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Original Research Article

Maternal body mass index: how much it affects mother and baby

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ABSTRACT

Background: Overweight, obesity, and morbid obesity in the mother are associated with adverse obstetrics well as neonatal outcome. Aim of this study was to assess the prevalence of overweight and obesity, and the impact of body mass index (BMI) on maternal and neonatal outcome.

Methods: This is a retrospective study from January 2018 to September 2018 on 180 women with singleton term pregnancies. Maternal and neonatal outcomes at delivery were noted.

Results: In present study, 3 (1.66%) pregnant women were underweight, 57 (31.66%) pregnant women had normal BMI, 71 (39.44%) pregnant women were overweight while 49 (27.22%) pregnant women were obese. Gestational weight gain was less than 8 kgs in 40 (22.22%) pregnant women, weight gain was 8-15.9 kgs in 132 (73.33%) pregnant women while weight gain was more than 16 kgs in 8 (4.44%) pregnant women. Out of 3 underweight women, 1 delivered by cesarean section and 2 had normal delivery, out of 57 women with normal BMI, 21 delivered by cesarean section and 36 had normal delivery, out of 71 overweight women, 47 delivered by cesarean section and 34 had normal delivery while out of 49 obese women, 38 delivered by cesarean section and 11 had normal delivery. PET and GDM was seen in 9 (7.5%) women each while macrosomia were seen in 5 (4.16%) women.

Conclusions: Increased association was seen with maternal obesity and adverse outcome of pregnancy like PIH, GDM, cesarean section.

Keywords: Body mass index, Maternal obesity, Maternal outcome, Neonatal outcome

INTRODUCTION

According to the WHO criteria, those whose BMI is lower than 18.5 kg/m² are considered as thin, those whose BMI is between 18.5 and 24.9 kg/m² are considered as normal weight, those whose BMI is between 25 and 29.9 kg/m² are considered as overweight and those whose BMI is between 30 and 39.9 kg/m² are considered as obese.¹

As per World Health Organization (WHO) criteria, the prevalence of obesity among pregnant women i.e. with BMI > 30 kg/m² is 1.8 to 25.3%.² By pre-pregnancy BMI, recommended weight gain recommended by the Institute of Medicine (IOM) have been the standard for research. These recommendations are as follows:

- For BMI < 19.8 kg/m², total weight gain should be between 12.5 to 18 kg;

- For BMI = 19.8 to 26.0 kg/m², total weight gain should be 10 to 11.5 kg.
- For BMI > 29.0 kg/m² total weight gain should be 7.0 kg.³

It is not known why obesity is a risk factor for preeclampsia. This condition might be related through oxidative stress, inflammation and altered vascular function. Recently, in both preeclamptic women and obese women, extensive vascular infiltration of neutrophils and vascular inflammation has been reported. Therefore, they could be at increased risk of developing preeclampsia when they become pregnant.⁴

In obese women, gestational diabetes, pregnancy-induced hypertension and preeclampsia, venous thromboembolism, the necessity for labor induction, and cesarean delivery are the most important and commonly described maternal complications during pregnancy and delivery. Overweight and obesity in the mother are associated with a greater risk of stillbirth, perinatal death, preterm delivery, fetal macrosomia, fetal birth defects, and need for admission to neonatal intensive care.⁵

Maternal overweight is an independent risk factor associated with fetal death, showing a increasing risk with increasing maternal weight.⁶

Objectives of this study was to

- To find the prevalence of obesity
- To examine the association between BMI and maternal and
- Perinatal outcome in primi and multigravida delivering singleton babies.

METHODS

This study involved women registered for antenatal care during the first month of pregnancy. This is a retrospective study. Clinical records of patients attending antenatal clinics and delivering in Omega Hospital, Nagpur were analyzed from January 2018 to September 2018 on 180 women with singleton term pregnancies.

The records of patients starting antenatal care in the first trimester, attending at least four antenatal visits and delivering single babies from 37 completed weeks up to 42 weeks gestation were analyzed. Gestational age, height and weight at the time of patients' booking and before delivery were noted. Maternal and neonatal outcomes at delivery were noted.

Inclusion criteria

- Women starting antenatal care in the first trimester, attending at least four antenatal visits and delivering single babies from 37 completed weeks up to 42 weeks gestation.

Exclusion criteria

- Women with multifetal gestation, congenital malformation, placenta previa, IUGR, breech
- Any pre-pregnancy chronic medical disease (e.g., hypertension, diabetes, renal or cardiac disease, sickle cell disease and multiple pregnancy).

BMI was calculated by means of formula;

$$\text{BMI} = \frac{\text{Weight in kg}}{\text{Height in m}^2}$$

Women were categorised into 4 groups:

- Underweight = BMI of < 19.9 kg/m²
- Normal BMI = 20-24.9 kg/m²
- Overweight = BMI 25-29.9 kg/m²
- Obese = BMI > 30 kg/m²

The group with BMI in normal range (20-24 kg/m²) was used as the reference or comparison group for the analysis.

Gestational weight gain was defined as the difference between the maternal weight measured within one week prior to delivery and the maternal weight recorded at the first visit to the hospital.

Obstetric outcome included the following

PIH, GDM, mode of delivery, perinatal outcome in form of birth weight were assessed.

New born baby weight was taken at the time of birth without any clothes.

Birth weight of the baby was characterized as

- Low birth weight (LBW) as ≤ 2.50 kg
- Normal birth weight (NBW) as 2.51-3.99 kg
- Macrosomia as ≥ 4.00 kg.

Statistical analysis

Data was collected, tabulated in Microsoft excel sheet. Statistics was taken out in percentages.

RESULTS

Table 1: Age distribution.

Age distribution	No. of pregnant women	%
< 20 years	1	0.55%
21-30 years	144	80%
31-40 years	34	18.88%
> 40 years	1	0.55%

In present study, 1 (0.55%) woman was below 20 years of age, 144 (80%) pregnant women were in 21-30 years age group, 34 (18.88%) pregnant women were in 31-40 years age group while 1 (0.55%) pregnant woman was of more than 40 years age.

So, majority of pregnant women were of 21-30 years age group (Table 1).

Table 2: Body mass index.

Body mass index	No. of pregnant women	%
< 19 kg/m ²	3	1.66%
20-24.9 kg/m ²	57	31.66%
25-29.9 kg/m ²	71	39.44%
> 30 kg/m ²	49	27.22%

In present study, 3 (1.66%) pregnant women were underweight, 57 (31.66%) pregnant women had normal BMI, 71 (39.44%) pregnant women were overweight while 49 (27.22%) pregnant women were obese.

So, more number of women were overweight followed by normal weight followed by obese (Table 2).

Table 3: Gestational weight gain.

Gestational weight gain	No. of pregnant women	%
< 8 kg	40	22.22%
8-15.9 kg	132	73.33%
16+	8	4.44%

Table 5: Obstetric outcome.

Obstetric outcome	Underweight	Normal	Overweight+ Obese
PET	-	-	9 (7.5%)
GDM	-	-	9 (7.5%)
Macrosomia	-	-	5 (4.16%)

So, the risk of complications increased with increased BMI (Table 5).

DISCUSSION

In present study, 1 (0.55%) woman was below 20 years of age, 144 (80%) pregnant women were in 21-30 years age group, 34 (18.88%) pregnant women were in 31-40 years age group while 1 (0.55%) pregnant woman was of more than 40 years age (Table 1).

In present study, 3 (1.66%) pregnant women were underweight, 57 (31.66%) pregnant women had normal BMI, 71 (39.44%) pregnant women were overweight while 49 (27.22%) pregnant women were obese (Table 2).

In present study, gestational weight gain was less than 8 kgs in 40 (22.22%) pregnant women, weight gain was 8-15.9 kgs in 132 (73.33%) pregnant women while weight gain was more than 16 kgs in 8 (4.44%) pregnant women.

So, optimum weight gain was achieved in majority of patients (Table 3).

Table 4: Type of delivery.

Type of delivery	No. of pregnant women	LSCS	Normal delivery
< 19 kg/m ²	3	1 (33.33)	2 (66.66%)
20-24.9 kg/m ²	57	21 (36.84%)	36 (63.15%)
25-29.9 kg/m ²	71	47 (66.19%)	34 (47.88%)
> 30 kg/m ²	49	38 (77.55%)	11 (22.44%)

In present study, out of 3 underweight women, 1 delivered by cesarean section and 2 had normal delivery, out of 57 women with normal BMI, 21 delivered by cesarean section and 36 had normal delivery, out of 71 overweight women, 47 delivered by cesarean section and 34 had normal delivery while out of 49 obese women, 38 delivered by cesarean section and 11 had normal delivery.

So, majority of overweight and obese women had cesarean delivery (Table 4).

In present study, PET and GDM was seen in 9 (7.5%) women each while macrosomia was seen in 5 (4.16%) women.

Yeşilçiçek C et al, found the prevalence of overweight (BMI 25.00-29.99 kg/m²) as 20.6%. Obesity (BMI 30.00-34.99 kg/m²) existed in 3.9% of them.⁷

In present study, gestational weight gain was less than 8 kgs in 40 (22.22%) pregnant women, weight gain was 8-15.9 kgs in 132 (73.33%) pregnant women while weight gain was more than 16 kgs in 8 (4.44%) pregnant women (Table 3).

Yeşilçiçek C et al, found that, 70.8% of the pregnant women gained 8-15.9 kg during pregnancy. 19.9% gained over 16 kg. weight gain in overweight and obese women was 12.2 and 11.5 kg respectively.⁷

In present study, out of 3 underweight women, 1 delivered by cesarean section and 2 had normal delivery, out of 57 women with normal BMI, 21 delivered by cesarean section and 36 had normal delivery, out of 71 overweight women, 47 delivered by cesarean section and 34 had normal delivery while out of 49 obese women, 38 delivered by cesarean section and 11 had normal delivery (Table 4).

Nadine F et al, found that obstetric interventions were high. Induction rate was 42.1% and a caesarean section rate was 45.3%.⁸

In present study, PET and GDM was seen in 9 (7.5%) women each while macrosomia was seen in 5 (4.16%) women (Table 5).

Wanjiku K et al, found that 49.8% had no change in BMI category. 43.9% had increased BMI category by 1, and 6.3% had increased BMI category by > 1. Increase in BMI category was associated with more risk of gestational diabetes ($P = 0.005$), failed induction ($p < 0.001$), lacerations ($P < 0.001$), cesarean section ($p < 0.001$), and postpartum infection ($p = 0.007$) in normal weight women. Overweight women had increased risk of preeclampsia ($p = 0.002$) and operative vaginal delivery ($p < 0.001$). Obese women had higher risk of chorioamnionitis ($p = 0.003$), failed induction ($p < 0.001$), and cesarean section ($p = 0.016$).⁹

Abdel-Hady El et al, found that compared to normal weight women ($n = 307$), overweight ($n = 187$) and obese ($n = 226$) women were at increased risk for pregnancy-induced hypertension [RR = 4.9 (95% CI 1.6-11.1) and 6.1 (95% CI 2.1-17.8), respectively], gestational diabetes (RR=4.4 [95% CI 1.2-16.3] and 8.6 [95% CI 2.6-28.8]), preeclamptic toxemia [RR = 3.8 (95% CI 1.1-14.6) and 5.9 (95% CI 1.7-20.4)], urinary tract infections [RR = 1.4 (95% CI 0.5-3.9) and 3.7 (95% CI 1.7-6.2)], and cesarean delivery [RR = 2.0 (95% CI 1.3-3.0) in obese women].¹⁰

Abdel-Hady El et al, found that neonates born to obese women had an increased risk for postdate pregnancy [RR = 3.7 (95% CI 1.2-11.6)], macrosomia [RR = 6.8 (95% CI 1.5-30.7)], low 1-minute Apgar score [RR=1.9 (95% CI 1.1-3.6)], and admission to neonatal care units [RR = 2.1 (95% CI 1.2-2.7)]. Low birth weight was less frequent among obese women [RR = 0.5 (95% CI 0.3-0.9)] while the risk was high among underweight women [RR = 2.3 (95% CI 1.4-3.8)].¹⁰

Cedergren M et al, found that obese women with low gestational weight gain had a decreased risk for preeclampsia (0.52; 0.42-0.62), cesarean section (0.81; 0.73-0.90), instrumental delivery (0.75; 0.63-0.88), and LGA births (0.66; 0.59-0.75). For preeclampsia and LGA infants, 2-fold increased risk was seen among average and overweight women with excessive weight gain. High gestational weight gain was associated with increased risk for cesarean delivery in all maternal BMI classes.¹¹

Kristensen J et al, found that maternal obesity was associated with a more than doubled risk of stillbirth [odds ratio = 2.8, 95% confidence interval (CI): 1.5-5.3] and neonatal death (odds ratio = 2.6, 95% CI: 1.2-5.8) compared with women of normal weight. No statistically significantly increased risk of stillbirth or neonatal death was found among underweight or overweight women.¹²

CONCLUSION

In this study, 71 (39.44%) pregnant women were overweight while 49 (27.22%) pregnant women were obese. Increased risk was seen with association between maternal obesity and adverse outcome of pregnancy like PIH, GDM, cesarean section.

Hence, proper antenatal check-up and counselling regarding various adverse effect of obesity in pregnancy should be done. It will give good maternal and neonatal outcome.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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