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CLINICAL ARTICLE

Influence of obesity on route of delivery in a population of African descent in Martinique

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ABSTRACT

Objective: To determine whether obesity is an independent risk factor for cesarean delivery in Martinique. **Methods:** A retrospective study was performed using data for deliveries that occurred at the University Hospital of Fort de France between January and September 2010. Women were divided into four groups on the basis of body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters; <25 [group 1], 25–29 [group 2], 30–39 [group 3], and ≥40 [group 4]). Independent risk factors for cesarean delivery were identified through multivariate analysis. **Results:** Overall, 1286 women were included. Mean weight gain was lower in groups 2 (9.9 kg, 95% CI 9.2–10.7), 3 (5.7 kg, 4.7–6.7), and 4 (1.0 kg, –1.5 to 3.5), than in group 1 (12.3 kg, 11.9–12.7; $P < 0.001$ for all). In univariate analysis, cesarean deliveries were more frequent among nulliparous women in group 2 ($P = 0.007$) and group 3 ($P = 0.053$) than among those in group 1. In multivariate analysis, BMI was not associated with cesarean delivery (BMI 25–29: adjusted odds ratio 0.64, 95% CI 0.33–1.25; BMI ≥30: 0.61, 0.29–1.39). **Conclusion:** Obesity was not an independent risk factor for cesarean delivery. Weight control and a positive attitude towards trial of labor in obese women could have led to the findings. © 2015 International Federation of Gynecology and Obstetrics. Published by Elsevier Ireland Ltd. All rights reserved.

1. Introduction

Obesity is a common issue among women of childbearing age. In the USA, 40% of pregnant women are overweight and 28% are obese [1], whereas the respective rates are 15% and 7% in France [2]. In Martinique in the French West Indies, the prevalences are similar to those in the USA: 26% of pregnant women are obese and 29% are overweight [3].

Obesity is a risk factor for various obstetric complications, including gestational hypertension, pre-eclampsia, diabetes mellitus, fetal macrosomia and malformations, intrauterine fetal demise, and cesarean delivery [1,4]. Indeed, high cesarean delivery rates are commonly reported in studies on this topic [1,4], with a linear relationship between body mass index (BMI, calculated as weight in kilograms divided by the square of height in meters) and cesarean delivery rates (7% rise with every unit increase in BMI) [4]. Nevertheless, the explanation for this observation remains elusive [5]. Although the high rate of cesarean deliveries has been linked with the numerous complications of pregnancy increasingly encountered in obese women [4], an independent link between obesity and cesarean delivery has also been observed in large studies [6,7]. Thus, the aim of the

present study was to determine whether such a link exists in a population of African descent in Martinique.

2. Material and methods

A retrospective study was performed using data for deliveries that occurred at the University Hospital in Fort-de-France, Martinique, between January 1 and September 30, 2010. The exclusion criteria were fetal abnormalities diagnosed prenatally, non-cephalic presentation, placenta previa, scarred uterus, and multiple pregnancy. Ethical approval was obtained from the institutional review board of the French National College of Obstetricians and Gynecologists (number OBS 2013-08-07). Written informed consent was obtained from all participants.

Women were categorized into four groups according to their BMI: group 1 (BMI <25), group 2 (overweight; BMI 25–29), group 3 (obese [class I–II]; BMI 30–39), and group 4 (obese [class III]; BMI ≥40). Height and weight had been measured at the first prenatal visit. Several demographic and medical features were recorded, including maternal age, parity, educational level, marital status, history of hypertensive disorder or diabetes, smoking habits, and place of birth (French West Indies, metropolitan France, Caribbean islands, or other).

Gestational diabetes had been diagnosed following an oral glucose charge test (administration 100 g glucose). Hypertensive disorder during pregnancy included chronic hypertension (blood pressure > 140/90 mm Hg recorded at least twice before 20 weeks of pregnancy), gestational hypertension (hypertension diagnosed after 20 weeks), or pre-eclampsia

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(hypertension plus proteinuria >300 mg/day). Maternal weight gain was recorded. Gestational age at delivery was determined according to the date of the last menstrual period and had usually been confirmed by ultrasonography before 15 weeks of gestation. Labor initiation was described as spontaneous or induced. Duration of labor was measured as the time between a cervical dilatation of 3 cm to delivery, excluding cesarean delivery before labor. Route of delivery (cesarean, assisted vaginal, or spontaneous vaginal) and its indications were recorded. Shoulder dystocia was present when a specific maneuver was necessary to assist delivery. Management of the third stage of labor (i.e. active management and manual removal of placenta) and the occurrence of postpartum hemorrhage were also recorded. Neonatal Apgar scores and weights were recorded, as well as the need for transfer to the pediatric unit.

The aim of the present study was to determine the influence of maternal BMI on mode of delivery after controlling for other variables. Therefore, in univariate analysis, quantitative variables were compared using the Student *t* test or Mann–Whitney test. Discrete (qualitative) variables were compared using the χ^2 test or Fisher exact test. $P < 0.05$ was deemed statistically significant. A stepwise multivariate analysis with bidirectional elimination was conducted to establish the proper role of obesity in the occurrence of a cesarean or an assisted delivery. Before modelling, the absence of interactions between the explanatory variables was assessed. The results were considered significant if the first species risk was less than 5%. All calculations were performed using Stata version 10 (StataCorp, College Station, TX, USA).

3. Results

During the study period, 1286 women delivered at the maternity ward of the study center. Group 1 included 787 (61.2%) women (including 33 [2.6%] with a BMI <17), group 2 included 303 (23.6%), group 3 included 171 (13.3%), and group 4 included 25 (1.9%). The maximum BMI recorded was 52.5. Parity varied between groups, with the proportion of nulliparous women highest in group 1 (Table 1).

Obstetric care was similar in the three groups: the number of women who had fewer than four prenatal consultations was 56 (7.1%) in group 1, 15 (5.0%) in group 2, 15 (8.8%) in group 3, and 1 (4.0%) in group 4 ($P = 0.37$). The mean weight gain during pregnancy was lower in groups 2 (9.9 kg, 95% confidence interval [CI] 9.2–10.7), 3 (5.7 kg, 95% CI 4.7–6.7) and 4 (1.0 kg, 95% CI –1.5 to 3.5) than in group 1 (12.3 kg, 95% CI 11.9–12.7; $P < 0.001$ for all). Obstetric complications during previous pregnancies are shown in Table 1 and complications during the index pregnancy in Table 2.

Compared with group 1, induction of labor was significantly more frequent in group 2 (odds ratio [OR] 1.55, 95% CI 1.07–2.25; $P = 0.02$) and group 3 (OR 1.97, 95% CI 1.28–3.03; $P = 0.001$) (Table 2). The difference between groups 1 and 4 was not significant as a result of insufficient power (low number of women in group 4). However, when induction of labor due to diabetes or a hypertensive disease during

pregnancy was excluded, induction was not more common in group 2 (OR 1.33, 95% CI 0.87–2.04), group 3 (OR 1.39, 95% CI 0.80–2.41), or group 4 (OR 1.16, 95% CI 0.26–5.18) than in group 1.

Among nulliparous patients, cesarean delivery was significantly more common in group 2 than in group 1 ($P = 0.007$) (Table 3). The proportion delivering by cesarean was also higher in group 3 than in group 1, but the difference was nonsignificant ($P = 0.055$) (Table 3).

Among parous women, labor was significantly longer in group 3 than in group 1 ($P = 0.003$) (Table 3). It was shorter in group 4 than in group 1 ($P = 0.045$), although the low number of parous patients in group 4 means that this finding is of limited relevance. The analysis of cesarean delivery indications revealed no differences in distribution between the four groups. Birth weight was similar in groups 1 and 2 (Table 3). However, it was significantly higher in groups 3 ($P = 0.013$) and 4 ($P = 0.046$) than in group 1 (Table 3).

Multivariate analysis showed that pre-eclampsia was associated with cesarean delivery (Table 4). Overweight and obesity were not independently linked with cesarean delivery (Table 4). A low education level was associated with an instrumental delivery, but neither overweight nor obesity was (Table 4).

4. Discussion

In the present study, the rate of cesarean delivery was not higher among patients in groups 3 and 4 than among patients with a BMI lower than 25 when adjusting for potential confounders. However, obstetric complications during previous pregnancies and the index pregnancy, including hypertension and gestational diabetes, were more frequent among women with a higher BMI.

The absence of an observed link between obesity and cesarean delivery is unusual: the cesarean delivery rate is well known to have a linear positive link with maternal BMI [1,4–8]. However, the associations between BMI and obstetric complications in the present study are in line with previous findings [6–8]. Medical complications partly account for the high cesarean delivery rate [7], which could explain the present finding that cesarean delivery tended to be more common among women in group 3 than among women with a BMI of less than 25 in univariate analysis. However, the difference in cesarean delivery rate has not been eliminated in previous studies when controls for these factors have been introduced [6–8].

Because the present study focused on the impact of BMI on cesarean delivery rate, women with a scarred uterus were excluded because this problem represents an additional risk factor for cesarean delivery. In general, the success rate of trial of labor after cesarean delivery is reduced in obese women [9]. Further, there is a reluctance to offer trial of labor in women in whom emergent cesarean delivery is considered particularly hazardous because of the technical difficulties and increased postoperative morbidity observed in this population [1,9]. Thus, exclusion of previous cesarean deliveries eliminated such an influence on the decision of mode of delivery among obese women in the present

Table 1
Sociodemographic data and medical history.^a

	Group 1 (n = 787)	Group 2 (n = 303)	Group 3 (n = 171)	Group 4 (n = 25)
Maternal age, y	27.9 (27.4–28.3)	30.1 (29.3–30.9) ^b	29.3 (28.4–30.3) ^b	27.3 (25.4–29.1)
Nulliparous	432 (54.9)	104 (34.3) ^b	63 (36.8) ^b	10 (40.0)
Educational level less than high school	254 (32.3)	122 (40.3) ^b	77 (45.0) ^b	14 (56.0) ^b
Having a partner	346 (44.0)	132 (43.6)	73 (42.7)	13 (52.0)
Tobacco consumption	120 (15.2)	37 (12.2)	15 (8.8)	3 (12.0)
Tobacco consumption during pregnancy	65 (8.3)	10 (3.3)	5 (2.9) ^b	1 (4.0)
Born in the Caribbean	685 (87.0)	286 (94.4) ^b	164 (95.9) ^b	24 (96.0)
History of diabetes	4 (0.5)	8 (2.6)	8 (4.7) ^b	0
Previous gestational hypertension or pre-eclampsia	24 (3.0)	19 (6.3)	25 (14.6) ^b	5 (20.0) ^c

^a Values are given as mean (95% confidence interval) or number (percentage).

^b Comparison with group 1: $P < 0.05$.

^c Comparison with group 1: $P = 0.07$.

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