

An Observational Study on Effect of BMI on Pregnancy Outcome in Primigravida Women Delivering in a Tertiary Care Hospital of North India

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Abstract: ***Objective:** To find out the effect of increasing body mass index (BMI) on adverse pregnancy outcomes in primigravida women delivering singleton babies. **Method:** We conducted a hospital - based observation study, done prospectively on 500 primigravida women who delivered singleton babies from June 2022 - December 2022. Based on their BMI and using World Health Organization classification, the pregnant females were divided into four groups. Underweight (BMI < 18.5 kg/m²), normal (BMI 18.5–24.9 kg/m²), overweight (BMI 25–29.9 kg/m²), and obese (BMI > 30 kg/m²). The various obstetric and perinatal outcomes were compared by using univariate analysis. **Results:** Out of 500 women enrolled, 30 (6%) were underweight, 126 (25.2%) were overweight, and 32 (6.4%) were obese. The mean age of the study participants was 24.63 ± 4.13 years with a mean BMI of 23.18 ± 4.94 kg. The risk of having gestational hypertension in overweight or obese pregnant females was more as compared to those having BMI in the normal range, [Odds Ratio 5.20 (95% CI; 2.92 - 9.52)], p value < 0.001. Postpartum hemorrhage risk was also high in this group [odds ratio 5.72 (95% CI; 2.24 - 16.24)] as compared to the normal BMI group (p value < 0.001). Macrosomia (birth weight > 4kg) was more common in women with BMI > 25 kg/m² (13.3%) as compared to the normal BMI group (1.3%). **Conclusions:** The study adds to the evidence that there is a definite association between maternal overweight and obesity and adverse pregnancy outcomes including higher cesarean section rate, Gestational hypertension, stillbirth, fetal macrosomia and PPH.*

Keywords: Maternal obesity; WHO guidelines; maternal outcomes; perinatal outcomes

1. Introduction

The Prevalence of obesity among the females of reproductive age is estimated to be between 20–36%, and is still rising alarmingly all over the world¹. The situation in India is also the same. As per the National Family Health Survey - 5 (NFHS - 5) the prevalence of obesity in females rose from 20.6% (NFHS - 4) to 24%². As the prevalence is increasing among the women of reproductive age group, it will get reflected in the pregnant females also.

The Body mass index (BMI) is defined using the formula of weight in kilograms divided by the square of the height in meters (kg/m²). It is used to classify overweight and obesity in adults³. In Previous literature, the relationship between maternal height and weight with pregnancy complications has been studied extensively, but in recent research, BMI is widely accepted as a better measure of over or underweight⁴. We find many studies conducted around the world on this topic and there is also a paucity of data from developing countries and very few studies have been conducted in India, more so in the hilly areas of North India⁵. The aim of this study was to find out the effect of increasing BMI on pregnancy outcomes in primigravida women delivering singleton babies.

2. Methods

This study was an observation study conducted prospectively in the Department of Obstetrics & Gynecology, Indira Gandhi Medical College (IGMC) Shimla from 1st June, 2022 to 31st December, 2022. We included primigravida women in our study who had a singleton term pregnancy and presented to the department in early labor. The study participants were recruited consecutively during the study period till we reached a sample size of 500. All the females with multiple pregnancy, having any congenital malformation, and pregnancy with known medical disorder and who did not give consent to participate in the study were excluded from the study. All anthropometric measurements (weight and height) were carried out by means of standard methodology as described by Casadei K and Liel J⁶. For the purpose of calculating the BMI, only the first trimester weight of the pregnant female was taken. The weight of the new born baby was taken at the time of birth without any clothes. To ensure that there is no inter observer bias and instrumental bias, all measurements were taken by the same measuring instrument or scale and were done by the same person. BMI was calculated by means of the formula weight in Kg/ height in metre². We categorized the pregnant females into four categories as follows: 1) Underweight - BMI of < 18.5 kg/m² 2) Normal -

BMI 18.5–24.9 kg/m²) Overweight - BMI 25–29.9 kg/m²) Obese - BMI >30 kg/m²]. For the purpose of comparison and group analysis, the group with BMI in the normal range (18.5–24.9 kg/m²) was used as the reference. Obstetric outcomes included the following: mode of delivery, Lower segment caesarian section, post - partum hemorrhage (PPH), Macrosomia, Gestational Hypertension, stillbirth and perinatal outcomes in form of birth weight were assessed.

This study was approved by the Institutional Ethics Committee, Indira Gandhi Medical College (IGMC), Shimla. Written and informed consent was obtained from all the participants. Data were analyzed using Epi info version 7.2.2.6 software. Descriptive statistics and frequency percentages were determined for categorical variables. Means and standard deviations were calculated for quantitative variables. Qualitative variables were compared by Chi - square test and odds ratio with 95 % confidence interval. A p value of 0.05 was taken to be statistically significant.

3. Results

A total of 500 women were enrolled in this study. Out of these, 30 (6%) were underweight, 312 (62.4%) had normal BMI, 126 (25.2 %) were overweight, and 32 (6.4%) were obese. The mean age of the study participants was 24.63 +

4.13 years and the mean BMI was 23.18 + 4.94 kg. As far as the complications of pregnancy, labor and delivery are concerned, we found the following results among women in different BMI categories. We found that the risk of having PIH in pregnant females who were overweight or obese was more as compared to those having BMI in the normal range, resulting in an odds ratio of 5.20 (95 % CI 2.92 - 9.52) and it was statistically significant also (p value < 0.001). The relationship between BMI and Gestational hypertension was found to be linear. Similarly, we observed that the risk of cesarean section was more common in the overweight + Obese group [odds ratio 6.47 (95 % CI 4.04 - 10.5)] compared to the normal BMI group, while in the underweight women group, all but one had normal vaginal delivery. The risk of postpartum hemorrhage remained statistically significant in the group with BMI > 25 kg/m² [odds ratio 5.72 (95 % CI (2.24 - 16.24)] as compared to the normal BMI group (p value <0.001). Low birth weight (birth weight < 2,500 g) was more common in underweight women (33.3%) compared to the women with BMI 18.5–25 kg/m² (21.5 %). We also found that macrosomia (birth weight > 4kg) was more common in women with BMI >25 kg/m² (13.3 %) as compared to the normal BMI group where only 1.3% macrosomic babies were delivered. Two (1.2%) still births were there in the overweight + Obese group while no stillbirth was seen in the normal BMI group (Tables 1, 2).

Table 1: Study sample characteristics

S. No.	Parameter	Mean + Standard Deviation	N (Sample size)
1.	Age (Years)	24.63 + 4.13	500
2.	Weight (Kg)	53.73 + 10.71	500
3.	Height (Cm)	151.58 + 8.39	500
4.	BMI (Kg/m ²)	23.18 + 4.94	500
5.	Birth Weight (Kg)	2.75 + 0.68	500

Table 2: Association of obstetric and perinatal outcomes with body mass index

Outcomes	Under weight BMI < 18.5 kg/m ² n = 30	Normal BMI - 18.5–24.9 kg/m ² , n = 312	Overweight + obese BMI > 25 kg/m ² n = 158	p value	Odds ratio (95 % CI)
LSCS	1 (3.3%)	34 (10.9%)	70 (44.3%)	< 0.001	6.47 (4.04 - 10.5)
PPH	-	6 (1.9%)	16 (10.1%)	< 0.001	5.72 (2.24 - 16.24)
Gestational Hypertension	-	19 (6.1%)	40 (25.3%)	< 0.001	5.20 (2.92 - 9.52)
LBW	10 (33.3%)	67 (21.5%)	44 (27.8%)	< 0.06	1.41 (0.90 - 2.20)
Macrosomia	-	4 (1.3%)	21 (13.3%)	< 0.001	11.74 (4.21 - 40.63)
Stillbirth	-	-	2 (1.3%)	-	-

4. Discussion

The findings of this study add to the existing literature which suggests that obesity (measured by BMI) increases the risk of complications in pregnancy which lead to increased chances of medical and obstetric interventions thereby posing a danger to the mother as well as her fetus.

In our study the risk of gestational hypertension was 5.72 times higher among the Obese females as compared to those having normal BMI. Similar findings were seen by Jain D et al⁷ and Kutchi I et al⁸. O'Brien et al⁹ in their meta - analysis have also shown of the risk of gestational hypertension doubles every time there is 5 - 7 kg/m² increase in the BMI. We also found that 44.3% of females in the overweight and Obese category had to undergo LSCS as compared to only

10.9 % in the normal weight category. These findings are in concurrence with the studies done by Jain D et al⁷ and Bhattacharya S et al¹⁰

In our study, the risk of PPH was found to be 10.1% in the Overweight + Obese group as compared to just 1.9% in the normal BMI group. Similar results have been reported by Bhattacharya S et al¹⁰ and Kutchi I et al⁸ and they have also observed an increase in PPH with an increase in BMI but in another study by Bianco et al¹¹, no such difference in the rates of PPH was seen between the two groups. We also observed that the risk of low birth weight in our study was 1.41 times more as compared to the group with high BMI, though this difference was not found to be statistically significant. This was also seen in studies conducted by Bhattacharya S et al¹⁰ and Callaway et al¹². Macrosomia risk in our study was found to be very high in overweight and

obese women with an odds ratio of 11.74. These results were in accordance with several other studies^{13, 14} investigating the relationship of maternal obesity with fetal growth, which have also shown similar results that obese women have an increased chance of delivering large for date infants. We also found two stillbirths in our study in the group with high BMI as compared to the normal BMI group. Similar results were observed by Kutchi I et al in their study conducted in Tamil Nadu⁹.

5. Conclusion

This study has added to the growing body of evidence that there is a definite association between maternal overweight and obesity and adverse pregnancy outcomes including higher cesarean section rate, Gestational hypertension, stillbirth, fetal macrosomia and PPH. It is high time that we realize the existence of global obesity epidemic which is also being reflected in pregnant females. There is a need to develop comprehensive strategies and guidelines including intensified public awareness campaigns to sensitize policy makers, medical professionals and the public at large regarding these harmful effects of obesity, particularly among the pregnant females on obesity to improve maternal as well as perinatal outcomes.

Conflict of interest

None declared

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