THE EFFECTS OF MATERNAL OBESITY ON MATERNAL AND NEONATAL OUTCOMES IN WOMEN WITH GESTATIONAL DIABETES

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ABSTRACT

Background

Obesity and gestational diabetes mellitus (GDM) can interfere. Poorly controlled blood glucose can cause unfavourable maternal and neonatal outcomes.

Objectives

The study aims to know the effects of maternal obesity on maternal and neonatal outcomes in pregnant women with controlled GDM..

Patients and Methods

A prospective observational study was performed on 90 pregnant women with GDM admitted to Sulaimani Maternity Teaching Hospital from January 2020 to January 2021. Maternal and gestational ages, residencies, gravidity, and parity were recorded. In addition, maternal body mass index, depending on Rcog guidelines for blood glucose targets, mode of delivery, and maternal and neonatal complications were noted. Also, neonatal complications were documented, including Apgar score and body weight.

Results

Maternal ages were 34.2±6.4 years, ranging from 21 to 45. Most of them (92.3%) resided inside Sulaimani. None of the maternal outcomes had a significant association with their body weight (P-value >0.05). One woman in the obese group had intrauterine fetal death. All neonatal consequences were significantly associated with maternal body weight (P-value <0.05).

Conclusion

The current study did not find significant associations between maternal body weights with maternal outcomes in women with controlled GDM. However, at the same time, maternal obesity has significantly increased neonatal complications.

Keywords: *Maternal obesity; Gestational Diabetes; Maternal Outcomes; Neonatal outcomes.*

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INTRODUCTION

Obesity and its resultant complications are more frequently recognised as a global issue due to improving living standards and greater access to affordable; however, not necessarily healthier nutrition. In addition, metabolic syndrome, i.e., hypertension, diabetes mellitus (DM), hyperlipidemia, and atherosclerotic vascular diseases, is a medical consequence of obesity [(1)].

The prevalence of type I and II DM in childbearing-aged women has steadily increased [(2)]. Further, poorly controlled DM before pregnancy and during the first trimester can cause congenital malformations, miscarriage, and increased perinatal mortality [(2)]. By itself, pregnancy is a condition of reduced insulin sensitivity. It can grow 50-60% insulin resistance and a 2-3 fold decrease in insulin response in normoglycemic women. Thus, women at risk of getting gestational diabetes (GDM) most often reduce insulin sensitivity before conception, like being obese or overweight [(1)].

Besides, GDM is usually developed during the last half of the pregnancy, and its incidence is 1.7-15.7% according to maternal age, ethnicity, and diagnostic criteria [(2)]. GDM has been linked to interfering with fetal growth and increasing fetal weight, i.e., macrosomia [(2)]. The frequency and severity of the complications related to DM and GDM are directly linked to the level of glycemic control and management; better control can decrease the complications [(1, 2)].

Obesity is a significant issue that should be concerned about it. Obesity is defined as a body mass index (BMI) of ≥ 30 kg/m2 [(3)]. Moreover, obesity can be a risk for preeclampsia and GDM, increasing the rate of cesarean section (C/S) performed [(4)]. Also, excessive weight gain during pregnancy or the puerperal period is a significant risk factor for later obesity in the woman [(4)]. Further, maternal obesity significantly affects the fetus and the child's health later in life [(4)].

The current study aimed to know the effect of maternal obesity and glycemic control on maternal and neonatal outcomes in patients with GDM.

PATIENTS AND METHODS

A prospective observational study was performed on 90 pregnant women diagnosed with GDM between 24-40 completed weeks and were admitted to the Diabetic Center of Sulaimani Maternity Teaching Hospital from January 2020 to January 2021. The pregnant women were randomly selected by using a simple random sampling method.

The Kurdistan Board of Medical Specialties (KBMS) approved the study proposal, and a formal acceptance letter was obtained from Sulaimani Maternity Teaching Hospital. In addition, informed consent has been taken from the patients for their inclusion in the study.

The inclusion criteria included pregnant women with GDM with good glycemic control. However, the exclusion criteria included the following:

- Multiple pregnancies.
- Other maternal comorbidities like hypertension and ischemic heart disease.
- Fetal congenital abnormalities were found by ultrasound screening during the current pregnancy.
- Refusal to participate.

The demographic features were recorded, including maternal and gestational ages, residencies, and parity and gravidity. Besides, maternal BMI during booking visits, blood glucose level during pregnancy, course of labour, mode of delivery, and maternal and neonatal outcomes, were recorded. Then, the women were divided into two groups according to their BMI:

1- Group I: BMI of <25 kg/m^2.

2- Group II: Obese BMI (BMI of ≥ 30 kg/m^2).

Both the groups were followed up from the second trimester onward till delivery according to the regular schedule arranged by the multidisciplinary team at the Diabetic Center at two to four weekly intervals until 32 weeks of gestational age; then, every one to two weeks until the delivery time. Both groups had good glycaemic control(self-monitoring of blood glucose SMBG). However, the different group was the obese group to follow. Further, the neonatal complications, Apgar score, and body weight were also recorded.

The "IBM SPSS Statistics version 25" software was used to analyse the data, and descriptive and inferential statistics were used. Further, a P-value of ≤0.05 was considered a statistically significant association. Also, Pearson Chi-Square was used to determine the significance of the association between categorical independent and dependent variable pairs.

RESULTS

The mean±SD (standard deviation) of the women's age was 34.2±6.4 years and resided inside Sulaimani (92.3%), and they delivered near the end of their pregnancy with a mean gestational age of 37.1 weeks. All women (100%) had good glycemic control. Most pregnant women had been put on either metformin alone or with insulin treatment. The two groups were similar in their demographic characteristics (Table 1). None of the maternal outcomes was significantly altered by their body weight. However, 13 (14.4%) women had a prolonged first stage, one woman had been afflicted with intrauterine fetal death, and one woman delivered by assisted vaginal delivery in the obese group (Table 2). All neonatal outcomes were altered significantly by maternal weight; low Apgar scores, admissions to NICU, feeding problems, and shoulder dystocia were more frequent among the obese group (Table 3).

Table 1. Demographic characteristics.

Demographic characteristics		BMI groups (Kg/m2) Group I	BMI groups (Kg/m2) Group II	Total	p-values
Age (year) mean±SD (range)		32.8±6.5 (21 - 45)	35.6±6 (21 - 44)	34.2±6.4 (21 - 45)	0.217
Residency No. (%)	Urban	42 (46.7)	41 (45.6)	83 (92.3)	0.874
	Rural	3 (3.3)	4 (4.4)	7 (7.8)	
	Total	45 (50)	45 (50)	90 (100)	
Gravida	Primi	9 (10)	4 (4.4)	13 (14.4)	0.134
	Multi	36 (40)	41 (45.6)	77 (85.6)	
Parity	≤5	44 (48.9)	43 (47.8)	87 (96.7)	0.557
	>5	1 (1.1)	2 (2.2)	3 (3.3)	
Gestational age (week) (mean±SD)		37.5±1.4 (33 to 40)	36.8±1.9 (29 to 40)	37.1±1.7 (29 to 40)	0.301
Neonatal weight (%)	No (≤4 Kg)	43 (47.8)	42 (46.7)	85 (94.4)	0.645
	Yes (>4 Kg)	2 (2.2)	3 (3.3)	5 (5.6)	

BMI = body mass index; SD = standard deviation

Table 2. The difference between maternal outcomes among the two study groups.

Maternal outcomes			BMI groups (Kg/m2) (%) Group I	BMI groups (Kg/m2) (%) Group II	Total (%)	p-values
Mode of delivery	**Normal vaginal delivery**		12 (13.3)	10 (11.1)	22 (24.4)	
	Operative	Assisted vaginal delivery	0 (0)	1 (1.1)	1 (1.1)	0.581
		C/S	33 (36.6)	34 (37.8)	67 (74.4)	
Episiotomy		Yes	7 (7.8)	9 (10)	16 (17.8)	0.269
		No	38 (42.2)	36 (40)	74 (82.2)	
Prolonged first stage		Yes	3 (3.3)	13 (14.4)	16 (17.8)	0.431
		No	42 (46.7)	32 (35.6)	74 (82.2)	
Postpartum haemorrhage		Yes	0 (0)	3 (3.3)	3 (3.3)	0.078
		No	45 (50)	42 (46.7)	87 (96.7)	
Lower genital tract trauma		Yes	1 (1.1)	7 (7.8)	8 (8.9)	0.062
		No	44 (48.9)	38 (42.2)	82 (91.1)	
Postpartum endometritis		Yes	1 (1.1)	0 (0)	1 (1.1)	0.315
		No	44 (48.9)	45 (50)	89 (98.9)	
Intrauterine fetal death		Yes	0 (0)	1 (1.1)	1 (1.1)	0.315
		No	45 (50)	44 (48.9)	89 (98.9)	
Total			**45 (50)**	**45 (50)**	**90 (100)**	—

BMI = body mass index; C/S = cesarean section

Table 3. The differences between the neonatal outcomes.

Neonatal outcomes		BMI groups (Kg/m2) (%) Group I No. (%)	No. (%)	Total (%)	p-values
Shoulder dystocia	Yes	0 (0)	2 (2.2)	2 (2.2)	**0.041**
	No	45 (50)	43 (47.8)	88 (97.8)	
Low APGAR score at five minutes	Yes	2 (2.2)	33 (36.7)	35 (38.9)	**0.001**
	No	43 (47.8)	12 (13.3)	55 (61.1)	
Admission to NICU	Yes	2 (2.2)	33 (36.7)	35 (38.9)	**0.002**
	No	43 (47.8)	12 (13.3)	55 (61.1)	
Feeding problem	Yes	3 (3.3)	11 (12.2)	14 (15.6)	**0.004**
	No	42 (46.7)	34 (37.8)	76 (84.4)	
Total		**45 (50)**	**45 (50)**	**90 (100)**	**—**

BMI = body mass index; NICU = neonatal intensive care unit; SD = Standard deviation

DISCUSSION

Gestational DM can increase the risk of complications in mothers and newborns [5]. Besides, there is a trend of maternal and neonatal unfavourable outcome increment in mothers with obesity and DM [6]. However, the current study's findings showed no significant association between such negative maternal outcomes and maternal body weight; however, there was a significant association between maternal body weight and neonatal outcomes. Our findings are not compatible with the results of Athukorala et al. [7], in which they found a significant association between maternal obesity and maternal outcomes; however, it is going in line with their study in which they found an increased risk of unfavourable neonatal outcomes, including macrosomia, with maternal body weight. Further, all of the women in the current study had GDM, and 50% were obese; however, the women in the study performed by Wahabi et al. [6] included women without DM plus women with GDM. Besides, the study by Athukorala et al. [7] involved women with hypertensive adverse maternal outcomes, contrary to the current research in which women with hypertension were excluded.

Near to the present study's findings, Casey et al. [8] found no significant association of body weight of pregnant women with unfavourable maternal and neonatal outcomes when they followed the patients up for ten years after the pregnancy. However, the study performed by Casey et al. [8] selected women who had been diagnosed with mild GDM, and because women with GDM are already afflicted with decreased secretion of insulin and increased insulin resistance before and during pregnancy; thus, they have an increased risk of being afflicted with DM later in their lives [9]. Therefore, although they found no significant association between unfavourable maternal and neonatal outcomes with GDM, their patient selection differs from the current study's inclusion criteria in which all the pregnant women in the present study had GDM [9].

In the current study, only five neonates had a body weight of more than 4000 grams, i.e., macrosomia, and its associations with maternal BMI were statistically non-significant. However, neonatal complications like shoulder dystocia, feeding problems, and admission to the neonatal intensive care unit (NICU) can result from increased neonatal body weight, primarily when the neonate is delivered by vaginal delivery. Also, maternal DM can increase insulin resistance and decrease insulin response; thence, it can cause macrosomia in the neonate [4,10]. Therefore, because the association of neonatal macrosomia with maternal BMI in the current study was statistically non-significant; thus, we suggest that decreased macrosomia has led to a decrement in maternal complications.

The current study chose women with GDM, and 50% were afflicted with obesity. Although studies in the literature found interactions between obesity and GDM and maternal and neonatal outcomes [11–13], the current study did not find significant associations except for neonatal outcomes. Although that can explain the findings, this study chose only diabetic women, and no comparative non-diabetic groups were used due to its study design nature.

In Conclusion, although maternal GDM and obesity were associated significantly with maternal and neonatal unfavourable outcomes in the literature, the

current study did not find such significant associations except for significant neonatal outcomes.

The main limitation of the current study is the absence of an equivalent comparative non-GDM pregnant group due to its prospective observational study design. However, its main strength is studying the effects of maternal body weight during pregnancy on both maternal and neonatal outcomes.

Conflict of interest

The authors declare that there was no conflict of interest.

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