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Original Research Article

A prospective observational study on correlation between the BMI of pregnant women and materno-fetal outcome

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ABSTRACT

Background: Body Mass Index (BMI) during pregnancy is crucial to stipulate health risks. High pre-pregnancy BMI and/or excessive weight gain during pregnancy has negative implications on pregnancy outcomes, putting the health of mother and infant at risk also it amplifies the burden of chronic disease. Hence, public initiatives aiming in reduction of maternal and fetal morbidity and mortality can be vitalised by identification of high-risk population based on BMI leading to implementation of targeted interventions, such as nutritional counselling, weight management programs, and close monitoring during pregnancy.
Methods: This prospective observational study was conducted over a period of over 10months of duration from January 2025 to October 2025 among 500 pregnant women coming to ANC OPD who fulfilled the selection criteria and agreed to participate in study. The study aimed to assess the feto-maternal outcomes in pregnant women of different BMI categories.
Results: Out of 500 pregnant females, majority of pregnant females were in normal BMI category 59% (295) while rest were underweight 13% (65), overweight 22% (110), and obese 6% (30). The antenatal and postnatal complications were more in overweight and obese patients in comparison to normal weight and underweight. Also, the instrumental delivery and lscs rate were higher among the women with high BMI.
Conclusions: In developing countries like India both underweight and obesity poses a significant impact on the outcome of pregnancy. Achieving an optimal weight gain for every pregnant woman is the basis for the development of a healthy population and an essential factor in the physiological course of pregnancy and childbirth and thus contributing to reduction in maternal and fetal mortality and morbidity.

Keywords: BMI, Chronic diseases, Intervention, Nutritional, Pregnancy, Obese, Overweight, Underweight

INTRODUCTION

With the growth in India, socioeconomic changes have influenced lifestyle and dietary changes among the society including women.[1] Body Mass Index (BMI) during pregnancy is crucial to stipulate health risks.[1] Irrespective of low or high BMI there is possibility of the outcome of pregnancy been affected. High pre-pregnancy BMI and/or excessive weight gain during pregnancy has negative implications on pregnancy outcomes, putting the health of mother and infant at risk also it amplifies the burden of chronic disease.[2]

The overweight and obese females are more prone for complications like gestational diabetes, gestational hypertension, Macrosomia, congenital malformations, fetal growth abnormalities, postpartum hemorrhage, and certain obstetric interventions like induction of labor and operative deliveries.[3,4] Long term consequences of maternal overweight and obesity, is an increased risk of diabetes mellitus and cardiovascular disease for the

woman and childhood obesity and chronic diseases in offspring.[2] While, the underweight females are associated with increased risk of abortion, FGR, low birth weight, anemia, preterm labor which may cause low APGAR scores and increased perinatal deaths.[5,6]

Considering for standardisation, BMI also known as quetelet index is most useful population level measure as it is same for all ages of adults being most accepted and a reliable indicator of body fat for most people and it is a statistical measure that compares a person's weight for height using the formula-

$BMI = (Weight(kg))/[Height(m)]^2$

WHO classified weight into following categories depending on BMI - Underweight [<18.5], Normal weight [18.5-24.9], Overweight [25-29.9], obese class 1 [30-34.9], Obese class 2 [35-39.9], Obese class 3 [≥40]. The same WHO weight categories are also used during the pregnancy to categorize women into various weight categories like underweight, normal, overweight and obese.

In pregnancy, BMI is calculated using the pre-pregnancy weight but if it is unknown, the first weight measurement at the prenatal visit is used. Weight gain in pregnancy has been established as an important determinant of pregnancy outcome.[7-9] According to the National Family Health Survey (NFHS-5) conducted between 2019 and 2021, obesity increased from 20.6% in 2015-2016 to 24.0% in 2019-2021, while the incidence of underweight declined marginally from 22.9% in 2015-2016 to 18.7% in 2019-2021.[1]

Hence, public initiatives aiming in reduction of maternal and fetal morbidity and mortality can be vitalised by identification of high-risk population based on BMI leading to implementation of targeted interventions, such as nutritional counselling, weight management programs, and close monitoring during pregnancy.[10] Also, research into current study concerns to formulate the evidence based guidelines and recommendations for optimal maternal health practices.[11]

The present study aimed to correlate maternal BMI and materno-fetal outcome has importance to evaluate maternal nutritional status, pregnancy outcomes and long-term fetal health implications which later influences the knowledge about clinical practice, public health strategies, and research to provide optimal interventions.

METHODS

This was a prospective observational study conducted at East Point College of Medical Sciences & Research Centre, Bengaluru over 10months of duration from January 2025 to October 2025 among 500 pregnant women came to ANC OPD in the department of obstetrics and gynecology, fulfilled the selection criteria and agreed to participate in study. The study aimed to assess the feto-maternal outcomes in pregnant women of different BMI categories.

The study population in this study fulfilled the selection criteria. The inclusion criteria includes all pregnant women with singleton pregnancy having 1st trimester weight and height recordings of any age group. The exclusion criteria includes multi-fetal gestation, pregnancy with ART or infertility treatment, with congenital defects or anomalies, intrauterine fetal death, placenta previa, preexisting medical conditions like diabetes, hypertension, cardiac disease and hypothyroidism.

After the approval from Ethical committee of the institution the study was conducted by obtaining the informed consent from the participants in the study. The demographic data (age, parity, socioeconomic status) of all pregnant women in study was collected followed by the structured history taking and medical record review that includes weight in kg, height in metre, medical history, obstetric history, gestational age, mode of delivery, complications in intrapartum or postpartum, sepsis, etc. Also, the details of fetus delivered was collected like birth weight, APGAR score, neonatal complications, NICU admission, neonatal death, etc. the relevant investigation were also conducted.

The collected data were analysed with the SPSS statical software after formulating the tables and descriptive statistics was also tabulated. Comparative analysis was done using chi square test. A p value of <0.05 was considered statistically significant.

RESULTS

In this prospective observational study, there were 500 pregnant females as participants whose data were tabulated in the following table form.

Out of 500 pregnant women, the majority belonged to the normal BMI category (59%, n=295), followed by overweight (22%, n=110), underweight (13%, n=65), and obese (6%, n=30). Most participants were primigravida (62.4%) and were in the age group of 25-35 years (67.2%).

Antenatal complications such as anemia (n=161), hypertensive disorders (n=195), and gestational diabetes (n=71) were more frequently observed in overweight and obese women compared to normal and underweight groups. The incidence of IUFD was also slightly higher in higher BMI categories.

With respect to mode of delivery, LSCS and instrumental deliveries were more common among overweight and obese women, whereas normal vaginal delivery was predominant in the normal BMI group. Preterm deliveries were observed more frequently in overweight and obese categories, while most normal BMI women delivered at term. Postpartum complications such as PPH (n=52),

perineal tears (n=45), and wound infection/dehiscence (n=21) were higher in women with increased BMI compared to those with normal or low BMI.

Table 1: Maternal demography and outcomes based on their BMI.

Categories/BMI	Underweight <18.5	Normal 18.5-24.9	Overweight 25-29.9	Obese ≥30	Total
Number of cases	65	295	110	30	500
Parity					500
Primigravida	48	175	70	19	312
Multigravida	17	120	40	11	188
Age in years					500
<25	40	55	00	01	96
25-35	25	198	88	25	336
>35	00	42	22	04	68
Antenatal complications					
Abortion	00	01	04	01	06
Antepartum hemorrhage	01	00	02	02	05
Anemia	22	113	18	08	161
Hypertensive disorder	00	98	75	22	195
Gestational diabetes	00	16	31	24	71
IUFD	00	01	02	01	04
Mode of delivery					
Vaginal	61	225	70	13	369
Normal	58	195	38	05	296
Instrumental	03	30	32	08	73
LSCS	04	70	40	17	131
Gestational age					
Preterm	01	48	70	18	137
Term	64	231	40	12	347
Post term	00	16	00	00	16
Postpartum complication					
Perineal tear	01	18	22	4	45
Puerperal sepsis	00	01	00	01	02
PPH	02	29	16	05	52
Wound dehiscence/infection	00	03	10	08	21

Table 2: Fetal outcome based on maternal BMI.

Categories/BMI	Underweight, <18.5	Normal, 18.5-24.9	Overweight, 25-29.9	Obese ≥30	Total
Birth weight in kg					
<2.5	16	93	03	04	116
2.5-4	49	200	85	14	348
>4	00	02	22	12	36
APGAR score					
>7	65	290	107	29	491
<7	00	05	03	01	09
NICU admission	04	78	34	08	124
Neonatal death	00	03	02	01	06
Delivery related injuries	00	01	02	02	05

Fetal outcome analysis showed that low birth weight (<2.5 kg) was more common among underweight mothers (n=16), whereas macrosomia (>4 kg) was predominantly observed in overweight (n=22) and obese (n=12) women. The majority of neonates had an APGAR score >7 (98.2%), with low APGAR scores mainly seen in higher BMI groups.

NICU admissions were highest among babies born to overweight (n=34) and normal BMI mothers (n=78),

contributing to a total of 124 admissions. Neonatal deaths were relatively low (n=6) but were more frequently seen in overweight and obese categories. Delivery-related injuries were also slightly higher in overweight and obese mothers compared to other BMI groups.

DISCUSSION

This study conducted in Dept of OBG, East Point College of Medical Sciences & Research Centre, Bengaluru is prospective observational including 500 pregnant women who were categorised based on their BMI into WHO categories aiming to understand the correlation of maternal BMI to maternal & fetal outcomes.

Our study shows majority of participants were in normal BMI category 59% (295) while rest were underweight 13% (65), overweight 22% (110), and obese 6% (30). The most probable reason behind this trend being the majority of women coming to our hospital were from upper middle class and has urban life influence. The findings have been in resolute with the other studies conducted like cohort conducted by Van Der Linden et al, another by Yazdani et al, and Jenabi et al.[12-14] Also the studies conducted in India like cohort by Bhattacharya et al and Bhavadharini et al found that majority population was with normal BMI followed by overweight, underweight and obese respectively.[15,16]

In this study conducted, pregnant women with higher BMI having overweight and obesity were found to have association with increased risk of gestational diabetes, hypertensive disorders, cesarean section, instrumental delivery, post-partum hemorrhage wound infection, prolonged labour, fetal macrosomia, intrauterine fetal demise, increased NICU admission. Also, delayed lactation and lactation failure was observed.

According to a study, women in labor with a BMI >35 had a 3.8 times greater chance of a cesarean delivery than women with a BMI <25.18 with reduced likelihood of vaginal birth after caesarean delivery and vaginal delivery if weight gain in pregnancy is greater than 18 kg.[17,18] Success of VBAC is found to be less than 68.2% among overweight compare to 79.9% in normal population in Chicago study. High BMI increase likelihood of anesthetic interventions, failed regional blocks, failed induction, and GDM increase further risk.[19,20] Fetal risks associated with increased BMI includes first trimester abortion, increased birth defects including neural tube defects, cardiac anomalies, omphalocele, cleft lip, cleft palate, adverse neonatal outcomes from shoulder dystocia such as nerve palsies.[21-23] High BMI associated with fetal distress with resultant increase in fetal meconium aspiration, still birth, early neonatal death.[17, 23]

In this study, it was noticed that pregnant women with low BMI <18.5 Kg/m² was associated with low birth weight and preterm labour. The findings of this study are consistent with the prior studies and adds to the increasing evidence which suggest close association of maternal nutritional status with the feto-maternal outcomes.

CONCLUSION

The increasing population of overweight and obese women worldwide is a major public health concern, now reaching epidemic proportions. Two third of these women are in reproductive age which has critical consequences for fetal and maternal health.

Our study proved that there is a direct correlation between maternal BMI with maternal and fetal outcome. Both extremes of BMI had adverse outcomes on maternal and fetal health. All those pregnant women attending OPD having either high or low BMI should be considered as high-risk pregnancy and intensive surveillance to be carried out to prevent complications.

In developing countries like India both underweight and obesity poses a significant impact on the outcome of pregnancy. It aimed to educate the health care providers and treating clinicians regarding the importance of health education and raising public awareness regarding pre conceptional counselling to guide the women to keep an ideal BMI prior to pregnancy. Achieving an optimal weight gain for every pregnant woman is the basis for the development of a healthy population and contributing to reduction in maternal and fetal mortality and morbidity.

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