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Original Research Article

## Obesity in pregnancy: maternal and perinatal outcome

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### ABSTRACT

**Background:** The objective of this study was to find out the spectrum of complications during pregnancy due to maternal obesity with incidence and to assess the neonatal outcome.

**Methods:** Retrospective study of antenatal patients was done in Sardar Vallabhbhai Patel Institute of Medical Sciences and Research (SVPIMSR), Ahmedabad from June 2019 to December 2019. Antenatal patients were categorized into 3 classes based on body mass index (BMI): class I=30-34.9 kg/m<sup>2</sup>, class II=35-39.9 kg/m<sup>2</sup>, and class III ≥40 kg/m<sup>2</sup>. The maternal and perinatal outcome of the patients was evaluated in relation to BMI.

**Results:** A total of 61 women were included in the study, with 44 belonging to class I, 15 women to class II and 2 women to class III. In class I, 27% women had pre-eclampsia and its incidence increased with class II (69.2%) and class III (100%). The incidence of gestational diabetes mellitus (GDM) increases with increase in BMI (class I=5.4%, class II=7.6% and class III=50%). Incidence of fetal growth restriction (FGR) (7.6% and 2.7%) and post term pregnancy (38% and 16.2%) more in class II compared to class I respectively. Lower segment caesarean section (LSCS) rates are seen to be highest in class III (100%) as compared to class II (53%) and class I (50%). Class III (50%) women were more likely to have macrosomic babies than class II (40%) and class I (34.1%).

**Conclusions:** Interventions directed towards weight loss and prevention of excessive weight gain must begin in the preconceptional period. Obese mothers must be counselled regarding risk and complications of obesity and importance of weight loss.

**Keywords:** Maternal outcome, Obesity, Perinatal outcome

### INTRODUCTION

Obesity is a health problem that is increasing in prevalence globally with a higher incidence in females than males according to the World Health Organization (WHO). Obesity in pregnant women increases the risks of maternal and perinatal complications. The WHO has defined the criteria of overweight as body mass index (BMI) >25 kg/m<sup>2</sup> and that for obesity as BMI >30 kg/m<sup>2</sup>.<sup>1</sup> The increasing prevalence of obesity worldwide has prompted the WHO to designate obesity as one of the most important public health threats in the world. Obesity in pregnancy puts the mother and the fetus at increased risk of several complications such as gestational diabetes mellitus,

hypertensive disorders of pregnancy, preeclampsia, preterm labor, post term pregnancy, dysfunctional labor, caesarean section, instrumental delivery.

Neonates of obese women were mostly large for gestational age (LGA), macrosomic and they had high incidences of birth injuries, shoulder dystocia, premature deliveries, antepartum still birth, neonatal hypoglycemia and congenital malformations like open neural tube defect, cardiac anomalies, cleft lip and cleft palate.<sup>2</sup>

The purpose of this study is to find out incidence of the pregnancy complications due to maternal obesity and also to assess the obstetric outcome and neonatal outcome. This

study will highlight the importance of pre-conceptional counseling regarding obesity and related issues. The results of this study will emphasize addressing a problem which can be modified and thus several complications during pregnancy and also a long-term risk factor for cardiovascular diseases and for diabetes mellitus can be prevented.

## METHODS

A retrospective observational study was conducted in obstetrics and gynecology department of Sardar Vallabhbhai Patel Institute of Medical Science and Research (SVPIMSR), Ahmedabad from June 2019 to December 2019 amongst 61 antenatal patients with booking BMI  $>30$  kg/m<sup>2</sup>. Details of antenatal patients needed for the study was taken from medical records of patients delivered by cesarean section or vaginal delivery after due permission from authority. Patients were categorized into 3 classes based on their booking visit BMI (calculated by dividing weight in kilogram by square of height in meters).<sup>2</sup> The 3 classes were - class I: 30-34.9 kg/m<sup>2</sup> - obese; class II: 35-39.9 kg/m<sup>2</sup> - morbidly obese; and class III:  $\geq 40$  kg/m<sup>2</sup> - extremely obese.

The raw frequencies of various outcomes of pregnancy in maternal BMI groups were calculated and incidence was drawn out using excel sheets and descriptive statistics. For each outcome variable, BMI (class I, class II and class III) the maternal age, parity, need of induction, mode of termination, history of hypertension, or diabetes mellitus, and perinatal outcome (birth weight, growth retardation and neonatal intensive care unit admission) were included in the model. The maternal and perinatal outcome of the patients evaluated in relation to body mass index. The software used to analyze data was descriptive statistics and excel sheets.

### Inclusion criteria

All antenatal patients who were registered and delivered at the obstetrics and gynecology department of SVPIMSR

during the period from June 2019 to December 2019 with booking BMI is  $>30$  kg/m<sup>2</sup>.

## RESULTS

A total of 61 women were included in the study fulfilling the inclusion criteria. They were further divided into 3 classes - class I: BMI 30-34.9 kg/m<sup>2</sup> included 44 women (72%), class II: BMI 35-39.9 kg/m<sup>2</sup> included 15 women (24.5%) and class III: BMI  $>40$  kg/m<sup>2</sup> included 2 women (3.2%) (Figure 1).

As shown in Table 1, out of 61 women 24 had preeclampsia, of which 12 women were between BMI 30-34.9 kg/m<sup>2</sup>, 10 were between BMI 35-39.9 kg/m<sup>2</sup>, 1 was with BMI  $>40$  kg/m<sup>2</sup>. 4 women had gestational diabetes mellitus (GDM). 13 women had post term pregnancy, of which 7 were between BMI 30-34.9 kg/m<sup>2</sup>, 6 were between BMI 35-39.9 kg/m<sup>2</sup>. 2 women had intrauterine growth restriction (IUGR). Oligohydramnios were seen in 7 women, of which 4 were between BMI 30-34.9 kg/m<sup>2</sup> and 3 were between 35-39.9 kg/m<sup>2</sup>. Polyhydramnios was seen in two women. 2 women had preterm labor.

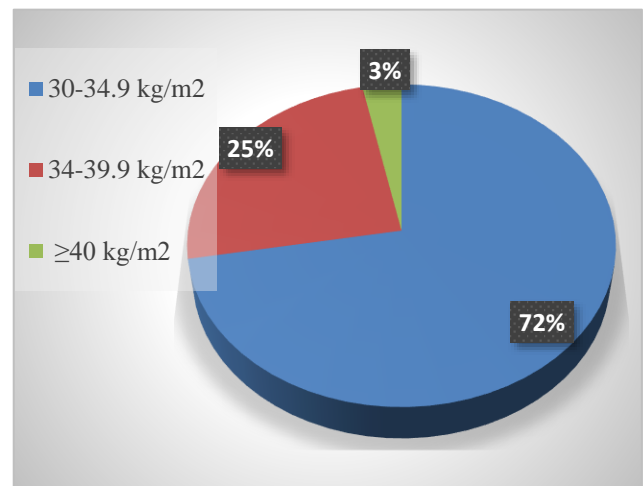


Figure 1: Distribution of the study.

Table 1: Ante partum complications and its relation with BMI.

Complications	Class I, N (%) (n=44)	Class II, N (%) (n=15)	Class III, N (%) (n=2)	Total, N (%) (n=61)
GDM	2 (5.4)	1 (7.6)	1 (50)	4 (6.6)
Pre-eclampsia	12 (27)	10 (69.2)	2 (100)	24 (39.3)
Post term pregnancy	7 (16)	6 (38)	-	13 (21.3)
Oligohydramnios	4 (8.1)	3 (23)	-	7 (11.5)
Polyhydramnios	1 (2.7)	-	1 (50)	2 (3.3)
IUGR/FGR	1 (2.7)	1 (5)	-	2 (3.3)
Preterm labour	1 (2.7)	1 (5)	-	2 (3.3)

**Table 2: Mode of delivery.**

Mode	Class I, N (%) (n=44)	Class II, N (%) (n=15)	Class III, N (%) (n=2)	Total, N (%) (n=61)
<b>Vaginal</b>	22 (50)	7 (47)	-	29 (47.5)
<b>Spontaneous</b>	8	1	-	9 (14.8)
<b>Induced</b>	14	6	-	20 (32.8)
<b>LSCS</b>	22 (50)	8 (53)	2 (100)	32 (52.5)

**Table 3: Indication of LSCS.**

Indication	Class I, N (%) (n=22)	Class II, N (%) (n=8)	Class III, N (%) (n=2)	Total, N (%) (n=32)
<b>Induction failure</b>	7 (32)	3 (38)	1 (50)	11 (34.4)
<b>Fetal distress</b>	3 (14)	2 (25)	-	5 (15.6)
<b>CPD</b>	6 (27)	-	-	6 (18.8)
<b>Secondary arrest of labor</b>	2 (9)	-	-	2 (6.3)
<b>Severe pre-eclampsia</b>	4 (18)	3 (38)	1 (50)	8 (25)

**Table 4: Intrapartum and postpartum complication.**

Complications	Class I, N (%) (n=44)	Class II, N (%) (n=15)	Class III, N (%) (n=2)	Total, N (%) (n=61)
<b>PPH</b>	3 (7)	2 (13)	1 (50)	6 (9.8)
<b>Wound gaping (LSCS)</b>	2 (5)	2 (13)	1 (50)	5 (8.2)

**Table 5: Perinatal outcomes.**

Birth weight (kg)	Class I, N (%) (n=44)	Class II, N (%) (n=15)	Class III, N (%) (n=2)	Total
<b>&lt;2.5</b>	1 (2.2)	1 (6.7)	-	2
<b>2.5-3.9</b>	36 (70.4)	11 (73.3)	1 (50)	48
<b>≥4</b>	7 (27)	3 (20)	1 (50)	11

Of the total 61 women, 29 women delivered vaginally and 32 by lower segment caesarean section (LSCS). Of the 29 women delivered vaginally 9 were spontaneous, 20 were induced (Table 2).

Table 3 shows that majority of the indications for LSCS is failed induction (N=11), followed by cephalopelvic disproportion (N=6), followed by fetal distress.

Of the 61 women post-partum hemorrhage (PPH) was encountered in 6 women (9.8), of which 2 women delivered vaginally and 4 by cesarean. 5 women had wound gaping postoperatively and one woman developed peripartum cardiomyopathy (Table 4).

Out of 61 babies, 2 babies had weight less than 2.5 kg, lowest being 2.12 kg. 11 babies were macrosomic (weight >4 kg), maximum weight being 4.23 kg. Total 16 babies required neonatal intensive care unit (NICU) admission of which 7 neonates belonged to class I, 8 neonates from class II and 1 from class III. All macrosomic neonates are at risk of neonatal hypoglycemia and thus required vigilant observation in neonatal intensive care unit for 3 days. 4

neonates having low Apgar score (<4) needed NICU admission which included 2 preterm neonates (Table 5).

## DISCUSSION

A number of systems have been used to define and classify obesity. The BMI, also known as the Quetelet index, is currently most often used. The BMI is calculated as weight in kilograms divided by the square of the height in meters (kg/m<sup>2</sup>).<sup>2</sup>

This study has demonstrated that many adverse outcomes of pregnancy are associated with maternal obesity and has provided quantification of these risks. We have confirmed an increase in the previously reported complications of pregnancy in obese women such as gestational diabetes, preeclampsia, induction of labor, increased rate of cesarean section and wound infection.

### *Antenatal complications*

The risk of preeclampsia is positively associated with a raised BMI. The overall incidence of pre-eclampsia in obese women is 39.3 which is consistent with the study

conducted by Dasgupta et al were the incidence of hypertensive disorders is 38.<sup>3</sup> Hypertensive disorders of pregnancy are significantly higher among obese women, O'Brien et al demonstrated that the risk of preeclampsia is typically doubled every 5-7 kg/m<sup>2</sup> increase in pregnancy BMI.<sup>4</sup>

The increase in the risk of GDM increased with the increase in BMI from 5.4 in class I obese women to 7.6 in class II obese women to 50 in class III. In previous study about 17 of obese women show GDM in pregnancy compared to 1-3 women in normal BMI.<sup>5</sup> Therefore, diabetes is associated with increasing BMI and thus obesity.

Post term pregnancy was seen in 21.5 women and the percentage women with post term pregnancy increased as BMI increased. Obese women are more likely to go for postterm pregnancy and induction of labor.

Obese women are more prone for delivery by cesarean section. In our study the rate of cesarean increased with BMI. There was increased planned elective caesarean section for predicted macrosomia. The increase in emergency caesarean sections is the consequence of the increased rate of large for gestational age infants leading to cephalopelvic disproportion during labor or uterine contractility being suboptimal in obese women. The same study also found that there was a progressive reduction in the successful vaginal delivery rate with increasing BMI.<sup>6</sup>

The increased risk of PPH in obese women is due to relatively larger area of implantation of the placenta usually associated with a large for gestational age fetus. In our study PPH and wound infections were significantly raised from obese women (PPH=7, 13 and 50) to morbidly obese women (wound gap=5, 13 and 50). Sebire et al reported a 44 increase of PPH with BMI >30 kg/m<sup>2</sup>.<sup>7</sup> Alanis et al had demonstrated higher risks of post caesarean wound gape, discharge and seroma formation among the morbidly obese.<sup>8</sup>

### **Perinatal outcome**

Obesity is associated with maternal insulin resistance and foetal hyperinsulinemia even in the absence of maternal diabetes.<sup>9</sup> Insulin resistant individuals have higher fasting plasma triglyceride levels and greater leucine turnover.<sup>10</sup> Amino acids are insulin secretagogues and an increased flux on amino acids could stimulate foetal hyperinsulinemia. Triglycerides are energy rich and placental lipases can cleave triglyceride and transfer free fatty acids to the fetus. The combination of an increased energy flux to the fetus and foetal hyperinsulinemia may explain the increased frequency of large for gestational age infants seen in the obese non-diabetic women in this study.

The original Pedersen hypothesis suggested that increased glucose concentrations in the diabetic mother led to foetal hyperglycemia and hyperinsulinemia causing increased

foetal growth.<sup>11</sup> GDM is thus associated with increased incidence of macrosomia (birth weight >4 kg). In our study macrosomia is seen in 11 neonates and its incidence increases with increase in BMI of mother.

### **CONCLUSION**

Obesity causes significant complications for the mother and fetus. Interventions directed towards weight loss and prevention of excessive weight gain must begin in the pre-conception period. Obstetrician must counsel their obese patients regarding the risks and complications conferred due to obesity and the importance of weight loss. Maternal and fetal surveillance may need to be heightened during pregnancy; a multidisciplinary approach is useful. Women need to be informed about both maternal and fetal complications and about the measures that are necessary to optimize outcome, but the most important measure is to address the issue of weight prior to pregnancy. Obesity in pregnancy is a major predictor of obesity later in life, which is commonly associated with the development of chronic hypertension, dyslipidemia and type 2 DM. The macrosomic babies (weight >3.5 kg) are at high risk of developing obesity in adolescence and diabetes mellitus in their adult life. Therefore, from a public health perspective, obesity represents an important modifiable risk factor for adverse pregnancy outcome which must be addressed during preconceptional and early pregnancy visit.

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