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ABSTRACT

Objective: To evaluate the prognoses associated with psychosocial deprivation in women with gestational diabetes mellitus (GDM).

Design: Observational study considering the 1498 multiethnic women with GDM who gave birth between January 2009 and February 2012.

Setting: Four largest maternity units in the northeastern suburban area of Paris.

Participants: The 994 women who completed the Evaluation of Precarity and Inequalities in Health Examination Centers (EPICES) questionnaire.

Main outcome measure: Main complications of GDM (large infant for gestational age (LGA), shoulder dystocia, caesarean section, pre-eclampsia).

Results: Psychosocial deprivation (EPICES score ≥30.17) affected 577 women (56%) and was positively associated with overweight/obesity, parity and non-European origin, and negatively associated with family history of diabetes, fruit and vegetable consumption and working status. The psychosocially deprived women were diagnosed with GDM earlier, received insulin treatment during pregnancy more often and were more likely to have LGA infants (15.1% vs 10.6%, OR=1.5 (95% CI 1.02 to 2.2), p<0.05) and shoulder dystocia (3.1% vs 1.2%, OR=2.7 (0.97 to 7.2), p<0.05). In addition to psychosocial deprivation, LGA was associated with greater parity, obesity, history of GDM, ethnicity, excessive gestational weight gain and insulin therapy. A multivariate analysis using these covariates revealed that the EPICES score was independently associated with LGA infants (per 10 units, OR=1.12 (1.03 to 1.20), p<0.01).

Conclusions: In our area, psychosocial deprivation is common in women with GDM and is associated with earlier GDM diagnoses and greater insulin treatment, an increased likelihood of shoulder dystocia and, independently of obesity, gestational weight gain and other confounders with LGA infants.

Strengths and limitations of this study

- It is known that psychosocial deprivation is associated with more gestational diabetes and we report for the first time that, among women with gestational diabetes mellitus, psychosocial deprivation is associated with a poor prognosis.
- Our large multicentre and diverse cohort and the adjustments for the relevant confounding factors, such as body mass index and gestational weight gain, ensure the robustness of our findings.
- We defined psychosocial vulnerability using the Evaluation of Precarity and Inequalities in Health Examination Centers (EPICES) questionnaire, which has been validated during pregnancy or not. This tool evaluates several domains at an individual level, including material goods, money, friendship and family networks, healthcare and leisure.
- However, the EPICES questionnaire was retrospectively fulfilled (6–24 months after pregnancy).

INTRODUCTION

Socioeconomic status reflects access to resources to prosper, and psychosocial deprivation is associated, across countries and over time,[1 2] with higher mortality and morbidity, including type 2 diabetes.[3] The main drivers in more incident type 2 diabetes appear to be higher body mass index (BMI) and impaired health behaviours.[4] The American Diabetes Association recommends the inclusion of assessments of patients' psychological and social situations as an ongoing part of the medical management of diabetes.[5] Indeed, psychosocial deprivation in patients with diabetes has been reported to be associated with increased obesity,[6] worse glycaemic control,[7] poorer adherence,[8 9] more diabetic complications[6 7 10 11] and perhaps greater mortality.[12–14] During pregnancy, psychosocial deprivation is also associated with poor outcomes that include increased rates of maternal[15] and neonatal[15 16] hospitalisation, stillbirth,[17] postnatal death,[18] preterm delivery[17 19] and small for gestational age infants.[17–20]

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy and is now very common, with a prevalence ranging from 9.3% in Israel to 25.5% in California, USA.[21] Although GDM is also more frequent in cases of psychosocial deprivation,[18 19 22 23] its prognosis in case of poor psychological and social conditions is currently unknown. We hypothesised that psychosocial deprivation might be associated with poor prognoses in women with GDM when confounding factors, such as obesity,[19] gestational weight gain (GWG)[16] and smoking habits,[20] are considered.

The four largest maternity units in the Northeastern suburban area of Paris, France, participated in the IMPACT initiative, which aimed to improve postpartum screening for dysglycaemia after GDM.[24 25] During this study, the women who attended these maternity units responded to the Evaluation of Precarity and Inequalities in Health Examination Centers (EPICES) questionnaire, a questionnaire which evaluates psychosocial deprivation.[6 7 19 24 26] Therefore, for the first time, we had the opportunity to investigate the fetomaternal prognoses of these women with GDM according to their individual psychosocial statuses.

METHODS

Patients

This study is a secondary analysis of the IMPACT study.[24 25] Briefly, the IMPACT initiative began in March 2011 and was a mobilisation campaign for women with GDM and their community caregivers that sought to increase postpartum screening for dysglycaemia. We aimed to evaluate the effect of this initiative by comparing the postpartum screening rates between the women who delivered before (between January 2009 and December 2010) and after this initiative (between April 2011 and February 2012). We systematically included women who were at least 18 years of age, free of known pregestational diabetes, had GDM and were followed during pregnancy in one of the four largest maternity units of the Seine-Saint Denis area of France during these periods of time. GDM was detected by oral glucose tolerance test and was defined by fasting blood glucose values ≥5.3 mmol/L and/or a 2 h blood glucose value ≥7.8 mmol/L between January 2009 and December 2010,[24 25] and thereafter according to the International Association of Diabetes and Pregnancy Study Groups criteria, adopted in France in 2010.[27] GDM screening was universal in the four centres. In the primary analyses, we included the women who could be contacted by telephone and provided self-reports that indicated whether they had undergone postpartum screening tests during the 6 months following their deliveries.[24 25] For the current analysis, we included all of the women who delivered between January 2009 and February 2012 and who retrospectively completed the EPICES questionnaire by phone regardless of their report concerning the postpartum screening.

Data collection and assessment of outcomes

One single investigator extracted the following data from hospital records: age at conception, origin/ethnicity, family history of diabetes, history of previous GDM, gestational age at the time of GDM diagnosis (three classes: <24 weeks of gestation, between 24 and 28 weeks of gestation and ≥28 weeks of gestation), insulin treatment during pregnancy and GWG. Excessive GWG was defined according to the recommendations of the Institute of Medicine; that is, GWG ≥16 kg in women with pregravid BMIs <25 kg/m^2, ≥11.5 kg in overweight women (BMIs between 25 and 29.9 kg/m^2) and ≥9 kg in obese women (BMI ≥30 kg/m^2). We also collected obstetrical and neonatal outcomes, including offspring birth weight in comparison to the standard French population (large for gestational age (LGA) was defined by a birth weight exceeding the 90th centile),[28] pre-eclampsia (blood pressure ≥140/90 mm Hg on two recordings 4 h apart and proteinuria of at least 300 mg/24 h or 3+ or higher on dipstick testing of a random urine sample), shoulder dystocia (defined as the use of obstetrical manoeuvres, ie, McRoberts, episiotomy after delivery of the fetal head, suprapubic pressure, posterior arm rotation to an oblique angle, rotation of the infant by 180°, delivery of the posterior arm and acute or elective caesarean section).

The investigator conducted semistructured interviews by phone between January and November 2011 for the women who delivered before the IMPACT campaign (maximum delay of time since delivery 24 months) and at least 6 months after delivery for the women who delivered after the IMPACT initiative. The investigator requested information about the participants' current weights, heights, waist circumferences, professional statuses, smoking statuses, number of children, antihypertensive and lipid-lowering treatments, family histories of diabetes and daily consumptions of fruits and vegetables. All these data were therefore declarative. Waist circumference was deducted from the current waist size of trousers (waist circumference <80 cm: 6–14 (UK) or 34–42 (France), 80–88 cm: 16–20 (UK) or 44–48 (France); >88 cm: 22 (UK) or 48 (France) or more).

The investigator also conducted interviews to assess psychosocial deprivation using the EPICES score, which is a French deprivation score that is calculated based on responses to 11 questions that consider both socioeconomic conditions and family environment (see online supplementary appendix 1).[7 26 29] It evaluates several domains at an individual level, including material goods, money, friendship and family networks, healthcare and leisure. As previously reported, the EPICES score is a continuous variable, and increasing quintiles are associated with increased risks for poor health conditions such as obesity, diabetes in women, higher rates of smoking, poorer access to dental and gynaecological care, and poorer perceived health statuses.[24 26] However, psychosocial deprivation can be defined by a score ≥30.17,[29] which was the threshold used here.

Statistical analyses

Sample size calculations were based on the main criterion of the IMPACT study, that is, a postpartum screening test performed 6 months following delivery.[24 25] Results reported in this manuscript were prespecified, exploratory end points. Continuous variables are expressed as means ±SD, and normality was assessed with the Kolmogorov-Smirnov tests. There were no missing data concerning psychosocial deprivation and main outcomes. Comparisons of two independent groups were performed using the Student t test if the variable was normally distributed; otherwise, the Wilcoxon Mann-Whitney test was used. The significance of differences in proportions (ie, qualitative variables) were tested with the χ^2 test, and the ORs and 95% CIs were calculated in cases of statistical significance ($p<0.05$). We defined EPICES score tertiles in our cohort: first tertile: EPICES score <23.71 (mean 11.7±6.2; n=296); second tertile: score between 23.71 and 51.5 (mean 35.0 ±8.5; n=355); and third tertile: score ≥51.5 (mean 69.9 ±12.6; n=343). The factors associated with having an LGA infant were assessed with a univariate logistic regression method. For multivariate analyses, we included all factors that were associated with LGA infants with $p\leq0.05$ in the univariate analyses. SAS Statistics (V.9.2; Cary, USA) was used to conduct all statistical analyses.

RESULTS

Characteristics of the women

A total of 1498 women gave birth following GDM between January 2009 and February 2012 in our maternity units. Of these women, 994 responded retrospectively by phone to the EPICES questionnaire. Table 1 illustrates the characteristics of these women. The characteristics of the 994 women who responded to the EPICES questionnaire were similar to those of the 504 who did not respond, with the exception of greater daily consumptions of fruit and vegetables (66.1% vs 59.0%, respectively, $p<0.01$) and a trend towards being older (33.3±5.2 vs 32.7±5.5 years, respectively, $p=0.06$). The EPICES questionnaire could not be completed by the women who could not be reached by phone and those with French language proficiencies that were insufficient for answering the questions.

Psychosocial deprivation affected 577 women (56%) and was positively associated with parity, overweight and obesity, greater waist circumference and non-European origin. Psychosocial deprivation was negatively associated with daily fruit and vegetable consumption, reduced family history of diabetes and working status (table 1).

Pregnancy outcomes

Table 2 shows that the psychosocially deprived women were not only more likely to have been diagnosed with GDM prior to 24 weeks of gestation but also more likely to have been treated with insulin during pregnancy than the non-psychosocially deprived women. The psychosocially deprived women were more likely to have LGA infants and infants with shoulder dystocia, but no differences in caesarean section or pre-eclampsia were found. Figure 1A–D shows that the prevalences of insulin treatment during pregnancy (figure 1A), LGA infants (figure 1C) and shoulder dystocia (figure 1D) increased with increasing EPICES score tertiles.

Table 3 shows that, in addition to psychosocial deprivation (OR=1.5 (95% CI 1.02 to 2.22)), LGA was associated with higher parity, greater BMI and obesity of the mother (OR=2.1 (1.4 to 3.1)), increased incidence of GDM history (OR=2.0 (1.4 to 3.1)), ethnicity/origin, greater EPICES score (per 10 units: OR=1.50 (1.22 to 2.22)), greater GWG and excessive GWG (OR=2.8 (1.9 to 4.1)) and insulin treatment during pregnancy (OR=1.6 (1.1 to 2.4)). A multivariate analysis that considered parity, obesity, personal history of GDM, ethnicity, EPICES score, excessive GWG and insulin therapy during pregnancy revealed that the EPICES score remained independently associated with LGA infants (table 3). In a model that was identical to the aforementioned model with the exception that weight and height were used in the place of obesity, an association between psychosocial deprivation and LGA infants remained (per 10 units: OR=1.11 (1.02 to 1.20, $p<0.05$). In another model that was identical to the aforementioned model with the exception that psychosocial deprivation (ie, EPICES score ≥30.17) was used in place of the EPICES score, a trend towards an association between psychosocial deprivation and LGA infants remained (OR=1.53 (0.98 to 2.39), $p=0.06$). The prevalence of shoulder dystocia was too low to allow multivariate analyses.

DISCUSSION

In this study, psychosocial deprivation in women with GDM was associated with earlier GDM diagnoses and more extensive insulin treatment. Moreover, we show for the first time that, independent of confounding factors, psychosocial deprivation was associated with increases in adverse outcomes, particularly in LGA infants. We report that psychosocial deprivation (ie, an EPICES score above 30.17) affected 56% of the women with GDM in our study; another study reported a prevalence of 48% (11/23 women with GDM) in another area of France using the same definition of deprivation.[19] This high prevalence is due not only to the prevalence of precarity[30] and multiethnicity[31] in the Northeastern suburban area of Paris, but also to the roles played by these conditions in the rate of GDM. Indeed, the prevalence of GDM has been reported to be 1.7-fold to 2.9-fold higher among patients with high EPICES scores,[19] low educational statuses[22 23] or low family incomes[18 23] compared with their counterparts without these conditions. Notably, 23% of pregnant women in France have been reported to have high EPICES scores regardless of GDM status,[19] and 17.5% have been coded as psychosocially deprived by social workers[15] in two other areas in France. Together, our results advocate for screening for deprivation among pregnant women with GDM.

Table 1 Characteristics of the total cohort of women by psychosocial status

	Total n=994	No psychosocial deprivation n=417	Psychosocial deprivation n=577	OR (95% CI)	p Value
EPICES score, unit	40.1±25.5	15.6±8.2	57.7±18.1		<0.001
Age, years	33.3±5.2	33.5±5.0	33.2±5.4		NS
Parity, n	2.4±1.3	2.3±1.2	2.6±1.3		<0.001
Nulliparity (%)	266 (26.8)	123 (29.6)	143 (24.8)		0.093
Weight (kg)	74.3±15.1	72.2±14.5	75.7±155		<0.001
Height (cm)	163±6	163±6	164±7		0.073
Body mass index, kg/m^2	27.8±5.4	27.2±5.3	28.2±5.4		<0.001
Weight status					<0.01
Normal weight (%)	307 (31.7)	153 (37.4)	154 (27.5)	REF	
Overweight (%)	374 (38.6)	150 (36.7)	224 (40.1)	1.5 (1.1 to 2.0)	<0.05
Obesity (%)	287 (29.6)	106 (25.9)	181 (32.4)	1.7 (1.2 to 2.4)	<0.005
Waist circumference					<0.01
<80 cm (%)	505 (51.8)	240 (58.3)	265 (47.2)	REF	
80–88 cm (%)	414 (42.5)	154 (37.4)	260 (46.3)	1.5 (1.2 to 2.0)	<0.01
>88 cm (%)	55 (5.6)	18 (4.4)	37 (6.6)	1.8 (1.03 to 3.36)	<0.05
Family history of diabetes (%)	545 (55.3)	247 (59.8)	298 (52.0)	0.7 (0.6 to 0.9)	<0.05
Non-daily fruit and vegetable consumption (%)	336 (33.9)	108 (25.9)	228 (39.7)	1.9 (1.4 to 2.5)	<0.001
Anti-hypertensive treatment (%)	62 (6.3)	20 (4.8)	42 (7.3)		NS
Lipid-lowering treatment (%)	8 (0.8)	2 (0.5)	6 (1.1)		NS
Smoking (%)	76 (7.7)	36 (8.7)	40 (6.9)		NS
History of GDM (%)	184 (20.6)	71 (18.9)	113 (21.8)		NS
Ethnicity/origin					<0.001
Europe (%)	229 (23.7)	140 (34.2)	89 (16.0)	REF	
Antilla (%)	19 (2.0)	8 (2.0)	11 (2.0)		NS
North Africa (%)	382 (39.5)	183 (44.7)	199 (35.7)	1.7 (1.2 to 2.4)	<0.01
Sub-Saharan Africa (%)	145 (15.0)	22 (5.4)	122 (22.1)	8.8 (5.2 to 14.9)	<0.001
Middle East (%)	25 (2.6)	8 (2.0)	17 (3.1)	3.3 (1.4 to 8.1)	<0.01
India–Pakistan (%)	74 (7.7)	26 (6.4)	48 (8.6)	2.9 (1.7 to 5.0)	<0.001
Asia (%)	92 (9.5)	22 (5.4)	70 (12.6)	5.0 (2.9 to 8.7)	<0.001
Working status (%)	376 (38.1)	212 (53.4)	154 (26.9)	0.3 (0.2 to 0.4)	<0.001

The data are expressed as n (%) or as the means±the SDs.
EPICES, Evaluation of Precarity and Inequalities in Health Examination Centers; GDM, gestational diabetes mellitus; NS, not significant; REF, reference.

Table 2 Events during pregnancy by psychosocial status

	Total n=994	No psychosocial deprivation n=417	Psychosocial deprivation n=577	OR (95% CI)	p Value
GDM diagnosis					0.024
<24 weeks gestation (%)	122 (15.1)	41 (12.1)	81 (17.3)	REF	
24–28 weeks gestation (%)	350 (43.3)	141 (41.5)	209 (44.7)	0.8 (0.5 to 1.2)	NS
≥28 weeks gestation (%)	336 (41.6)	158 (46.5)	178 (38.0)	0.6 (0.4 to 0.9)	0.011
Insulin therapy during pregnancy (%)	260 (29.4)	80 (21.8)	180 (34.8)	1.9 (1.4 to 2.6)	<0.001
GWG, kg	9.9±6.1	9.9±5.7	9.9±6.4		NS
Excessive GWG (%)	265 (27.4)	109 (26.6)	156 (27.9)		NS
Birth weight, kg	3.4±0.6	3.4±0.5	3.4±0.5		NS
Large for gestational age infants (%)	131 (13.2)	44 (10.6)	87 (15.1)	1.5 (1.02 to 2.2)	0.037
Birth weight ≥4000 g (%)	107 (11.7)	39 (10.1)	68 (12.9)		NS
Birth weight ≥4250 g (%)	42 (4.6)	17 (4.4)	25 (4.7)		NS
Shoulder dystocia (%)	23 (2.3)	5 (1.2)	18 (3.1)	2.7 (0.97 to 7.2)	0.047
Caesarean section (%)	256 (25.8)	104 (24.9)	152 (26.3)		NS
Preeclampsia (%)	18 (1.8)	11 (2.6)	7 (1.2)	0.5 (0.2 to 1.2)	0.096

The data are expressed as n (%) or as the means±the SDs.
GDM, gestational diabetes mellitus; GWG, gestational weight gain; REF, reference.

As previously reported for women with and without GDM,[19 32] we found that psychosocially deprived women with GDM were more likely to be obese. These women were also more likely to be unemployed and less likely to be daily consumers of fruits or vegetables; the latter association is most likely due to the cost of these foods. An association between socioeconomic status and healthy eating status, including fruit and vegetable consumption, has previously been reported.[33 34] We also observed a link between ethnicity/origin and deprivation; similar links have previously been described as complex relationships.[35–38] The women with and without psychosocial

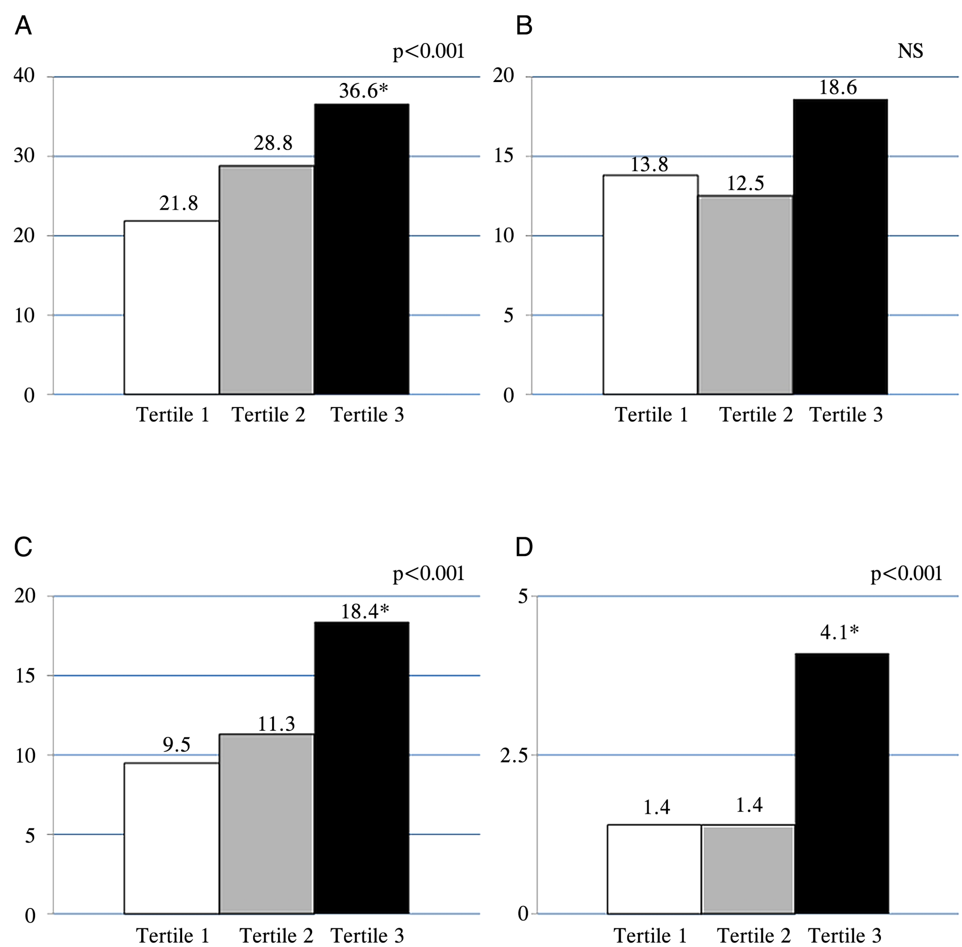

Figure 1 Prevalence of events according to the EPICES score tertiles. (A) Insulin therapy during pregnancy (%); (B) GDM diagnosis before 24 weeks gestation (%); (C) large for gestational age infants (%); (D) shoulder dystocia (%). *p<0.05 versus the first tertile. Tertile 1: EPICES score <23.71 (mean 11.7±6.2); tertile 2: EPICES score between 23.71 and 51.5 (mean 35.0±8.5) and tertile 3: EPICES score ≥51.5 (mean 69.9±12.6). EPICES, Evaluation of Precarity and Inequalities in Health Examination Centers; GDM, gestational diabetes mellitus; NS, not significant.

Table 3 Factors associated with LGA infants

	No LGA infant n=863	LGA infant n=131	Univariate analysis p Value	Multivariate analysis OR (95% CI)*	Multivariate analysis p Value*
Age, years	33.3±5.2	33.5±5.2	NS		–
Parity, n	2.4±1.3	2.7±1.2	<0.01	1.10 (0.93 to 1.31)	NS
Weight (kg)	73.1±14.8	82.1±15.3	<0.001		
Height (cm)	163±6	167±6	<0.001		
Body mass index, kg/m^2	27.5±5.4	29.8±5.0	<0.001		–
Obesity (%)	231 (27.4)	56 (44.4)	<0.001	1.53 (0.998 to 2.45)	0.06
Family history of diabetes (%)	470 (55.0)	75 (57.3)	NS		–
Non-daily fruit and vegetable consumption (%)	284 (33.0)	52 (39.7)	NS		–
Smoking (%)	66 (7.7)	10 (7.6)	NS		–
History of GDM (%)	143 (18.7)	41 (31.8)	<0.001	1.73 (1.09 to 2.75)	<0.05
Ethnicity/origin			<0.05		
Europe (%)	207 (24.8)	22 (16.8)		REF	
Antilla (%)	17 (2.0)	2 (1.0)		0.90 (0.18 to 4.38)	NS
North Africa (%)	314 (37.6)	68 (51.9)		1.63 (0.93 to 2.87)	0.09
Sub-Saharan Africa (%)	122 (14.6)	23 (17.6)		1.11 (0.54 to 2.32)	NS
Middle East (%)	24 (2.9)	1 (0.8)		0.32 (0.04 to 2.55)	NS
India–Pakistan (%)	66 (7.9)	8 (6.1)		1.02 (0.40 to 2.59)	NS
Asia (%)	85 (10.2)	7 (5.3)		0.59 (0.22 to 1.61)	NS
Working (%)	499 (39.0)	41 (31.3)	0.09		–
EPICES score, unit	39.1±25.4	46.5±25.3	0.002	1.12 (1.03 to 1.20)†	<0.01
Psychosocial deprivation (%)	490 (56.8)	87 (66.4)	0.037		–
GDM diagnosis			NS		–
<24 gestational weeks (%)	101 (14.9)	21 (16.4)			–
24–28 gestational weeks (%)	290 (42.6)	60 (46.9)			–
>28 gestational weeks (%)	289 (42.5)	47 (36.7)			–
GWG, kg	9.7±6.1	10.9±5.8	<0.05		–
Excessive GWG (%)	205 (24.3)	60 (47.6)	<0.001	2.34 (1.54 to 3.55)	<0.0001
Insulin therapy during pregnancy (%)	210 (27.8)	50 (38.8)	<0.05	1.32 (0.86 to 2.04)	NS

The data are expressed as n (%) or as the means±the SDs.
Current weights, heights, professional statuses, smoking statuses, number of children, family histories of diabetes and daily consumptions of fruits and vegetables were self-reported.
*Multivariate analysis considering parity, obesity, personal history of GDM, ethnic origin, EPICES score, excessive GWG during pregnancy and insulin therapy during pregnancy.
†Per 10 units.
EPICES, Evaluation of Precarity and Inequalities in Health Examination Centers; GDM, gestational diabetes mellitus; GWG, gestational weight gain; LGA, large for gestational age; NS, not significant; REF, reference.

deprivation reported similar prevalences of pre-pregnancy antihypertensive and lipid-lowering treatments, although metabolic disorders are often associated with elevated EPICES scores[39 40] and stress.[41] The lack of association observed in our study might be specific to women of reproductive age or might be attributable to reduced numbers of medical visits prior to pregnancy due to precarity.[16] The latter supposition would also result in undiagnosed metabolic syndrome prior to pregnancy, which would be in accordance with the greater prevalence of GDM diagnoses prior to 24 weeks of gestation among psychosocially deprived women. These findings suggest the possibility that these women might actually have had undiagnosed pregravid type 2 diabetes. Indeed, precarity is a risk factor for undiagnosed type 2 diabetes even in women of reproductive age.[42] However, we do not have access to the results of postpartum glycaemic assessments that would be needed to confirm this hypothesis.

We also studied the association between psychosocial deprivation and adverse pregnancy outcomes in women with GDM for the first time. Compared with women without precarity, those with precarity were more likely to have LGA infants and infants with shoulder dystocia. The association between EPICES scores and LGA infants was independent of obesity, which suggests that this relationship was only partially driven by the increased prevalence of overweight/obesity among the deprived women.[43 44] GWG and the prevalence of excessive GWG, which are other confounding factors regarding LGA infants,[43 44] were comparable between the women with and without precarity. We have recently shown that, compared with women from sub-Saharan Africa, European women experience more GDM-related events.[31] Furthermore, racial/ethnic differences in the clinical outcomes of GDM, including macrosomia, are commonly reported (for review).[45] The association of LGA with precarity remained significant after adjusting for origin/ethnicity while we did not find any association between precarity and offspring with birth weights greater than 4000 or 4250 g. The association between psychosocial deprivation and shoulder dystocia, which was not adjusted for confounding factors because the rate of dystocia events was low, was most likely driven by the prevalence of LGA infants. In a population-based study, the risk for shoulder dystocia increased significantly with BMI category in an unadjusted analysis, but this significance disappeared after adjusting for GDM.[35] As previously reported for pregnant women regardless of GDM status,[15] we found that the women in our cohort with GDM underwent caesarean section at similar rates regardless of the presence of psychosocial deprivation. Vulnerable women were diagnosed earlier with GDM, which suggests that unknown pregravid dysglycaemia might partially explain the increased rate of LGA infants.[46] In a recent German study, the groups that were found to be at high risk for GDM were women of low socioeconomic status, migrants and obese women. An elevated risk of fetal malformations was found among the women who had been diagnosed with GDM, which suggests that many of these women might have had high glucose levels by the first trimester.[47]

The present study has limits and strengths. The public hospital recruitment and the area we cover probably included a higher proportion of women living with vulnerable conditions, precluding a generalisation of our results. On the other hand, we could only include women who could fulfil the EPICES instrument and this may have underestimated the prevalence of psychosocial deprivation. Our large multicentre and diverse cohort and the adjustments for the relevant confounding factors ensure the robustness of our findings. However, we did not have access to data about glycaemic control, diet, physical activity or the numbers of visits during pregnancy. Thus, the adverse outcomes observed for the women with precarity might have been due to these factors based on the following arguments: (1) poor glycaemic control has been reported in vulnerable patients with diabetes[7] and was most likely present in our population with GDM and psychosocial insecurity because insulin treatment was more often necessary during GDM among this population; (2) fruit and vegetable consumption was lower among the vulnerable women following pregnancy, which might be indicative of poorer nutritional habits during pregnancy;[33 34 48] (3) exercise during late pregnancy has been reported to vary with the education level of the mother;[33 34 49] and (4) access to healthcare might depend on socioeconomic status,[19] but it is unlikely that access to healthcare influenced our results because healthcare is free of charge within the French healthcare system. Compliance may also differ according to psychosocial vulnerability status. Some data were self-reported, such as current weight, height, waist circumference class, professional status, smoking status, number of children, antihypertensive and lipid-lowering treatments, family history of diabetes and daily consumption of fruit and vegetables. We used the EPICES score, which is an individual index that has been validated during pregnancy[19] and appears to be more strongly linked to the risk of adverse maternofetal outcomes than neighbourhood-level socioeconomic status.[17] However, the EPICES questionnaire was retrospectively fulfilled (6–24 months after pregnancy).

CONCLUSIONS

To conclude, our results from a large multiethnic multicentre European cohort from an area in which precarity is common demonstrate that psychosocial deprivation affected more than half of the women with GDM. Psychosocial deprivation was associated with higher BMIs and earlier GDM diagnoses among the vulnerable women, which suggests that GDM most likely corresponded to unknown type 2 diabetes mellitus in these women and that prenatal diagnosis of type 2 diabetes should be reinforced in them, with weight control intervention and adherence to a healthy lifestyle before pregnancy.[50] The vulnerable women were also more likely to be treated with insulin, but they gained as much weight during pregnancy as did the non-vulnerable women. Independent of the gestational age at GDM diagnosis, insulin use, overweight/obesity, GWG and other confounders, these women were also more likely to have LGA infants. This finding suggests that the routine screening of women with GDM for psychosocial vulnerability may be an important tool for improving the prognoses of these women and their children. For example, specific follow-up and psychosocial support might be beneficial in these women.

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Psychosocial deprivation in women with gestational diabetes mellitus is associated with poor fetomaternal prognoses: an observational study

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