOD. To clarify its active constituents, the extract was further separated to provide two flavone glycosides named graveobioside A (1) and luteolin-7-O-β-D-glucoside (2) elucidated by MS/MS and NMR techniques. Graveobioside A and luteolin-7-O-β-D-glucoside possessed potent activities against XOD with IC50 values of 287.17±2.3 and 77.36 ± 4.70 μg/mL, respectively. To further investigate inhibitory activity of graveobioside A on XOD, three types of animal models were established to evaluate its effects in mice. The effect of graveobioside A on potassium oxonate-induced hyperuricemia in mice was determined. The results indicated that the serum uric acid level in each dose group of graveobioside A(20 mg/kg10 mg/kg and 5 mg/kg) significantly was reduced than that of hyperuricemic group (P<0.01);In addition, the middle and high dose groups of graveobioside A could obviously inhibit XOD activity in serum(P<0.05). Then carrageen-induced mice paw edema model was employed for the anti-inflammatory activity of graveobioside A. The result showed each dose group of graveobioside A possessed most activities against inflammation. The rat acute feet swelling induced by sodium urate was often used to test compounds effects on gouty arthritis. The middle and high dose group of graveobioside A had significant activity compared to the model group (P<0.01). Therefore, graveobioside A had potential activity to treat gout and gouty arthritis

Conflict of Interest disclosure: This symposium was sponsored by Sunwins Commodity Sales Co., Ltd & Qingdao University (China)

NON-COMMUNICABLE DISEASES AND ITS PREVENTION IN CHINA

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Along with the rapid development of social and economic, transitions in diseases pattern has been changed from infectious diseases to the non-communicable diseases (NCDs). In 2012, the mortality rate of NCDs among Chinese residents was 533/100 000, accounting for 86.6% of the total deaths. Cardio-cerebrovascular disease, cancer and chronic respiratory disease were the main cause of death, accounting for 79.4% of total deaths. The prevalence of overweight and obesity in adults aged 18 and over were 30.1% and 11.9%, respectively, while that for children aged 6~17 year olds were 9.6% and 6.4%, respectively. The prevalence of hypertension in adults aged 18 and over was 25.2 % and the prevalence of diabetes was 9.7%. According to the results of the national cancer registration in 2013 in China, the incidence of cancer was 235/100 000. It is indicated that unhealthy lifestyle including unhealthy dietary

pattern, smoking, excessive drinking, inadequate physical activity and the extension of sedentary time, and psychosocial stress was the main risk factors for the epidemic of NCDs. The epidemic of NCDs brings serious burden to economy. In 2003, the direct economic burden of five major chronic diseases (coronary heart disease, stroke, hypertension, cancer and diabetes) was 151.422 billion RMB; in 2010, the direct economic burden of five major chronic diseases was 211.436 billion RMB, accounting for 10.6% of the total health expenditure. It is estimated that the cost of cardiovascular disease, cancer, chronic respiratory disease, diabetes, and mental health will total 191 trillion RMB for the period 2012-2030. The preventive interventions of NCDs are highly cost-beneficial. Economic analysis showed that the comprehensive intervention, dietary intervention and physical activity intervention for obesity could avoid the loss of productivity equivalent to 314144.8 RMB, 31738.6 RMB, and 16391.6 RMB, respectively; and medical expenses equivalent to 37448.1 RMB, 3357.0 RMB, and 2486.0 RMB, respectively. In order to control the epidemic of NCDs, the Action Plan of control and prevention of NCDs has been issued in 2012. The Action Plan of Health China 2030 has been launched in 2016. The cost-effective and cost-beneficial measures have been identified and implemented.

Keywords: Non-communicable diseases; Risk behavioral factors; Economic burden; Prevention and control

Conflict of Interest disclosure: This symposium was sponsored by Sunwins Commodity Sales Co., Ltd & Qingdao University (China)

OMICS BASED STUDY ON N-3 PUFA IN THE PREVENTION AND TREATMENT OF TYPE 2 DIABETES IN ASIAN

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Background and Objectives: The interaction of genomics and metabolomics with omega-3 fatty acids among the Asian type 2 diabetic patients is not clear. We aimed to investigate the interaction between genes and omega-3 fatty acids for type 2 diabetes risk and for glycemic traits among type 2 diabetic patients. In addition, we aimed to examine the response of metabolomics profiles to omega-3 fatty acid intervention.

Methods: We conducted a case-control study involving 622 type 2 diabetic patients and 293 healthy controls, and a double-blinded randomized controlled trial among 185 type 2 diabetic patients for omega-3 supplements over 6 months. Among these participants, we genotypes several type 2 diabetes-related genetic variants to examine the interaction between omega-3 fatty acids and these genetic variants for type 2 diabetes in the case-control study and for glycemic traits in the trial. In addition, we examine the effect of omega-3 fatty acid intervention on the metabolomics profiles in a subset of the patients.

Results: In the case-control study, we found significant interaction between a genetic risk score generated from 9 type 2 diabetes-related genetic variants, with the inverse association between erythrocyte alpha-linolenic acid and type 2 diabetes only observed in those with low genetic risk. In addition, PEPD variant interacts with total erythrocyte omega-3 fatty acids for type 2 diabetes risk, with the genetic risk of PEPD variant being abolished in high omega-3 fatty acid group. In the randomised trial, we did not detect similar gene-fatty acid interaction pattern as in the case-control study. In the metabolomics analyses of the trial, we identified a most significant biomarker of omega-3 fatty acid supplements: 3-carboxy-4-methyl-5-propyl-2-furanpropanoate, a furan fatty acid metabolite. Change of this metabolite is positively correlated with change of serum eicosapentaenoic acid and docosahexaenoic acid, but negatively correlated with change of serum triglycerides.

Conclusions: Both genomics and metabolomics approaches could help advance our understanding about the role of omega-3 fatty acids in type 2 diabetes prevention and treatment.

Conflict of Interest disclosure: This symposium was sponsored by Sunwins Commodity Sales Co., Ltd & Qingdao University (China)

Track 5: Nutrients and Nutritional Assessament

SSS_144/1033

EARLY DETECTION OF MALNUTRITION IN THE FACILITY AND COMMUNITY SETTING FOR IMPROVED HEALTH AND ECONOMIC OUTCOMES

IMPROVING HEALTH OUTCOMES: EARLY DETECTION OF MALNUTRITION UTILIZING VALIDATED TOOLS

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Background and Objectives: Effective implementation of nutrition care plays a key role in achieving improved patient outcomes. Malnutrition negatively affects the patient evolution in terms of higher morbidity, mortality, re-admissions, prolonged hospitalizations and costs. Increased medical awareness regarding the impact of nutritional status on patient outcomes is essential. Malnourished patients cost more than patients with similar diseases who are well-nourished, demonstrating an independent and additive effect of malnutrition on negative outcomes. When malnutrition is identified and interventions are implemented, use of medical care and resulting costs decrease. Therefore, early use of screening and assessment tools (at hospital admission) to identify risk factors, establish a diagnosis of malnutrition and enable effective treatment is fundamental to provide the highest quality of care and improve patient outcomes. Methods: An estimated 30-50% of hospitalized adult patients are malnourished in the U.S. and internationally based on a combination of malnutrition screening and assessment studies. Yet, research indicates that the diagnosis/identification rate remains low with only 3.2% of adult patients are discharged with an International Classification of Diseases, Ninth Revision (ICD-9) malnutrition diagnostic code. Screening and assessment are different processes, the former should identify risk factors and the latter provides diagnosis. Both serve essential roles in creating a inter-disciplinary patient care plan. Results: A triangulation of indices is necessary to determine nutrition status. Weight loss in the last six months and decreased food intake are included in many of the various tools. Both are simple, easily available, do not require use of additional devices, can be provided by the patient or any member of the family and are related to morbidity and mortality in different populations. There are more sophisticated measurements including computed tomography and functional tools, particularly in cancer units, that when available can be added to increase accuracy. Conclusions: Dissemination and implementation of simple, validated tools that can be utilized in a variety of global healthcare settings, to early and accurately assess risk for and identify the presence of malnutrition is fundamental to improving patient and system level health outcomes.

CREATING A REPLICABLE MODEL OF NUTRITION CARE EXCELLENCE IN THE CLINICAL SETTING

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Background and Objectives: Optimal quality of care is a must for all healthcare institutions across the world. Nutritional care processes must be a priority for hospitals, thus supporting their implementation in clinical outcomes. This is why the conception of nutritional care processes allows hospitalized patients experiencing superior results.

Considering the current approach of healthcare models, it is of utmost important to generate strategies that allow healthcare systems improve their process performance by integrating nutritional management into their patients' clinical care. A comprehensive model responds to the nutritional needs of hospitalized patients under the superior concept of generating value.

Objective: To develop a model of hospital nutritional care that allows minimizing malnutrition related risks, optimizing care processes and improving clinical outcomes of hospitalized patients.

Methods: A systematic review of literature on hospital nutritional care models informed the construction of a new nutritional model in 2016, which was consulted and validated with feedback from 10 participating hospitals.

Results: Publications related to nutritional quality standards have focused on methods of measuring the activities of nutrition processes, thus making it necessary to propose a model of easy duplication and validation in different scenarios of clinical practice. The model aims to promote good practices for clinics delivering nutritional interventions based on set criteria of excellence. Using existing literature on nutritional care models for inpatients and subsequent fieldwork, four lines of patient care plans were proposed: 1. Identification of nutritional risk; 2. Intervention and follow-up; 3. Exchange doors: path of patient care to ensure continuity of treatment; and 4. Education and generation of culture of nutritional care to the patient, caregiver, family and organization.

Quality standards were established to demonstrate the applicability of the model considering the need for organizations to evaluate the impact on their clinical results, ,inform the construction of models aimed at being differentiators through creation of value for the patients, and lead organizations to be centers focused on excellence.

Conclusions: The construction of the new model of care allows the achievement of processes of healthcare of superior value in order to bring hospital nutrition to sites of relevance previously not considered.

Keywords: Nutrition Therapy, Quality of Health Care.

REDUCING THE ECONOMIC BURDEN OF DISEASE-ASSOCIATED MALNUTRITION THROUGH TARGETED INTERVENTIONS ACROSS THE CONTINUUM OF CARE

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Background and objectives: Disease-associated malnutrition costs health care systems across the globe billions of US dollars annually. This is a result of the direct and indirect costs associated primarily with higher rates of health care resource utilization by malnourished patients compared to their well-nourished counterparts. Nutrition interventions can be effective in terms of alleviating the burden of malnutrition and improving patient outcomes. Increasingly more real-world, pragmatic study designs such as quality improvement programs (QIPs) are used to study nutrition care improvements for malnourished patients across the continuum of care.

Objectives of the presentation include 1) brief overview of economic burden of disease-associated malnutrition; 2) review studies implementing effective research methods used to study nutrition interventions and their impact on patient health and economic outcomes; and 3) discuss key pragmatic studies targeting inpatients and community-dwelling malnourished adults.

Methods: Review of real-world, pragmatic research studies implemented in both US and ex-US countries aiming to assess the impact of nutrition-focused interventions on health and economic outcomes of malnourished hospitalized patients and community-dwelling adults.

Results: Report the results of different pragmatic research studies assessing the effectiveness of nutrition interventions on patient outcomes including significant reductions in 30-day unplanned readmissions, hospital length of stay, and health care costs.

Conclusions: Unplanned 30-day readmissions, length of stay, and healthcare costs among malnourished inpatients and community-dwelling adults can be significantly decreased through nutrition-focused pragmatic programs that include comprehensive screening of patients for malnutrition, prompt administration of oral nutrition supplements, and education of malnourished patients in both hospital and community settings. Real-world, pragmatic study designs are effective methods of generating data that can inform effective decision making in the optimization of nutrition care for malnourished adults across the continuum of care.

Keywords: Economic burden, malnutrition, oral nutritional supplements, pragmatic designs, outcomes research/QIP

Conflict of Interest disclosure: Abbott Nutrition Employee

ADVANCING CLINICAL QUALITY IMPROVE-MENT PROGRAMS: A DATA DRIVEN APPROACH TO CAPTURE THE COST OF MALNUTRITION

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Background and Objectives: Nutrition deterioration or malnutrition risk among hospitalized patients is associated with increased complications, hospital stays and readmissions, which can lead to increased healthcare costs and resource utilization. Malnutrition risk, however, is not easy to detect unless actively searched and hospitals are concerned about the costs associated with the screening process. While different screening tools are available for hospitals to use, the Malnutrition Screening Tool (MST), which is a validated and easy to use tool has been shown to be the most valid and reliable tool for the identification of malnutrition in hospitalized patients.

Presentation objectives include 1) Brief review of studies evaluating hospital-associated malnutrition prevalence of up to 69%; 2) Presentation of a real-world cohort study aiming to evaluate malnutrition screening rates in four Colombian hospitals and report readmission rates and direct costs differences between patients with positive and negative MST results; 3) Presentation of descriptive results of a pilot study including MST screening rates, positive frequencies, and readmission rates; and 4) Discussion of study implications to highlight the importance of formal malnutrition screening programs and nutrition-focused interventions for malnourished hospitalized patients.

Methods: Review of previously published malnutrition studies and detailed overview of a cohort study in four Colombian tertiary care centers aiming to assess malnutrition screening rates, incidence of positive MST results, readmission rates and direct cost differences between malnourished and non-malnourished patients with acute myocardial infarction, community acquired pneumonia, chronic obstructive pulmonary disease and heart failure.

Results: Descriptive results (i.e., demographics and frequency of screening and of positive MST results) and comparative results in terms of length of stay, readmission and cost differences for malnourished versus non-malnourished patients participating in the real-world cohort study and the pilot ongoing study will be reported.

Conclusions: Healthcare costs of malnourished hospitalized patients are significantly higher than their well-nourished counterparts resulting primarily from prolonged hospitalizations and readmissions. The MST can be effectively used for identification of malnourished Colombian patients in need of nutrition-focused interventions. We will report findings of two studies suggesting that identification of malnourished patients can lead to improved health and economic outcomes for patients and hospitals.

Keywords: Malnutrition - Screening - Real-world - Healthcare costs - Nutrition-focused interventions

Conflict of Interest disclosure: Study funded by Abbott

Track 6: Functional Foods and Bioactive Compounds

SSS_144/20

ADDRESSING TODAY'S NUTRITION AND PUBLIC HEALTH CHALLENGES WITH FOOD TECHNOLOGY INNOVATIONS

INNOVATION IN INGREDIENT TECHNOLOGY TO ADDRESS NUTRITION, HEALTH, AND CONSUMER NEEDS

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Ingredient and food technology can produce practical, functional solutions to help people meet dietary recommendations and address some of the world's most significant public health-related challenges. To combat the rise of obesity and diet-related chronic diseases, global health and nutrition authorities have called for an "all sector approach" to encourage diets reduced in total calories, sodium, added sugars and with increased dietary fibre content to deliver adequate amounts of essential nutrients. Research shows that taste remains the most important attribute in food choice, reinforcing the need for new strategic solutions to improve the quality of the diet. Food technology is essential in the global effort to improve public health while delivering the great tasting foods and beverages that consumers expect. New technologies and innovative ingredient solutions are helping to address fibre and protein enrichments as well as sodium, added sugars and calorie reduction in foods and beverages. In addition, a number of added fibres also provide additional health benefits such as laxation, favorable glycemic response, and improved calcium absorption and bone calcium retention.

Investment in nutrition research and innovation has allowed ingredient manufacturers to work closely with food and beverage manufacturers, to deliver healthy options without compromising taste and texture.

Keywords: Food technology, Dietary fibre, Public health, Nutrition

Conflict of Interest disclosure: Employed by Tate & Lyle

FOOD TECHNOLOGY AND INGREDIENT INNOVATIONS: POTENTIAL IMPACT FROM A PUBLIC HEALTH PERSPECTIVE

Ferruzzi, Mario.

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Addressing public health challenges requires a healthful food supply that provides diverse options for consumers to meet dietary guidance and nutritional needs. This notion must include consideration of the consumer's preferences for taste, quality and price within the modern food environment. With delivery of positive nutritional attributes increasingly becoming an important component in consumer choice of food, the potential to mix messages on consumer perception of factors impacting nutrition and health has grown. It is therefore critical to continue to foster collaborations between food science and nutrition disciplines that lead to development of consumer foods that are aligned to key principles of existing dietary guidance policies. To achieve this goal, advances in food and ingredient technology have been a critical tool for product researchers allowing for development and promotion of a diverse array of quality products that can fit within the lifestyles of a broad consumer base and align with existing dietary guidance. This lecture will focus on describing the manner in which food science and technology is a translational tool for nutrition science and policy. We will describe the existence of collaborations between these disciplines leading to innovations that can help consumers reach the aspirations of dietary guidance. Examples of food science and technology creating new and innovative nutrient dense food options for consumers and the continued progress on reducing nutritional limiters will be provided, including reduction strategies for added sugars, saturated fats and sodium in processed foods which have provided options for consumers to align to a healthy eating pattern. These examples of existing alignment will be balanced with the continued efforts that are required within the context of promoting constructive dialogue which can promote better consumer food options.

Keywords: Food Technology. Food Ingredients. Dietary Guidance. Public Health

Conflict of Interest disclosure: Corporate Advising/Board Service: Coca Cola Company. Sensient Technologies. Welch's Foods

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Travel Support: Tate & Lyle

SSS_144/1005
EMERGING SCIENCE ON BIOACTIVES AND WHOLE GRAINS

THE ROLE OF BIOACTIVE COMPOUNDS IN WHOLE GRAINS: POTENTIAL BENEFITS FOR HUMAN HEALTH

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Epidemiologic research has consistently identified beneficial associations between consumption of whole grains and whole grain foods and lower prevalence of a number of chronic diseases. New research is also pointing towards the prebiotic effect of whole grains on the human gut microbiota, indicating a potential benefit for digestive health.

While whole grains and whole grain foods provide major sources of carbohydrates, protein, B- vitamins, minerals and phytochemicals, they also contain extra nutritional elements known as bioactives. According to the National Institute of Health (NIH), dietary bioactive components are defined as compounds that are constituents in foods, other than those needed to meet basic nutritional needs which are responsible for changes in health status.

The major bioactives found in whole-grains are phenolic compounds including phytosterols, dietary fibers (beta-glucan), lignans, alkylresorcinols, phytic acid, γ-oryzanols, avenanthramides, cinamic acid, ferulic acid, inositols and betaine. Currently, no recommended intake levels for dietary bioactive components have been established, but it is well understood that the majority of bioactive compounds of whole-grains are present in the bran and germ fraction of cereal-grains.

To date, scientific researchers understand that bioactives may elicit health benefits through multifactorial physiological mechanisms. Potential mechanisms include antioxidant activity, mediation of hormones and inflammation, enhancement of the immune system, and facilitation of substance transit through the digestive tract. The additive and synergistic effects of the biologically active compounds within whole grains and whole grain foods may be responsible for their health benefits.

The objectives of this session are to provide an overview of bioactive components found within all whole grains and describe the potential impact of dietary bioactives on human chronic disease states or conditions such as type 2 diabetes, obesity, cardiovascular disease, cancer and digestive health. An open discussion of the need for recommended intake levels for bioactives will also be included during this session.

Keywords: Whole grains, bioactives, oats, health benefits, recommended intake levels

Conflict of Interest disclosure: Renee is a consultant for her own company, Premier Nutrition, LLC, Minneapolis, MN, 55401. She has received honoraria from PepsiCo to support preparation and presentation of this abstract. The views expressed in this abstract are those of the author and do not represent position or policy of PepsiCo, Inc.

OATS. MORE THAN JUST A FIBRE: THE ROLE OF UNIQUE BIOACTIVE AVENANTHRAMIDES

Sang, Shengmin.

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Oats (Avena sativa L.) have been cultivated for more than two thousand years in various regions throughout the world, and considered as a multifunctional crop nutritionally superior to many other unfortified cereals. They are commonly consumed as a whole grain and are known to provide healthy nutrients, such as proteins, unsaturated fatty acids, vitamins, and minerals, to humans. Numerous laboratory and clinical studies have demonstrated that consumption of oat-based products can lower serum cholesterol levels, reduce glucose uptake, decrease plasma insulin response, and prolong satiety. The beneficial nutritional properties of oats have attracted attention from scientific researchers and the general public, and have resulted in the food industry using oats as a food ingredient more extensively. Oats can be found in various food products, including breakfast cereals, beverages, bread and infant foods.

Oat is a good source of dietary soluble fibre especially β-glucan, which has outstanding functional and nutritional properties. β-Glucan has been considered as the major active component in oat for its positive impact on cholesterol and glucose disposition. However, the nutritional benefits of oats appear to go beyond fiber to bioactive phytochemicals with strong antioxidant and anti-inflammatory effects. Oats contain many bioactive phytochemicals, which are structurally diverse secondary metabolites synthesized by plants. The major phytochemicals in oats include carotenoids, vitamin E, phytosterols, saponins, phenolic acids, flavonoids, lignans, and avenanthramides (AVAs).

Among these phytochemicals, AVAs are phenolic compounds that are unique because they are found exclusively in oats and not in any other cereals. More than 25 AVA compounds have been identified since they were first isolated in the 1980s, with the most abundant being 2c, 2f and 2p. The total concentrations of AVAs in oat grains can reach up to 300 mg kg-1 based on literature reports. However, some processing can result in a decrease in total AVAs. Recently, AVAs have been reported to possess different bioactivities that may have a health benefit, such as antioxidant, anti-inflammatory, and cholesterol lowing activities.

The nutrition of oats appears to go beyond the benefits of fibre, to also include possible benefits of bioactives for their strong antioxidant and anti-inflammatory effects, suggesting intake of oats have the potential to contribute to prevention of some chronic diseases. However, the studies on the beneficial health effects of AVAs are still in their infancy. Additional health benefits of AVAs may yet be identified. Therefore, more research is needed in this area.

Keywords: Oats. fiber. phytochemicals. avenanthramides. health effect

FROM RESEARCH TO DIETARY RECOMMENDATIONS

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Whole grain oats are well-known for its many health benefits due to their nutrient-rich content, but mainly caused by the effect of β-glucan, its viscous soluble fiber which has been subject of research for a long time.

Since 1963, scientific research has shown evidence regarding soluble fiber and its lowering cholesterol properties to achieve a risk reduction on heart diseases when consumed with a healthy diet and a regular practice of physical activity.

The U.S. Food and Drug Administration (FDA) states that 3 g or more of β-glucan (oat soluble fiber) in conjunction with a diet low in saturated fat and cholesterol can reduce the risk of coronary heart disease; the American Heart Association also supports this statement. To achieve the heart health benefit, 56-150 g of whole grain oats can be consumed per day in form of oat bran, oat flakes, or in foods containing oats; e.g. ½ cup (40g) of oat flakes contain 2 g of β-glucan.

In regards to a glycemic response effect, the European Food Safety Authority (EFSA 2011) published an opinion allowing health claims for postprandial blood glucose response reduction when 4 g of β-glucans from oats for each 30 g of available carbohydrate should be consumed per meal.

Controlling appetite in order to adhere to dietary recommendations for weight loss /maintenance is necessary. Studies on the effect of oats on satiety have shown benefits at amounts of β-glucan ranging from 2.2g to 5.5g. Viscosity plays an important role in this effect, and then any processing could affect physicochemical process. This should be considered when we are looking for a satiety effect.

Besides soluble fiber, oats are also a source of insoluble fiber. A portion of 30g of oats contributes with approximately 10% of the daily value for fiber, which can be beneficial to achieve fiber recommendation. Both types of fiber are highly beneficial for digestive health.

Additionally, the nutrient content beyond fiber: unsaturated fatty acids, vitamin B complex and nutrients with antioxidant function make oats and oat containing products a great choice to improve breakfast quality.

Keywords: Oats, soluble fiber, health benefits, beta-glucan.

IS THERE A ROLE FOR DIETARY/FOOD SUPPLEMENTS IN NUTRITION AND HEALTH?

FROM CHALLENGES OF THE PAST TO OPPORTUNITIES OF THE FUTURE: EVOLUTION OF THE FIELD OF NUTRITION

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The field of nutrition has evolved drastically over the past century. This has paralleled a shift in public health challenges from those related to communicable disease to lifestyle-related non-communicable disease. Nutrition scientists and policy makers are now faced with the dichotomous situation of malnutrition and obesity, with its associated comorbidities. In an attempt to control spiraling healthcare costs, societies' focus has shifted as well, to one aimed at prevention, and health maintenance and promotion. Nutrition research has in turn gone through a necessary evolution. Rapid advances in research and technology have led to important discoveries in the "omics" and microbiome. While these have greatly informed the understanding of the diet/lifestyle-chronic disease relationship, rates of chronic disease show no signs of abating in both developed and developing countries. This shortcoming may be due in part to the application of a reductionist approach, driven by a desire to understand what is responsible for nutritional effects down to the specific nutrient or molecule. This approach has necessarily expanded in recent years to become more holistic and multidisciplinary to better understand the role of nutrition in a broader context. Ultimately this approach will culminate in a full understanding of the dietary landscape – a web of interactions between nutritional, dietary, social, behavioral and environmental factors – and how it impacts health maintenance and promotion.

Keywords: Nutrition, non-communicable disease, dietary landscape, health promotion

Conflict of Interest disclosure: Dr. Shao is a full time employee of Herbalife Nutrition, a global nutrition company which manufactures and markets dietary/food supplements, functional foods and skin care products.

Further collaborators: Dr. Shao serves as the Chair of the Scientific Council for the International Alliance of Dietary/Food Supplement Associations, a non-profit alliance of sector associations from around the world.

DIETARY/FOOD SUPPLEMENTS IN HEALTH PROMOTION: ILLUSTRATIONS OF THE BENEFITS AND RISKS OF RESEARCH

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A fundamental challenge in substantiating the benefits and risks of dietary/food supplements through research is the absence of a consensus regarding a framework for the scientific evidence. Can any degree of competent and reliable scientific evidence, including in vitro or animal models, be relied upon to provide supplement recommendations at a personal level or for public health? Is evidence derived from observational studies – such as cross-sectional, case-control, and/or cohort designs – sufficient to define these outcomes? Should one or more randomized clinical trials (RCTs) of any nutritional intervention be required before taking action to translate research results into the practice of nutrition care or public policy? As each of these research strategies has inherent strengths and limitations, must evidence be derived from two or more of these approaches to achieve sufficient scientific and regulatory agreement on the benefits and risks of dietary/food supplements and allow statements about health promotion and/or the reduction in risk of chronic disease? Should the breadth and depth of the evidence be dependent on the health claim allowed in communications via labeling and marketing? Despite the perception of RCTs in nutrition as the "gold standard" for determining causality, limitations common in their implementation often result a high risk of type II errors (i.e., false negatives – failures to detect an effect that is present); for example: absence of baseline and endpoint assessments of nutritional status; selection of a dose inappropriate to the response; too small a sample size or brief a duration for the intervention; designs ignorant of background dietary patterns; lack of relevant biomarkers of compliance and/or mechanisms of action; and confounding by issues such as health status, medication use, and non-intervention dietary components. These problems with RCTs often lead to results that contrast with evidence from experimental and observational studies. Thus, it is helpful to consider the options available in drawing conclusions when outcomes from RCTs and observational studies disagree: (i) the RCT is correct and the observational study is wrong; (ii) the observational study is correct and the RCT is wrong; (iii) both the RCT and observational study are wrong; and (iv) the RCT and observational study are both correct but, as designed and implemented, are asking different questions. It should be considered that the innate complexities of nutrient actions and interactions cannot always be adequately addressed through a single research design. In contrast to the use of RCTs within the context of a medical model, action to define the benefits and risks of essential nutrients and other dietary bioactive components provided as dietary foods/supplements should be taken at a level of confidence that is different from that needed in the evaluation of drug efficacy and safety in the treatment of disease.

Keywords: Dietary supplements, nutrition, research, benefits, risks

Conflict of Interest disclosure: Consultant to dietary supplement companies

REGULATION OF DIETARY/FOOD SUPPLE-MENTS: A GLOBAL OVERVIEW

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There are three questions which are most commonly asked about regulation and food supplements: Are they regulated? Are they sufficiently regulated? And what is the future of regulation in this area?

Over the past 25 years the global supplement market as developed substantially and with that growth has come new regulation across the world. This regulation has in some cases responded to the market, in other cases defined the market. But despite it often being developed along national or regional lines the commonalities of this regulation across the world significantly outweigh the elements that are today not common.

When looking at the question of whether supplement products are sufficiently regulated, it is important to first look at the origins of legislation in this area and where it is today. It is then important to look at this in a national or regional context of the efficacy of the systems in place for control and enforcement of products and manufacturing. It is the total management system for supplements that defines whether the regulation is sufficient.

Looking forward, two of the major areas of future regulation are becoming the global priorities for regulatory bodies. How to fairly and consistently provide consumers with information about products; and how to regulate the use of botanicals in products? Ensuring the confidence of the regulatory, scientific and consumer communities in regulation in these and related areas will help define the next stage in the evolution of the supplement category.

Keywords: Food Supplement, Dietary Supplement, Regulation, Trends

Conflict of Interest disclosure: Simon Pettman is the Executive Director of IADSA which is funded by supplements associations across the world and companies engaged in marketing food supplements.

Track 7: Food Culture Practices and Nutritional Education

GLOBAL FOOD VALUES IMPACT SURVEY: MEASURING HOW FOOD VALUES IMPACT THE POLICY AND REGULATORY LANDSCAPE

GLOBAL FOOD VALUES: PREDICTIONS AND THE IMPACT ON EMERGING FOOD VALUES FROM AROUND THE GLOBE

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Globally, the traditional primary value equation of food decisions and purchases: taste, price, and convenience, is evolving. Today, new food values beyond the product itself, including experience, social impact, environment, and transparency, are shaping how consumers view, and ultimately, make food purchase and health decisions. Food values are closely tied to human emotions and reflect gender, life stage and experiences, education, income, geographic location and culture. The impact of these new food values extends beyond the individual consumer—food and nutrition policies around the world reflect this evolving values. While science remains integral to policy development, policy decisions are no longer based solely on evidence-based data. Food and health policies are rapidly evolving to adapt to these new food values. Policies are emerging to encompass societal, environmental, experiential, safety, and health and wellbeing values that may, or may not be driven by science.

To understand the possible future impact of food values on the food and nutrition affairs landscape, FoodMinds embarked on an effort to construct and anticipate emerging values that are shaping consumer food decisions and behaviors as well as policy formulation flowing from shifts in these values. A first-of-its-kind prototype tool, the FoodMinds Food Values Factor AnalysisTM, informed by a survey conducted in over 15 countries in six continents using an interactive forecasting model to curate predictions from the global nutrition and food experts overlaid with market and modeling data, will be presented. The Analysis reveals a broad set of food values, which is comprised of several interrelated social, political, regulatory, agricultural and technological factors that are changing the way food is produced, distributed, marketed, regulated, sold and consumed. Importantly, these food values are emerging in different places around the globe and are being woven together in the flow of human migration and digital connectivity, including social media. Understanding the differences between these food values, level of impact and the relationships between them provides a deeper understanding of today's food and nutrition landscape, and can help to predict the future environment and policies that shape it.

REVIEW OF THE IMPACT OF EMERGING FOOD VALUE EQUATION ON POLICIES AROUND THE GLOBE – AND PREDICTIONS FOR THE FUTURE

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Evidence-based policy has been the standard for major authoritative bodies, but in recent years, emerging food values are playing an impactful role in the global policy landscape. A decade ago, the impact of food as medicine, renewable energy and energy sources, risk, and ethics began to appear on the horizon as key factors of food development. These issues converge when using a food systems approach. The United Nations Food and Agriculture Organization (FAO) and the World Health Organization (FAO) assert the importance of food systems, which encompass all aspects of food from farm to fork, to promote healthy and sustainable diets in its Sustainable Development Goals, which broaden how policy makers consider food, nutrition and its impact on society.

Additionally, there is a call for a "One Health" conceptual approach from authoritative bodies such as the WHO and FAO, which ties together the health of humans, animals and the environment. This concept is practical in its application to non-communicable diseases, but more holistic in its application to food values, from local and sustainable food to animal welfare to worker safety and social justice. While food values can be analyzed as factors to delve into specific drivers of change, the totality of these factors can also predict how the food and nutrition landscape may change. These values inform the "One Health" concept as an approach to how we think about food, while concurrently reflecting how society is thinking about food.

Policies have begun to encompass societal, environmental, experiential, safety and health and wellbeing values that may or may not be driven by science. Policy levers to curb consumption of sugar, sugar sweetened beverages, and "junk food" are being encouraged, despite what some note as limited evidence. At a national level, the most recent United States Dietary Guidelines for Americans Committee proposed the inclusion of sustainable eating patterns as part of the 2015-2020 Dietary Guidelines for Americans, which were later excluded in the final policy due to lack of conclusive evidence on the association between sustainable eating patterns and health outcomes plus political pressure.

Science is the foundation of policy, but the complex, multifactorial issues of obesity and climate change in today's environment present challenges to our standard approach to addressing scientific evidence. "Public health rules" suggest that exploring a practice-based evidence approach grounded on natural or "real world experiments" versus an evidence-based approach, may be the new strategy going forward.

Another important part of the equation is how to effectively communicate science, as this impacts not only how the science is heard, but how decisions are made at the policy level. In an environment where multiple factors, beyond science affect global public health, science needs to be approached in a transdisciplinary manner.

FOOD CULTURE PRACTICES AND NUTRITIONAL EDUCATION

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Latin America (LA) countries face, at the moment, a double burden of malnutrition. On one hand, even with the rates of stunting and wasting falling - although in different proportions among the LA countries -, the numbers of undernutrition parameters are still substantial. Among specific population groups, regions or even in low-income countries, there are low intakes of critical nutrients and food insecurity, which predisposes to micronutrient deficiency or, at least, to hidden hunger. On the other hand, overweight/obesity is increasing to alarming rates, as can be observed in Mexico, Venezuela, Chile and Uruguay, countries in which overweight already affects more than 60% of the population. In absolute numbers, the overweight/obesity has overcome undernutrition in almost all of the LA countries.

One of the most striking changes in food systems of LA countries is the displacement of dietary patterns based on meals and dishes prepared from unprocessed or minimally processed foods by those that are increasingly based on ultra-processed food and drink. The result is diets with excessive energy density, high in free sugars and unhealthy fats and salt, and low in dietary fiber that increase the risk of obesity and other diet-related non-communicable diseases (NCDs). This movement has a close relationship with the industrialization, urbanization and modernization processes, which have changed the dynamics of the families, the rhythm of life and lifestyle of the individuals.

As an answer to this epidemiological scenario, public health authorities are promoting positive changes in the dietary patterns of LA populations. For example, Ecuador, Chile, and Mexico have recently passed laws to promote Front-of-Package (FOP) in packaged foods. According to studies, the system with the most

favorable results in terms of healthy food choices and perception of healthfulness was the Multi-Traffic Light labeling system, and the summary system demonstrated the greatest impact on food reformulation. However, the LA region has specific characteristics that need to be considered when implementing any strategy regarding food labeling, such as mathematical and reading skills and education levels.

Brazil (2014) and Uruguay (2016) have launched new dietary Guidelines for its populations, both of which based its principles on a classification of food in the four categories: in natura, minimally processed, processed and ultra-processed; and a healthy diet must be based on the first two categories. PAHO has already adopted this classification, and affirms that "the proportion of ultra-processed products in food supplies can be seen as a measure of overall population diet quality".

Aware of its responsibility and role in public health, the food industry has moved to improve the nutritional quality of its products, either by reducing the sugar and sodium levels progressively or by prioritizing the elaboration of clean label products, among other actions.

As a result of health authority actions and increased access to information, there seems to be a population movement, albeit timid, to make more conscious food choices, prioritizing food with a better nutritional profile, and gradually regaining the habit of cooking at home.

Keywords: Double burden; Dietary pattern changes; Public health policy; Food industry actions; Consumer perception

Conflict of Interest disclosure: I am aware that my presentation must be evidence based, and free from bias towards any commercial entity or manufacturer. If there are any changes in my relationships between now and the time of the activity, I will inform the Scientific Department prior to the conference.

HOW EVOLVING FOOD VALUES ARE DRIVING MAJOR POLICIES IN EUROPE

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Since the late 1990's, the value system around foods has significantly changed for European consumers. Price, taste and convenience remain major attributes, but a wide range of other concerns have emerged which result in an increasingly complex environment for all stakeholders to perform tasks such as providing, preparing, eating and regulating food. The survey carried out by FoodMinds helps us to better understand the link between changes in food values and changes in food policies and regulation.

A key learning of the survey is that economic considerations do not appear as major drivers of food choices as they used to be 50 years ago. In highly developed countries, cost concerns roughly rank as 8th rank out of 14 drivers. However, price is still believed to be important and the "tax" lever has been recently used in several European countries as a tool to orientate food consumption (e.g., tax on saturated fat in Denmark, on sweetened beverages

in France, etc.), especially in people with lower incomes, who are thought to be at highest risk of unbalanced diets and obesity. Results have often been mitigated, but not null, and the nutritional efficiency of taxes remains under discussion.

European consumers are paying increased attention to the nutritional content of their foods. Sugar is becoming the number one enemy, illustrated by new guidelines, such as in UK, where it is recommended that added sugar accounts for no more than 5% of daily energy; there are also by strong pressures from the European Union for manufacturers to significantly decrease the sugar content of processed foods and more generally to improve the nutritional quality of products. Consumer concerns about foods have also translated into food-labeling requirements, which have been answered, at least partially, by a 2011 European regulation which, harmonized nutrition information, and made detailed ingredient listing mandatory in all countries, including, country of origin for some.

The geographic and socio-demographic structures of the European population largely contribute to explain food behaviors, with a high proportion of working educated urban people with little time to buy food or cook, yet have concerns about food quality (see above) and often environmental worries, which are increasingly important in Europe. Although it does not (yet?) appear to be a major driver, the environmental dimension impacts many areas, including food. Organic or "reasoned farming" practices are encouraged by the European Union and in several countries, and measures are taken that promote local and/or organic supplies for school meals to limit pesticides intakes and green-house gas emissions. Emblematic of the fight against "industrial agriculture" has been the ban of genetically-modified organisms in 19 European countries in 2015.

This very short overview suggests that in Europe, food-related policies and the food consumer values are often connected, but not always strictly. This is probably a reassuring conclusion, as public policies should consider consumer interest, concerns and opinion, but should not been dictated by the latter two, nor should attempts at regulating which remains each one's area of freedom and free choice.

Keywords: Europe; Nutrition Policy; Public Health Policy; Consumer Choice; Consumer Behavior

Conflict of Interest disclosure: I am aware that my presentation must be evidence based, and free from bias towards any commercial entity or manufacturer. If there are any changes in my relationships between now and the time of the activity, I will inform the Scientific Department prior to the conference.

BREAD FOR HEALTH

BREAD AND THE MEDITERRANEAN DIET: A DUET FOR THE PREVENTION OF CHRONIC DISEASES

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Wholegrain cereals are rich in nutrients and many phytochemical compounds, with recognised benefits for health, including dietary fibre, a number of phenolic compounds, lignans, vitamins and minerals and other bioactive components. Foods based on wholegrain cereals, including bread, play an important part in health and well-being. Thus, research consistently indicates that the regular consumption of wholegrain cereals reduces the risk of CVD, type 2 diabetes mellitus (DM2) and certain types of cancer, as well as several gastrointestinal pathologies.

The inclusion of different ingredients or the use of different baking technologies may modify the satiety response to bread, and aid in the control of food intake. We have performed a systematic search of randomized clinical trials on the effect of bread consumption on appetite ratings in humans. The inclusion of appropriate ingredients such as fiber, proteins, legumes, seaweeds and acids into breads and the use of specific technologies may result in the development of healthier breads that increase satiety and satiation, which may aid in the control of weight gain and benefit postprandial glycaemia. Indeed, we have investigated the appetite ratings and postprandial glucose, insulin, and gastrointestinal hormone responses related to hunger and satiety after the intake of a cereal-based bread contained a variety of cereal flours (wheat, oat, and spelt) and consisted of 22% dried fruits (figs, apricots, raisins, and prunes). It was also enriched with both fiber (7% from wheat cross-linked maltodextrins and pea) and protein (10–11% from wheat gluten and hydrolyzed wheat proteins). Consumption of that cereal-based bread contributed to appetite control by reducing hunger and enhancing satiety. In addition, consumption of this bread improved glycemic, insulinemic, and gastrointestinal hormone responses in healthy adults.

Additionally, we have carried out a study evaluating the glycaemic response, insulin response, appetite and gastrointestinal hormone responses, following the intake of the five most common breads consumed in Spain differing in their composition and manufacturing process. We did not find relevant differences in glycaemic index or insulinemic index within the breads. However, we found differences in glycaemic load among the tested breads, mainly in the wholemeal bread. We did not obtain relevant differences in either appetite ratings or gastrointestinal hormone responses between breads. Despite this, more emphasis on encouraging the consumption of different breads, specially whole wheat breads, should be made by national authorities in order to promote healthier and varied diets, and therefore, to establish healthy lifestyles.

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Keywords: Bread. Glycaemic index. Glycaemic load. Satiety. Whole grains.

GLUTEN INTRODUCTION AND THE RISK OF CELIAC DISEASE

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Celiac disease (CD) is a unique disorder in which consumption of a specific food nutrient, namely gluten, in conjunction with genetic susceptibility, is essential for the development of na insidiously evolving autoimmune reaction affecting the gut and other organs.

CD is a permanent condition that affects approximately 1 to 3% of the general population in most parts of world except for population in which the HLA risk alleles (HLA-DQ2 and/or DQ8) are rare such as in South East Asia.

The only treatment currently available for CD is strict adherence of a GFD for life. There is evidence that diagnosed but untreated CD is associated with significant increase in morbidity and mortality. Prolonged adherence to a GFD may reduce this risk for both morbidity and mortality to the levels found in the general population.

Adherence to a GFD in children results in remission of the intestinal lesions and promotes better growth and bone mineral density. It is the task of health care professionals to monitor and advise patients about adhering to a GFD because compliance with a GFD is variable and may be as low as 40%.

Summary of Recommendation: The recommendations are based on findings in children genetically predisposed to developing CD, because the risk of inducing CD through a gluten-containing diet exclusively applies to persons carrying at least 1 of the coeliac risk alleles. The following recommendations are conditional due to the low quality of evidence, however, applicable to all infants, although it is recognized that they may not be relevant to approximately two thirds of the population.

Breast-feeding and CD

(1) Recommendations on BF should not be modified because of considerations regarding prevention of CD (low quality of evidence).

(2) Introducing gluten while the infant is being breast-fed cannot be recommended as a means of reducing the risk of developing CD (low quality of evidence). BF should, however, be promoted for its other well-established heath benefits.

Timing of Gluten Introduction

(1) Gluten can be introduced into the infant's diet between the ages of 4 and 12 completed months. The age of gluten introduction in infants in this age range does not seem to influence the absolute risk of developing CDA or CD during childhood (depending on the age, quality of evidence varies from very low to high quality of evidence).

Type of Gluten

(1) No recommendation can be made regarding the type of gluten to be used at introduction (very low quality of evidence).

Amount of Gluten

(1) Despite the optimal amounts of gluten to be introduced at weaning or the effects of different wheat preparations on the risks of developing CD and CDA have not been established, ESPGHAN suggests that consumption of large amounts of gluten should be discouraged during the first months after gluten introduction (very low quality of evidence).

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Keywords: Gluten, Complementary feeding, Coeliac disease,

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POTENTIALLY HEALTH PROMOTING PHYTO-CHEMICALS OF THE BENZOXAZINOID GROUP ARE ABUNDANT IN CEREAL GRAINS AND FOOD PRODUCTS

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Proteins, carbohydrates and fat are large molecules that are necessary nutrients for growth and development; both for the human consumer and for the cereal crop itself. Small molecules, such as benzoxazinoids (BXs), lignans, phenolic compounds and alkylresorcinols are not needed for growth and development, but they often have interesting exploitable biological activities; - and they are present in cereal food products.

For a long time BXs were believed only to be present as defence compounds in the young cereal plants.

In 2008 we discovered that mature grains of rye and wheat contain BXs. Bread baked in our lab from rye or hydrothermally processed wheat showed to contain substantial amounts of BXs. The composition and quantity of BXs in food products depended much more on the food preparation process than on the cultivar. BXs were taken up by pigs, rats and humans after consuming rye-based food. BXs have a range of potential pharmacological properties, as reviewed by Adhikari et al (2015). When bacteria induce the production of inflammatory cytokines in innate immune cells, a previous diet high in BXs enhances this production, indicating an immune-modulating effect of the BXs. With a highly sensitive analytical method uptake of 6 BX compounds in human prostate tissue was documented after one week's high-BX diet.

Intake of BXs by humans, pigs and rats is not restricted to take place in experimental trials with specially produced food items. Our recent analyses of 25 commercial cereal food products, purchased in Danish supermarkets, showed concentrations of BXs from not detected to >500 µg/g dry weight. Most products high in rye content had high concentrations of BXs.

Based on the above, the possible health protecting effects of BXs should be in focus in future development of functional food products for humans and of feed for animals. Future research should cover: full characterization of BX structures; methods for easy isolation of pure compounds; fate of BXs in the body - occurrence in plasma and urine, and distribution to tissues; effect studies - not only registration of effects but understanding of mechanisms behind effects.

Keywords: Benzoxazinoids. Bread. Cereal grains. Phytochemicals.

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WHY JAPANESE CUISINE IS HEALTHY?

SYNERGISM IN UMAMI TASTE WHICH IS CENTRAL TO JAPANESE CUISINE 'WASHOKU'

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When we eat, we use all of our senses - sight, hearing, smell and touch – to form general judgments about our food. Taste however, is the most influential in determining how delicious a food is. Conventionally, it has been thought that our sense of taste is comprised of four basic or primary tastes, which cannot be replicated by mixing together any of the other primaries tastes, sweet, sour, salty and bitter. However, a further primary taste is now recognized: Umami. It is the lingering, pleasant taste one experiences when eating savory foods. Japanese cooking uses many umami rich foods, although it is a universal taste common in many foods.

Taking its name from Japanese, umami is a pleasant savory taste imparted by glutamate, a type of amino acid, and ribonucleotides, including inosinate and guanylate, which occur naturally in many foods including meat, fish, vegetables and dairy products. As the taste of umami itself is subtle and blends well with other tastes to expand and round out flavors, most people do not recognize umami when they encounter it, but it plays an important role in making food taste delicious.

Many chefs around the world gained much more awareness of umami by storing up tastes in preparation for creating new flavors. With the umami spectrum, they always find clear notes of umami in a good ripe tomato, aged Parmezan cheese or other fermented foods like miso and soy sauce, dried shiitake mushrooms, kombu, etc. Kombu is the indispensable material to cook Japanese soup stock 'dashi.' Taste of dashi is very subtle and delicate, but it brings out original taste of various vegetables and makes excellent harmony with other tastes. Further more, combination of glutamate and inosinate or guanylate enhances umami, more than 7 or 8 times higher than umami by single compounds. Once chefs understand synergistic mechanism by combination of different umami compounds, they successfully develop new dishes. It is possible to create a new dish which is built on the top of umami through a balanced mixture of the other four primary tastes. Having experiences of umami taste sensation in our mouth is crucial to understand exact meaning of this unique taste. Its taste quality is quite different from other four basic tastes. Everyone can easily imagine tastes of sweet, sour, salty and bitter. However, umami may not be noticed by some people without the experience being pointed out, because it is very subtle and overshadowed by other tastes.

In this presentation, I would like to let you understand what is umami and synergism between glutamate and inosinate or guanylate. Chef Takehiro Ohno's presentation and demonstration will deepen your knowledge on umami with experiences.

Keywords: Umami, Glutamate, Inosinate, Guanylate, Synergism

HEALTH MERITS IN THE JAPANESE CUISINE

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In 2013, Japanese Cuisine "WASHOKU" was registered on the Representative List of the Intangible Cultural Heritage of UNESCO. "WASHOKU" is defined as the "Traditional Dietary Cultures of the Japanese". Therefore, "WASHOKU" is a social practice based on an essential spirit of the Japanese, "respect for nature". It has four characteristics as follows; at first, ingredients used in WASHOKU are diverse, fresh and available in four distinct seasons such as spring, summer, autumn and winter. Next, since WASHOKU requires well-balanced and low-fat diets, it contributes to health. For example, fishes, soy beans, vegetables and so on, are widely used as materials for WASHOKU. The third point is that WASHOKU is associated with the beauty of nature in the presentation such as plates of dishes, decorating tables and rooms. Finally, WASHOKU has developed using traditional knowledge and customs closely associated with nature and in connection to annual events. Therefore, when Japanese people share a mealtime together, they enhance the bonds among family and community members.

The traditional Japanese Cuisine "WASHOKU" constitutes one soup and three dishes. In general, miso soup is the typical soup in WASHOKU and it is consumed at least once every day. Miso is made from soy beans via fermentation. Umami substances are added to miso soup as seasonings to enhance its flavor. One of the dishes constitutes cooked rice. The other two dishes are foods cooked using fresh materials such as fishes, seaweeds and vegetables. Since there are four seasons in Japan, fishes and vegetables are diverse and fresh. From science, we know that fishes contain some functional substances such as EPA and DHA, vegetables contain dietary fibers, many kinds of vitamins and minerals, and green tea contains polyphenols with antioxidant activities. Thus, the ingredients in WASHOKU contain functional compounds while being a low-fat diet.

The longevity of the Japanese was about fifty years old immediately after the Second World War. Then, it gradually increased and reached to 70 years old in 1980s, until the longevity of Japanese male and female became 80.8 and 87.1 years old, respectively, in 2016. The increase of the Japanese longevity is thought to be caused by the increase of animal foods and the decrease of carbohydrate as well as the development of medical techniques. Animal foods contain lots of protein with well-balanced essential free amino acids and fat. Recently, Japanese cancer center reported that the intake of animal foods decreased the risk of mortality by about 10 % related to the traditional Japanese Cuisine. Modern Japanese Cuisine "WASHOKU" consists on animal foods such as meats and milk products as well as fishes, soy beans and vegetables, leading

"WASHOKU" to become a more well-balanced diet and increasing the longevity of Japanese people.

In this presentation, I would like to introduce Japanese Cuisine "WASHOKU" and explain its merits in health.

Keywords: Washoku, healthy, well-balanced diets, umami substances

Conflict of Interest disclosure: This symposium was sponsored by Ajinomoto Co., Inc. (Japan)

SSS_144/1028

BUILDING A HEALTHIER SOCIETY BY HELPING PEOPLE TO EAT WELL

THE 21ST CENTURY NUTRITIONAL CHALLENGES THAT FACES THE FOOD INDUSTRY

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Since nutrition is a link between food and health regarding the fulfilment of dietary needs of energy, protein, vitamin, mineral and phytonutrients from food in human life course for good health and well-being, the 21 century nutritional challenges will have to aim for achieving food and nutrition security for all. Global nutrition situation compiled by FAO/WHO at the 2nd International Conference on Nutrition (ICN2) held at FAO in Rome in November 2014 indicated that 805 million people suffer from hunger; 161 million children under-five are stunted, 99 m. are underweight, and 51 m. are wasting; 2 billion people affected by micronutrient deficiencies; 43 m. children under five are overweight and obese; 500 m. people are obese with a rapidly increasing rates of diet related non-communicable diseases (NCDs); 3.4 m. people die each year due to overweight and obesity; and the cost of malnutrition is about 3.5 trillion USD per year. The commitments from ICN2 by member countries, UN agencies, civil societies and private sectors include eradicating hunger and prevent all forms of malnutrition, enhancing sustainable food systems, raising the profile of nutrition, ensuring healthy diets throughout the life course, and creating enabling environment for making informed choice. The ICN2 also endorsed the "Global Nutrition Targets 2025" from WHA Resolution by reduction of low birth weight, childhood stunting and wasting, anemia in women of reproductive age, no increase in childhood over weight, and increase in the rate of exclusive breast feeding rate. Framework for actions from ICN2 include sustainable, resilient food system for healthy diets; aligned health system providing universal coverage of essential nutrition actions; social protection and nutrition education; trade and investment for improved nutrition; safe and supportive environments for nutrition at all ages; and strengthen nutrition governance and accountability.

The UN General Assembly in 2015 adopted the 17 Sustainable Development Goals (SDGs) to be achieved by the year 2030. All SDGs are interrelated and complemented to other goals. For example SDG 2 "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" will be related to SDG 1. Ending poverty, SDG 3. Good health and well-being, SDG 4. Quality education for all, SDG 5. Gender equality, SDG 6. Clean water and sanitation, SDG 9. Industry, innovation and infrastructure. SDG 12. Responsible consumption and production, SDG 13 Climate actions, and SDG 17. Revitalize the global partnership for sustainable development. It has been emphasized that a successful sustainable development agenda requires partnerships between governments, the private sector and civil society. These inclusive partnerships built upon principles and values, a shared vision, and shared goals that place people and the planet at the centre, are needed at the global, regional, national and local level.

Since food industries are key players in food systems which are fundamental and essential for human well-being and sustainable development, they should welcome and engage actively with other stakeholders for achieving global nutrition targets including controlling of the NCDs, and achieving the SDGs particularly goal 2 ending hunger and all form of malnutrition.

Keywords: Nutrition security, SDGs, malnutrition, obesity, NCDs

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THE IMPORTANCE OF TASTE TO SUPPORT HEALTHY DIETS

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The sense of taste plays a crucial role in food selection and utilization. Traditionally, this sense has encompassed a small set of primary or basic qualities, namely sweet, salty, sour and bitter. These primary qualities have been thought to exist to insure that an organism can identify and consume critical nutrients (e.g. simple sugars and sodium) and avoid potential toxins. In 1909, Kikunae Ikeda identified a potential additional primary taste which he proposed was involved in identifying amino acids and protein. This taste quality, now called umami, had as its primary stimulus the sodium salt of the amino acid glutamate, best known as MSG. Over the subsequent 100+ years, considerable evidence has supported Ikeda's original hypothesis that umami constitutes a fifth basic taste quality although one with significant differences from the other four. In the second part of this presentation, I will describe some of the history of umami taste development from the point of view of a researcher in the United States. Among the topics I will address are early studies of the importance of MSG in many food systems, the identification of specific receptors for umami compounds, human developmental studies, and studies on the functional significance of umami. I will also raise important questions about umami that remain to be investigated. Throughout I will emphasize the central role that the Ajinomoto company has had in fostering basic and clinical research on this topic.

SPORTS NUTRITION FOR ACTIVE LIFE-STYLE

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Branched-chain amino acids (BCAAs), leucine, isoleucine, and valine, are non-indispensable amino acids for humans. Recent studies have found that BCAAs, especially leucine, work as not only building blocks of proteins, but also regulators of protein metabolism. It is also known that BCAAs are used as energy source during exercise. Human skeletal muscle contains free BCAAs at the concentration of ~650 μM, which is similar to the plasma concentration. The plasma BCAA concentrations are rapidly elevated by BCAA supplementation and peak at ~30 min after ingestion. We examined effects of BCAA supplementation (0.1 g of BCAAs/kg BW) right before squat exercise (20 squat/set x 7 sets with 3 min interval between sets) on the delayed-onset muscle soreness using untrained young female subjects. Dextrin was used as a control in place of BCAAs. The subjects participated two trials (BCAAs and control) with ~3 months interval. The trials were conducted with a crossover and double-blind design. The results showed that BCAA supplementation significantly decreased the muscle soreness 2-3 days after exercise, suggesting that the amino acid supplementation improves the muscle conditions after exercise.

The BCAA catabolism is regulated by branched-chain alpha-ketoacid dehydrogenase (BCKDH), which is located at the second step in the catabolism. The BCKDH is regulated by covalent modification. BCKDH kinase (BDK) is responsible for inactivation by phosphorylation of the BCKDH. Skeletal muscle has the high BDK activity to inactivate the BCKDH, resulting in providing BCAAs for protein synthesis. However, exercise promotes BCAA oxidation by activation of BCKDH in skeletal muscle. We prepared mice with chronically low levels of BCAAs by muscle-specific deletion of BDK (muscle-specific BDK knockout (BDK-mKO) mice). We examined the role of BCAAs in the adaptability to exercise training using the mice. The endurance capacity was increased by the 2-week training program in both mice, but was significantly less in BDK-mKO mice than in control mice, suggesting that sufficient BCAAs are required for the animals to maximally adapt the exercise training. These findings suggest that BCAAs are useful as sports nutrition for acute and chronic exercise.

Keywords: BCAAs, delayed-onset muscle soreness, exercise training, skeletal muscle, BCAA catabolism

HOW THE AJINOMOTO FOUNDATION AP-PROACHES THE CHALLENGES OF NUTRITION SECURITY

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The Ajinomoto Foundation.

The Ajinomoto Foundation (TAF) was established by Ajinomoto Co., Inc. and certified as the Public Interest Incorporated Foundation by the Cabinet Office of Japan in 2017.

TAF took over 4 nutrition related social projects, formerly managed by Ajinomoto, and is making them more public-oriented, socially impactful and sustainable.

We believe nutrition is the base of Sustainability and even economic growth. Its goals are closely tied with 2030 Agenda/ SDGs, particularly Goal 2, 3, 5, 1, under partnership to "end all forms of malnutrition".

1. Ghana Nutrition Improvement Project "KOKO Plus"
-Target: 6-24m infants (1st 1000 days) in Ghana
-Means: Product/ Education

TAF acquired the right of "KOKO Plus" from Ajinomoto and is building the Social Business model. This supplement food satisfies nutritional needs for infants, fortifying traditional complementary food koko with energy, protein, an amino acid and micronutrients. It was developed through Ajinomoto's expertise of processed food and nutrition to be Acceptable, Accessible and Affordable. This attracted partners including Ghana Health Service, University of Ghana and INF as well as donors like JICA, USAID, WFP and GAIN.

"KOKO Plus" has been proved to improve the health status of infants (stunting and anemia) and is under the scaling up phase now.

2. AIN program
Target: 2-5 y children, adolescent girls and adults in developing countries
Means: Education/ Agriculture/ School Meal/Food Processing

TAF has took over the AIN (Ajinomoto International Nutrition network) program which started in 1999 as a grants for NGOs dedicated to the improvement of eating habits and nutrition. Since then, AIN has supported 74 projects in 14 countries. We collaborate with NGOs to change the lifestyle of individuals through power of knowledge, empowerment and self-efficacy as nutrition issues has been shifting from undernourishment to NCDs and DBM.

3. VINEP (Vietnam Nutrition system Establishment Project)
Target: Ministries/ Universities
Means: Education system/ Lobbying

Ajinomoto launched VINEP in 2011 with the National Institute of Nutrition (NIN), Vietnam to expand their education programs for nutritional infrastructure. As a milestone, a regulation specifying the status of "dietitian" was put into effect in 2015 (job code). Then "dietitian" became a nationally recognized profession. The 2nd milestone is the graduation of 1st class bachelors of nutrition from Hanoi Medical University in June 2017. TAF is further working with the Japan Dietetic Association and the Ministry of Health, Labor and Welfare to support NIN to create Nutrition

Standard so that dietitians can take an active part and become nutrition leaders in the country.

4. Support for reconstruction after disaster

Target: Elderly residents in disaster-struck areas

Means: Cooking Together & Eating Together with nutritionally balanced menu

In temporary housings in Tohoku since 6 years ago, nutrition-related problems have been detected; increased risk of diabetes and heart troubles, vitamin and mineral deficiency caused by lack of vegetables, reluctance to prepare food, and fewer opportunities for conversation due to the destruction of communities. Our solution to those is "Cooking together, Eating Together" events using tailor-made mobile cooking table and our original menus. Seniors enjoy the valuable opportunity to gather and enjoy conversation, which helps to prevent isolation, with "reduced salt, more vegetable" menus.

Keywords: SDGs, KOKO Plus, AIN, amino acid, dietitian

Conflict of Interest disclosure: The speaker is the employee of Ajinomoto Co., Inc. and the initial funding of The Ajinomoto Foundation was solely made by Ajinomoto Co. Inc.

Track 8: Agriculture, Food Science and Safety

SSS_144/165

NUTRITIONAL REFORMULATION OF FOOD PRODUCTS – A KEY STRATEGY FOR IMPROVING FOOD SUPPLY IN LATIN AMERICA

FOOD POLICIES AND REFORMULATION OF FOODS IN CANADA

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The prevalence of overweight and obesity in Canada has increased 2.5 fold over the past 25 years [1]. Unhealthy diets are a major contributor to overweight and obesity, key risk factors for non-communicable diseases (NCDs) [2]. WHO has indicated the widespread production and marketing of energy-dense, nutrient poor foods and beverages high in fat, sugar and sodium as important contributors to obesity and NCDs [2]. As a result, public health initiatives at the nutrient level (e.g. labelling, advertising restrictions and reformulation) have been proposed as complementary strategies to improve diets. Nutrient profiling is the science of classifying or ranking foods according to their nutritional composition for reasons related to preventing disease and promoting health [3]. Thus programs such as front of pack labelling and setting reformulation targets require nutrient profiling systems that can be used in a transparent manner to define 'healthier' or 'less healthy' products for such programs.

In Canada, reformulation approaches included publishing sodium reduction benchmark targets for packaged foods in 2012 (as part of the national sodium reduction strategy) and earlier voluntary trans fatty acids (TFAs) limits which also encouraged substitution with unsaturated fats. Recently, Health Canada released their Healthy Eating Strategy which included a number of efforts including front-of-pack labelling, restrictions on marketing to children, and regulations eliminating partially hydrogenated oils. However, the potential for these approaches to be successful relies in part, on reformulation efforts by industry and public monitoring of the food supply.

The University of Toronto Food Label Information Program (FLIP) is a branded nutrition composition database of ~26,000 unique food and beverage products that began in 2010. Data includes national and private-label brand foods from the 4 largest Canadian grocery chains, accounting for approximately 75% of food retail sales. FLIP allows for an effective monitoring of the impact of reformulation efforts on the Canadian food supply over

time. We have utilized FLIP to comprehensively assess changes in sodium and trans fat levels in packaged foods sold in Canada from 2010 to 2013.

Analyses using the FLIP database to assess changes in sodium levels indicated that 16.2% of the food categories had significant reductions in sodium levels, with significant improvements seen in imitation seafood, condiments, breakfast cereals, canned vegetables/legumes, plain chips, hot cereals, meat analogues, canned condensed soup, and sausages and wieners. However, these analyses were done at year 3, mid-way through the 6-year target goals, and over 80% of the food supply had not yet made significant progress [4]. In contrast, impressive improvements were seen in elimination of trans fat, where 97% of products were meeting the TFAs limits within 7 years [5]. With the recent announcement of a front-of-pack labelling system in Canada (i.e. Warning Signs) and other programs, examination of the Canadian food supply in relation to these policy changes will be important to monitor industry reformulation progress in meeting healthy eating goals.

Keywords: Public health initiatives, policy, reformulation, sodium, front-of-pack labelling

NUTRIENT PROFILING FOR PRODUCT REFORMULATION: THE BENEFIT FOR THE CONSUMER

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Public health initiatives aimed at improving the nutritional content of food and beverages are regarded by WHO and other health authorities as an effective means to improve the health of the global population. Examples of countrywide initiatives include the UK responsibility deal (2011) with sodium as the primary target, the Health Canada guidance for the food industry (2012), and the recent United States FDA proposal (2016). In Latin America, several governments have proposed or implemented such approaches, such as the "Menos Sal Más Vida" initiative in Argentina, and the Brazilian Sodium initiative (2011). All of these approaches put the reformulation of food and beverages at the center of the public health nutrition agenda in addition to nutritional education and behavioral change initiatives.

To implement reformulation, manufacturers need guidance. Nutrient profiling (NP), the science of categorizing foods based on their nutrient composition, has emerged as an essential tool to guide reformulation and other nutrition policies. NP systems should be adapted to their specific purposes as it is challenging to design one system that can equally address all policies and purposes, e.g. reformulation and labelling.

In the symposium, we will present the principles and the validation process of the Nestlé Nutritional Profiling System (NNPS) that has been specifically designed for reformulation. The NNPS is a category-specific NP system which provides nutritional targets per serving for 7 to 10 nutrients, depending on the category; all nutrient targets need to be met to obtain an NNPS Pass status [1]. The system has been implemented since 2005 and is now used in all countries in which Nestlé operates (191 in 2016). The NNPS was recently shown to be able to identify more nutritious options within food and beverage categories [2], and a modeling study highlighted that potential reformulations following NNPS standards could improve nutritional intakes of the US and French populations [3]. These studies also identified some potential limitations of reformulation and the NNPS to address nutrition gaps, for example to act mainly on nutrients to limit but only with limited extend on nutrients to encourage [3]. New approaches for NNPS evolution that e.g. address this point and provide more holistic food and beverage product development guidance will be discussed.

In order to achieve its maximum potential and modify the food environment in a beneficial manner, reformulation should be implemented by the entire food sector. Multi-stakeholder partnerships including governments, food industry, retailers and consumer associations that will state concrete time-bound objectives accompanied by an independent monitoring system are the potential solution. Further, reformulation per se will not address the whole nutrition gap that exists in many countries, and there is a need to combine reformulation with other public health initiatives in more integrated frameworks.

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Keywords: Food and beverage reformulation, nutrient profiling, diet modeling, food supply

FOOD REFORMULATION: A PUBLIC HEALTH AND ECONOMIC PERSPECTIVE

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To address public health issues related to poor dietary habits, governments and public health agencies have been implementing policies intended to promote preventive behaviors thanks to information campaigns and food product labeling. Reviews of these policies show that they have some positive impact that, however, remains small, at least in the medium term. In addition, some of these policies are suspected to increase health inequalities, with less-educated individuals responding less to information policy. Given the modest impact of information-based policies, public health agencies are now considering other policies to modify the market environment to facilitate healthier food choices, even by non health-sensitive consumers. A broad range of instruments have been considered, from price policies to nutrition-related standards.

Policies focused on food quality are intended to facilitate healthy choices by consumers, even those who are not fully informed about the links between food consumption and health. Decreasing the salt and fat content in foods and increasing the whole grain content are good examples of food composition changes being made to address health-related issues. In this context, public health agencies urge the food industry to favor a better food environment through changes in the quality and variety of foods and through changes in advertising and marketing, and some governments are partnering with the food industry and the retail sector to generate changes on the supply side.

Are policies focused on the supply side more promising than policies focused on consumers? Which public health benefit can we expect from their implementation? Are market incentives sufficient to induce voluntary changes by firms or is public regulation of food quality needed to reach public health objectives?

To deal with these questions, we will first review the results of modeling-based articles to estimate the potential public health impact of changes in the nutritional quality of foods. We will suggest that the improvement of the nutritional quality of foods may induce significant health benefits even in the absence of changes in consumers' diet patterns. Although food reformulation alone would not be sufficient to dramatically reduce the prevalence of chronic diseases related to food consumption, it can play an important role in that direction.

Second, we will review the initiatives currently implemented by the food industry and assess their impact on consumers' intakes by using data collected in France. We will show that voluntary commitments made by firms are sometimes significant, but the final impact on consumers is still modest because the number of committed firms and the market shares of reformulated food remain limited.

Third, we will discuss what we can expect from self-regulation vs. public regulation of food quality. Although voluntary commitments could offer potential cost savings for regulators and firms, their success depends on several conditions that we will identify. Among them, we will insist on the need to favor collective agreements at the food industry level and the availability of monitoring tools to quantify and control their implementation.

Keywords: Food reformulation, self-regulation, quality standards, food consumption

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