

# *Assessment of maternal obesity and perinatal consequences*

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## **Abstract**

*Introduction: Nowadays the prevalence of obesity especially maternal obesity prevalence has increased substantially and provides a major challenge to public health. Besides that, weight gain during pregnancy may result in negative outcomes for women and neonatal.*

*Objective: We evaluated maternal obesity prevalence and outcomes during and after pregnancy at the Regional Hospital of Ferizaj.*

*Methods: A total of 258 pregnant females who delivered their babies at the Regional Hospital of Ferizaj between March 2018 and March 2020 were included in this study. Based on the body mass index (BMI) of maternal, the patients were divided into groups: underweight, normal weight, overweight, obese I, obese II, and obese III/morbid obese. The effects of obesity on fetal and maternal outcomes were investigated.*

*Results: Overall 258 pregnant women were included in our study, the average age was  $28.7 \pm 3.4$ , with min age of 19 and a max of 41 years old. The prevalence of BMI over the normal weight among pregnant women resulted in 70.5% (182/258). Most of the maternal were overweight at 29.6% (54/182), obese class I at 27.5% (50/182), obese class II at 25.3% (46/182), and obese class III at 17.6% (32/182), with a significant association between them  $\chi^2=2.8$ ,  $p<0.02$ . Adverse obese maternal effects*

*and perinatal consequences or other problems were significantly more frequent than in normal-weight maternal. Besides that, in this study, the low-birth-weight infant rate was higher in the low BMI pregnant cases with a strong significant association ( $\chi^2=37.8$  p value < 0.0001).*

*Conclusion: The finding of this study conclude that obesity plays a significant risk factor and it is a strong association with complications in pregnancy and newborns. Further studies are recommended to explore the obesity problems to develop guidelines and strategies and to minimize the adverse effect of this risk for developing maternal and newborn complications.*

**Keywords:** *Body mass index; obesity; pregnancy, maternal*

## **Introduction**

Nowadays the prevalence of obesity especially maternal obesity prevalence has increased substantially. It is a public health and pandemic problem that contributes to preventable deaths each year (1). Moreover, the cases of overweight and obese women of reproductive age are increasing in many countries. In obstetric services, pregnancy obesity is one of the important challenges. Meantime, the rise of maternal obesity prevalence is associated with the increase of potential negative effects on the mother and fetus. Due to the consequences that obesity in pregnancy causes, it is redefined as an obstetric condition that requires special attention (2). It is estimated that, in 2025, more than 21% of women in the world will suffer from obesity (3). Obesity is defined as body mass index (BMI)  $\geq 30$  kg/m<sup>2</sup> and can be further stratified by class: class I (BMI 30.0 to 34.9 kg/m<sup>2</sup>), class II (BMI 35.0 to 39.9 kg/m<sup>2</sup>), and class III and above (BMI  $\geq 40$  kg/m<sup>2</sup>) (4).

Marchi et al in one study highlights that maternal obesity increases the adverse outcomes not only for the mother but also for neonatal, and childhood. Moreover, maternal obesity increases the risk of gestational diabetes mellitus, gestational hypertension, pre-eclampsia, instrumental delivery, Caesarean section delivery, and stillbirth (5). Women with obesity are more likely to deliver a neonate with congenital abnormalities, large-for-gestational-age (LGA), and respiratory distress syndrome (6). Cnattingius et al, in their study, found that maternal overweight and obesity during pregnancy are associated with increased risks of preterm delivery, especially extremely preterm delivery (7). On the other hand, preterm birth (< 37 weeks' gestation) complications were a leading cause of death in children under 5 years, accounting for 1 million mortalities globally in 2015 (8). Furthermore, preterm babies are at increased risk of many complications, a risk that increases with decreasing gestational age at delivery. Post-term birth ( $\geq 42$  weeks' gestation)

is also associated with an increased risk of stillbirth, neonatal and infant death (9), and an increased risk of maternal morbidity due to fetal macrosomia, hemorrhage, and thromboembolic disease (10). The aimed study was to evaluate the prevalence of maternal obesity and its complications during and after pregnancy.

## Methods

This paper is an observational descriptive and cross-sectional design study. The inclusion criteria were pregnant women with obesity who delivered their babies at the University Clinical Center of Kosovo, Regional Hospital of Ferizaj between March 2018 and March 2020. The exclusion criteria for this research were incomplete medical records of pregnant women. Also, we have excluded all pregnant women with previous illness histories (like hypertension and diabetes mellitus).

During the two years of this study, we investigated about 258 pregnant women. For the classification of maternal BMI, we have used the WHO directive. So, maternal obesity was categorized as: obese I (30–34,9 kg/m<sup>2</sup>), obese II (35–39,9 kg/m<sup>2</sup>), and obese III/morbid obese ( $\geq 40$  kg/m<sup>2</sup>). All participants were divided into groups based on BMI, so:  $< 18.5$  kg/m<sup>2</sup> was underweight, 18.5–24.9 kg/m<sup>2</sup> was normal weight, 25–29.9 kg/m<sup>2</sup> was overweight, obese I (30–34,9 kg/m<sup>2</sup>), obese II (35–39,9 kg/m<sup>2</sup>), and obese III/morbid obese ( $\geq 40$  kg/m<sup>2</sup>). Moreover, we have investigated the effects of obesity on fetal and maternal outcomes. Participants in this survey were informed through verbal communication during the first the hospital. In this survey, no personal data were recorded, and all questionnaires were completed anonymously. Additionally, maternal were informed that participation in the study was voluntary and participants could withdraw at any moment. All study procedures were approved by the Human Investigation Committees at the Ferizaj Hospital. All methods were applied in accordance with relevant guidelines and regulations.

The statistical software package SPSS version 26.0 was used to analyze the maternal and neonatal outcomes. The number (n) and percentage (%) were used to present all categorical variables while for continuous variables we used the means and standard deviations (SD). The tests such as the chi-square ( $\chi^2$ ) test and the t-test were used to compare variables and to compare the mean values, respectively. To evaluate the associations of maternal obesity with GH and HBP we used univariate and multivariate logistic regression analyses. A p-value  $< 0.05$  was evaluated as statistically significant.

## Results

Overall 258 pregnant women were conducted in this study, the mean age was  $28.7 \pm 3.4$ , with min age of 19 and a max of 41 years old. Most of the maternal were in the age group 25-35 years old. The prevalence of BMI over the normal weight among pregnant women resulted in 70.5% (182/258). Most of the maternal were overweight at 29.6% (54/182), obese class I at 27.5% (50/182), obese class II at 25.3% (46/182), and obese class III at 17.6% (32/182), with a significant association between them  $\chi^2=2.8$ ,  $p<0.02$ . About 59.6% live in the urban area, approximately 40% were in high school, and 38.7% were at the university level. Moreover, 55.8% of maternal were employed, and 53.5% were multiparous. Related to the familiar history of diabetes mellitus and hypertension about 46.8% of the maternal have a familiar history with diabetes mellitus and 46.5% with hypertension. Gestational diabetes appeared in 28.7% of maternal, gestational hypertension at 34.1%, preeclampsia at 33.7% and about 39.5% have a caesarian section. According to the habits, most of maternal do not smoke, and also 71% have a sedentary life (table 1).

**TABLE 1.** Baseline characteristics of maternal: Maternal outcomes and labor and delivery

Variables	under-weight	normal weight	over-weight	obese class I	obese class II	obese class III
Age group < 25 years old	11	22	19	13	14	7
25–35 years old	8	14	24	16	13	9
> 35 years old	9	12	11	21	19	16
<b>Residence</b>						
Rural	7	13	20	23	27	14
Urban	21	35	34	27	19	18
<b>Education</b>						
Primary level	7	12	9	12	9	6
High school	16	17	19	20	19	12
University	5	19	26	18	18	14
<b>Employment</b>						
No	15	23	19	23	22	12
Yes	13	25	35	27	24	20
<b>Parity</b>						
Primiparous	20	23	21	23	19	14
Multiparous	8	25	33	27	27	18

Family history of diabetes mellitus						
No	22	30	29	18	24	14
Yes	6	18	25	32	22	18
Family history of hypertension						
No	19	26	34	23	19	17
Yes	9	22	20	27	27	15
Hyperglycemic and hypertension disorders						
Gestational Diabetes	5	8	12	17	20	12
Gestational hypertension	2	7	19	21	24	15
Preeclampsia	3	6	20	18	22	18
Caesarian section	12	9	19	20	25	17
Smoking						
No	24	35	39	45	34	26
Yes	4	13	15	5	12	6
Physical activity during pregnancy						
No	22	25	28	42	39	27
Yes	6	23	26	8	7	5

Table 2 shows the pregnancy and neonatal outcomes related to maternal obesity. We have grouped all maternal into two big groups. The first group includes all maternal with normal weight and the second group includes maternal obesity (such as maternal in the category of overweight, obese class I, obese class II and obese class III). Based on the logistic regression analyses, the pregnancy and neonatal outcomes were several times in risky in maternal obesity than in normal-weight pregnant women.

**TABLE 2.** Pregnancy and neonatal outcomes related to the maternal obesity

Variables	Normal weight		Obese	
	Odds ratio (95 CI)	P value	Odds ratio (95 CI)	P value
Gestational Diabetes	1.1 [0.52-1.95]	0.04	8 [4.1-12.6]	<0.01
Gestational hypertension	2.2 [2.0-7.5]	0.01	11 [8.1-22.7]	<0.0001
Preeclampsia	1.9 [0.98-5.5]	0.02	14 [8.2-24.0]	0.001
Caesarian section	1.2 [0.7-2.3]	0.03	3.7 [1.9-6.8]	0.004
Length stay >7 days	1.5 [0.67-2.84]	0.005	4.1 [2.5-7.1]	0.0001
Preterm delivery ≤ 37 weeks	1.02 [0.75-2.4]	0.01	3.2 [1.52-7.81]	0.009
Apgar score ≤7 at 5 min	0.74 [0.1-2.4]	0.9	1.5[0.5-3.2]	0.04
Birthweight ≤2500kg	0.5 [0.08-1.2]	0.4	1.2 [0.02-2.4]	0.03

Birth weight $\geq$ 4000kg	0.7 [0.05-1.8]	0.6	2.4 [1.09-3.8]	0.003
Birth weight $\geq$ 4500kg	1.9 [1.0-3.5]	0.02	6.7 [3.05-7.9]	<0.0001
Admission of the baby to the neonatal intensive care unit	1.9 [0.72-2.8]	0.03	9.5 [4.1-15.5]	<0.0001

## Discussion

This study demonstrates that being overweight or obese increases the risk of various adverse maternal and neonatal outcomes. Numerous studies have documented similar findings (11-14).

Our findings show that women older than 35 years of age were 1.8 times more likely to be obese compared to younger women. This fact is consistent with another study conducted by Madi et al (15) who also reported that older pregnant women among obese pregnant women had higher parity compared with the control group but is in contrast with another study conducted by Stepan et al (16) were not observed a significant difference between maternal age and gestational age in the comparison between groups with and without obesity.

Ngoga et al, highlight in their study that the rates of hypertensive diseases of pregnancy and gestational diabetes among obese women are significantly increased (17). In the present study, the prevalence of gestational hypertension was 33.7%, which was higher than that observed in another published study (18), but lower than in another study (19). Our data show that obese women have a 2 times greater risk of developing hyperglycemic disorders (28.7%), and this finding is higher than a previous study (17).

Avci et al, in their study, found significant increases in maternal and neonatal outcomes (such as hypertension, gestational diabetes mellitus, cesarean delivery, premature rupture of membranes, shoulder dystocia, etc) caused by obesity. Moreover, adverse maternal effects in obese cases were significantly more frequent than those in normal-weight cases. So, preterm birth, perinatal mortality, low APGAR scores, macrosomia rates, etc were significantly higher in maternal obese cases. While the low-birth-weight infant rate was higher in the low BMI cases than that in the other BMI categories ( $p < 0.01$ ) (19). The findings of this study were consistent with the findings of our study. Adverse obese maternal effects and perinatal consequences such as preterm birth, newborn intensive care unit requirement, or other problems were significantly more frequent than those in normal-weight cases.

Moreover, in this study, the finding of the low-birth-weight infant rate was higher in the low BMI pregnant cases than that in the other BMI categories (with a strong significant association  $\chi^2=37.8$   $p$  value  $< 0.0001$ ) was similar to the previous

study (19). We also found a significant association between obese mothers and some of the neonatal outcomes such as gestational diabetes and hypertension, macrosomia, pattern delivery, admission of the baby to the neonatal intensive care unit, and an Apgar score  $\leq 7$  with a p-value less than 0.05 compared to the maternal which resulted in normal weight. The results of this study are in agreement also with previously published studies (21,22).

## Conclusion

The finding of this study concludes that obesity plays a significant risk factor and it is a strong association with complications in pregnancy and newborns. Further studies are recommended to explore the obesity problems to develop guidelines and strategies and to minimize the adverse effect of this risk for developing maternal and newborn complications.

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