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Original Research Article

Study of relationship between maternal high body mass index and obstetrical outcome

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ABSTRACT

Background: Evaluate the impact of higher body mass index (BMI) on the maternal and perinatal outcome in pregnancies complicated by obesity.
Methods: This is prospective cohort study conducted in obstetrics and gynaecology department. The 86 women with BMI>25 kg/m^2 (cases) were compared with 90 women with BMI<25 kg/m^2 (control) with regard to ante-natal complications, intervention in labour, maternal morbidity and neonatal outcome. Outcome of these variables in both groups were calculated statistically.
Results: Obese women were significantly more likely to have gestational hypertension (OR=5.14; p=0.023) preeclampsia (OR=2.72; p=0.0445), gestational diabetes (OR=5.78; p=0.0133), abnormal weight gain (p=0.0001), induced labour (OR=2.26; p=0.04), cesarean delivery (OR=3.09; p=0.001), wound infection (OR=2.59; p=0.01) and adverse neonatal outcome.
Conclusions: Obesity is an independent risk factor for adverse pregnancy outcomes and hence preventable steps should be taken for reducing the maternal and perinatal morbidity and mortality.

Keywords: BMI, Pre-eclampsia, Abnormal weight gain, Cesarean, Perinatal outcome

INTRODUCTION

Pregnancy in women is considered unique, physiologically normal episode in women's life. Obesity is a pre-existing morbidity of the mother can complicate pregnancy and make it a high risk. BMI is defined as weight in kg divided by the square of the height in meters (kg/m^2), is most commonly used method for assessment obesity.

The magnitude of the obesity prevalence has been increasing in developed and developing nations. Obesity more currently is endemic.

In India, According to NFHS-4 the proportion of overweight/obese adult women almost doubled from 12.6% in 2006 to 20.7% in 2016.[1] In Ahmedabad District where this study has been conducted,30.7% of women were obese or overweight as per NFHS-4.[2]

Table 1: BMI criteria in various population.[3]

Variables	Normal	Overweight	Obese
Asian Indian	18.0-22.9	23.0-24.9	>25
International criteria	18.5-24.9	25-29.9	>30

Obese women unequivocally have reproductive disadvantages (American society for reproductive medicine, 2015). This leads to difficulty in achieving pregnancy, early and recurrent pregnancy loss, gestational diabetes due to insulin resistance and eclamptic toxaemia all associated with raised markers of inflammation both in maternal serum and placental tissue in obese women. Obese women are more likely to have medically induced preterm delivery, induction of labour, prolonged labour, operative and cesarean deliveries. DVT, wound infection and anaesthetic hazards are high.[4] There is also increased

risk of fetal macrosomia, unexplained fetal death, respiratory distress and neonatal intensive care unit admissions.

Analysis of adverse pregnancy outcomes in relation to BMI of the patients allows a better understanding of this modifiable risk that can grossly impact the life of mother and baby.

METHODS

The study protocol was approved by the regional committee for medical research ethics and all participants gave informed written consent. This prospective cohort study was conducted in 2029-2020 at B. J. Medical College, Ahmedabad, Gujarat over a period of year. Total 176 pregnant women were included in study.

BMI was calculated by means of the formula weight/ height^2. The group with BMI >25 kg/m^2 were categorized as cases while the group with BMI in the normal range (20-24.9 kg/m^2) was used as the reference or comparison group for the analysis.

Inclusion criteria

Pregnant women with first trimester BMI >25 Kg/m^2, irrespective of age and parity.

Exclusion criteria

Mothers not booked at first trimester, miscarriage, multifetal pregnancy, non-cephalic presentation, fetal congenital anomaly, women with BMI<18 kg/m^2.

The variables studied included antepartum complications (gestational diabetes mellitus, pre-eclampsia, eclampsia), onset of labour (spontaneous, induced), mode of delivery (vaginal, caesarean, instrumental) and postpartum complications (postpartum haemorrhage, wound infection, duration of hospital stay). Perinatal outcome variables included gestational age at birth, birth weight, Apgar at 5 minutes, admission in NICU and Indications for NICU admission

Statistical analyses were conducted, continuous characteristics of samples were expressed in mean ± standard deviation, and categorical outcomes were compared by Chi-square test and odds ratio. A p<0.05 was regarded as statistically significant

RESULTS

Eighty-six pregnant women with BMI>25 kg/m^2 and ninety pregnant women with BMI 18-25 kg/m^2 were selected and were followed prospectively. Out of 86 cases group 50 women were overweight (BMI 25-29.9), 26 women had moderate obesity (BMI 30-34.9) and 10 women having BMI >35 kg/m^2 (severally obese).

The majority of >25 BMI group of women (40.4%) were between 25-29 years whereas majority of control women (56.6%) were between 20-24 years. The mean age in >25 BMI group was 28.46 years where as in control group it was 24.34 years (p=0.001). The mean BMI at booking in obese women was 32.86 kg/m^2 and in control women it was 22.05 kg/m^2 (p=0.001).

In our study, 18.6% of >25 BMI women and 3.3% of control women had irregular menstrual pattern, giving statistically significant result (p=0.001). Similarly, in >25 BMI women group 20.9% had infertility where as in control women it was 4.40% (p=0.0009). Most of the women belongs to class V.

Hypertensive disorder of pregnancy increased linearly with increasing BMI. Obese women were significantly more likely to have gestational hypertension (OR=5.14; p=0.023) preeclampsia (OR=2.72; p=0.0445). The differences in the incidence of gestational diabetes mellitus among the two categories was statistically significant (OR=5.78; p=0.013)

Labour induction was more often in obese women when compared with normal BMI women (OR=2.26; p=0.04). In >25 BMI group the majority of induction of labour was done for hypertensive disorders of pregnancy. Post-datism was the major reason for induction in control group. Failed induction of labour also was more common in high BMI women. Obstetric complications like placenta previa, abruptio placenta, poly-hydroamniosis, oligo-hydroamniosis and PROM existed in both groups, but the difference was not statistically significant.

The caesarean delivery rates were higher in >25 BMI group (56.9%) than control group (30%) (OR=3.09; p=0.001). The primary caesarean delivery rates were 25.80% in >25 BMI group and in 14.40% control group. Similarly, in parous women with previous normal delivery, caesarean delivery was higher in >25 BMI group (28.5%) than control group (8.82%). Wound infection and dehiscence rates were higher in obese group (24.40%) than control group (11.11%) respectively. Obese and overweight group had 2.59-fold increased risk for wound infection and dehiscence.

The 10.5% of >25 BMI women and 4.44% of control group delivered preterm and 14% of >25 BMI women and 5.55% of control group delivered postdate. Main reason for prematurity in >25 BMI group was iatrogenic due to maternal condition requiring early termination of pregnancy or IUGR with doppler changes. The mean birth weight of the neonate was 3.08 kg in obese group and 2.88 kg in control group (p=0.008). The difference of APGAR at 5 minutes between both the groups was not statistically significant (p>0.05). NICU admission rate was also statistically significant high. The major reasons for admission of babies of higher BMI women were for the care of infants of diabetic mother and macrosomia

Table 2: Maternal characteristics.

Maternal characteristics	BMI >25 kg/m^2 (%)	BMI <25 kg/m^2 (%)	P value
Maternal BMI at booking, mean ± SD, (kg/m^2)	32.86±3.43	22.05±1.36	0.001
Maternal age, mean ± SD, (years)	28.46±4.56	24.34±3.55	0.001
Nulliparous	40 (44.4)	30 (34.9)	
Multiparous	90 (55.5)	56 (65.1)	
H/O menstrual irregularity	16 (18.6)	3 (3.3)	0.001
Past H/O infertility treatment	18 (20.9)	4 (4.4)	0.009

Table 3: Mode of delivery.

Mode of delivery	BMI>25 kg/m^2 (%)	BMI<25 kg/m^2 (%)	Odds ratio	P value
Vaginal	37 (43.1)	63 (70)	3.09	0.001
LSCS	49 (56.9)	27 (30)		
Primary LSCS	22 (25.58)	13 (14.4)	2.03	0.001

Table 4: Antenatal outcome.

Outcome	BMI>25 kg/m^2 (%)	BMI<25 kg/m^2 (%)	Odds ratio	P value
Gestational hypertension	9 (10.4)	2 (2.2)	5.14	0.023
Preeclampsia	14 (16.2)	6 (6.6)	2.72	0.044
Gestational DM	10 (11.6)	2 (2.2)	5.78	0.013
Induction of labour (IOL)	19 (22.1)	10 (11.1)	2.26	0.04
LSCS wound infection	12 (24.4)	3 (11.1)	2.59	0.01
Long duration of hospital stay	24 (27.9)	9 (10)	3.52	0.04

Table 5: Neonatal outcome.

Outcome	BMI >25 kg/m^2 (%)	BMI <25 kg/m^2 (%)	P value
Preterm delivery	9 (10.5)	4 (4.44)	
Gestational age at delivery ≥ 40 weeks	12 (14)	5 (5.5)	
Mean birth weight, mean ± SD, kg	3.08±0.55	2.88±0.44	0.008
<7 APGAR at 5 minute	6 (6.9)	3 (3.3)	0.272
NICU admission	19 (22)	8 (8.9)	0.01

DISCUSSION

Various studies have shown that health risks associated with obesity occur at a lower BMI in Asians than compared to the West.[5] Obesity now considering as endemic. This cohort study aims to report the effect of maternal high BMI on overall obstetric, maternal and neonatal outcome. With proper antenatal and intra-natal care, good outcome can be achieved in obese patients.

This study adds to the increasing body of evidence which suggests that pregnant women with higher BMI predisposed to more complications and adverse outcome, requiring vigilant management. In our study, we found increased incidence of pre-eclampsia (16.2%) and gestational hypertension (10.4%). The frequency was almost 2.72 times and 5.14 times higher compare to normal BMI group respectively. This was comparable to Ehrenthal et al study who found that risk of development of preeclampsia is statistically significant in higher BMI group.[6]

In our population, >25 BMI group exhibited a higher risk of developing gestational diabetes (11.6%,) when compared to normal BMI group (2.2%). There was 5.78-fold risk increase for gestational diabetes among overweight and obese women. The result of our study was compared to Susan et al did a meta-analysis from other relevant articles regarding obesity and risk of GDM and found that the odds ratio for this in overweight, obese, severely obese were 2.14, 3.56 and 8.56 respectively indicating the risk of developing GDM was higher in higher BMI.[7] Thus, active strategies for weight control and life style advice after delivery with regular follow up is needed for the management of these women.

The risk of induction among the obese women was increased almost 2.26-fold. This was comparable to Wolfe et al who found that the rate of induction increases with increasing BMI.[9]

In the >25 BMI group, our results supported a number of previous studies Weiss et al, Bhatacharya et al and Pevzner et al that have demonstrated an increased risk for cesarean delivery in this group.[10-12] Obese women had 3.09-fold increased risk. The caesarean delivery rates were higher among nulliparous obese and overweight group and even, obese women with previous normal delivery had higher risk for caesarean delivery.

Instrumental deliveries were surprisingly not increased in Overweight and obese group, which is in contrast to other studies (Weiss et al and Cedergren).[10,13] The increased cesarean delivery rates in obese women may explain why we did not find association between instrumental delivery and obesity.

We found obese and overweight women to be at a greater risk of post-operative wound infection and wound dehiscence. The >25 BMI women had 2.59-fold increased

risk for wound infection and dehiscence. This was possibly because increased amount of subcutaneous fat, increased association with comorbidities like diabetes, prolonged duration of surgical procedures, reduced immunity and inflammatory reactions in the adipose tissue.

Our results showed that the incidence of postdate pregnancy higher in the obese and overweight individuals, which was 14% in the >25 BMI and with only 5.55% in the control group which was not statistically significant with p>0.05. This is because of the close follow-up of the cases in the study and timely intervention at near 40 weeks. Denison et al retrospective study concluded that higher maternal BMI and greater weight gain during pregnancy was associated with increased risk of postdate pregnancy.[14]

Results showed that the incidence of preterm pregnancy higher with increasing BMI, which was not statistically significant with p>0.05. There are conflicting data in the literature regarding maternal obesity and preterm birth, with some studies Baeten et al showing increased risk and some studies showing no change, Sebire et al 54.[14,15] In our study main reason for prematurity is iatrogenic in >25 BMI group. If controlled for Iatrogenic delivery and PROM, rate of spontaneous preterm labour delivery is similar in both the group.

Higher BMI women had increased risk of delivering high birth weight babies. We found that 22.4% of >25 BMI group delivered babies 3.5 kg and above, when compared to 7.7% of control group. This is in favour to Laura et al study on maternal obesity and fetal macrosomia which was a meta-analysis of 30 similar studies. They found that the odds for giving birth to a large for gestational age babies was 142%, babies with birth weight >4 kg was 117% and babies with birth weight > 4.5 kg was 277%.[17]

From our study it was evident that neonatal complications were more common with maternal higher BMI. There was no difference in Apgar score at 5 min between the two groups. This is consistent with study done by Minsart et al and Kliegman et al.[18,19]

CONCLUSION

In our study comparing pregnant mothers with BMI >25 kg/m^2 and normal BMI, we found that prevalence of maternal and fetal complications were higher in the obese and overweight group. It has been recommended that all mothers should have their BMI calculated at booking as a part of the full risk assessment. Pregnancies among obese women must be classified as high-risk pregnancies and appropriate antenatal care should be provided with heightened surveillance, anticipation and diagnosis of the complications and intervene earlier if complications arise.

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