

Study of First Trimester Maternal Body Mass Index and Gestational Weight Gain and Their Association with Feto-Maternal Outcomes

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ABSTRACT:

Background: Pregnant women's body mass index (BMI) has increased recently, reflecting a general increase in the prevalence of obesity. High BMI before to conception and/or excessive gestational weight gain (GWG) have a negative impact on pregnancy outcomes, which raises the burden of chronic illnesses and jeopardies the health of both the mother and the unborn child. **Aim:** To study first trimester maternal Body Mass Index and gestational weight gain and their association with maternal and perinatal outcomes. **Objective:** To evaluate the effect of maternal BMI and gestational weight gain on fetomaternal outcome. **Material & Methods:** This was a prospective observational clinical study conducted in patients presenting to OPD of OBGY DEPARTMENT over a period of 18 months. The study was conducted among primigravida women visiting obstetrics OPD of our hospital during their first trimester pregnancy was comprise of my study population. **Results:** In present study, out of total 196 cases, first trimester BMI of 72 (36.7%) were found normal ($<18.5-24.9 \text{ kg/m}^2$) followed by 66 (33.7%) were found overweight ($25.0-29.9 \text{ kg/m}^2$). 35 (17.9%) were found in underweight ($<18.5 \text{ kg/m}^2$) whereas 23 (11.7%) were found Obese ($\geq 30.0 \text{ kg/m}^2$). out of total 46 cases in LWG, 42 (91.3%) cases were found Normal BW, 4 (8.7%) were found Low BW, none was found Macrosomia and 3 (6.5%) were required NICU admission. Out of total 92 cases in NWG, 88 (95.7%) were found Normal BW, 3 (3.3%) were found Low BW, 1 (1.1%) were found Macrosomia and 9 (9.8%) were required NICU admission. Out of total 58 cases in HWG, 53 (91.4%) cases were found Normal BW, 1 (1.7%) were found Low BW, 4 (6.9%) were found Macrosomia and 7 (12.1%) were required NICU admission. **Conclusion:** In clinical practice, this study recommend that women of childbearing age can be advised on the importance of maintaining an optimal BMI when planning to become pregnant.

Keywords: First Trimester, Clinical study, Overweight, Obesity, Pregnancy Pathology, Caesarean section, Weight Gain

INTRODUCTION

From a medical as well as a social perspective, the obesity epidemic has spread across the globe. The World Health Organization (WHO) has identified obesity as one of the most urgent global health challenges of the twenty-first century as a result of the alarming rise in obesity globally¹. Today, obesity is thought to be the most prevalent metabolic illness and a worldwide epidemic. Obesity is characterized as having too much body fat, which is extremely likely to cause health problems, as well as higher rates of morbidity and mortality.

Women of reproductive age have also been impacted by the significant rise in the prevalence of obesity. Body mass index is the most widely recognized indicator of obesity (BMI)². One of the risk variables seen most frequently in obstetric practice is maternal obesity^{3,4}.

Numerous experimental and epidemiological research have demonstrated that dietary modifications during the prenatal and postnatal periods of life can significantly affect a child's health and development.⁵ Professional scientific societies note that there is a higher prevalence of metabolic problems, neurodevelopmental disorders, cancer, and unfavorable changes in an individual's immune system as a result of obesity during pregnancy, in the postnatal period, and in adulthood.⁶ In affluent nations, the majority of women of reproductive age are overweight or

obese before having children. Growing numbers of pregnant mothers who are fat endanger the health of their unborn infants.

According to the WHO, the percentage of pregnant women who are obese ranges from 1.8% to 25.3%.¹ More over 30% of pregnant women in the majority of European countries are obesity, according to the European Perinatal Health Report.⁷

Pregnancy complications such as the risk of miscarriage, foetal and congenital anomalies, thromboembolism, preeclampsia and gestational hypertension, foetal macrosomia, gestational diabetes mellitus, IUGR (intrauterine growth restriction), stillbirth, as well as intrapartum, postpartum complications, and neonatal mortality are all associated with being obese during pregnancy.⁸ In comparison to women with a normal BMI, there are more caesarean sections performed on obese women⁹ and fewer lactating mothers¹⁰. Maternal mortality risk factors include obesity¹¹.

A significant predictor of poor outcomes for the health of the mother and the newborn is gestational weight increase¹².

Material and Methods

This was a prospective observational clinical study conducted in patients presenting to OPD of OBGY DEPARTMENT over a period of 18 months. The study was conducted among primigravida women visiting obstetrics OPD of our hospital during their first trimester pregnancy was comprise of my study population. Pregnant women with Singleton pregnancy and Primigravida woman coming in 1st trimester for antenatal checkup in OPD included. Pregnant women with pre-existing medical conditions like diabetes, chronic hypertension, heart disease, hypothyroidism, multifetal pregnancy and those not willing to give consent were excluded from this study. Approval of "Institutional Ethics Committee" was sought before start of the study.

Sample size: $n = (Z_{\alpha} + Z_{\beta})^2 (p_1q_1 + p_2q_2) / (p_2 - p_1)^2$

[Where, P₁ –proportion of small for gestational age babies in underweight, P₂ – proportion of small for gestational age babies in others, Z_α-1.96 (type 1 error), Z_β-1.037(type 2 error with 80 % power). Considering this the calculated sample size was **196**.

Detailed history was taken from patient. After that actual clinical examination was done. Data about first trimester BMI was calculated according to the formula weight in kilograms height in meter and these measurements was taken when patient comes in OPD in first trimester for the checkup. Weight of the patient was taken on digital weight machine and height by audiometer BMI = Weight in Kg / Height in meter². The weight machine was calibrated every weekly. As per revised values by the Health Ministry of India, 2009 BMI is classified as- (Underweight BMI <18.5, Normal BMI: 18.5-24.9, Overweight BMI: 25-29.9 & Obese BMI: 30 and above.) Gestational weight gain was calculated from first trimester to time of delivery. Normal gestational weight gain is categorized as per IOM guidelines as follows:

Pre pregnancy BMI category	Lower weight gain	Recommended weight gain	Higher weight gain
Underweight	<12.5 kg	12.5-18 kg	>18 kg
Normal weight	<11.5kg	11.5-16 kg	>16 kg
Overweight	<7 kg	7-11.5 kg	>11.5 kg
Obese women	<5 kg	5-9 kg	>9 kg

Maternal Outcome of the study was calculated in terms of perinatal complications and mode of delivery. Fetal outcome was calculated in terms of birth weight and NICU admission. The weight of a newborn baby was taken immediately after birth on baby weight machine, which was calibrated every weekly.

Neonates were classified as small if the birth weight was below 10 percentiles, normal if the birth weight was between 10% and 90 percentiles, large if it was above the 90% percentile and Low birth weight and macrosomia was defined as weight at birth of <2500grams and >4000grams.

Statistical Synthesis:

Descriptive and inferential statistical analysis was carried out in the present study. Results on continuous measurements were presented on Mean \pm SD (Min-Max) and results on categorical measurements were presented in Number (%). Significance was assessed at 95 % level of significance.

Results:

Out of total 196 cases, 82 (41.8%) were belong to 25-29 years followed by 77 (39.3%) were belong to 20-24 years. The mean height of the study participants was 151.4 cm. The mean of First trimester weight was 50.2 kg. The mean of First trimester BMI was 21.3 kg/m².

First trimester BMI of 72 (36.7%) were found normal (<18.5-24.9 kg/m²) followed by 66 (33.7%) were found overweight (25.0-29.9 kg/m²). 35 (17.9%) were found in underweight (<18.5 kg/m²) whereas 23 (11.7%) were found Obese (\geq 30.0 kg/m²). (Figure 1)

Figure 1: First trimester BMI of cases

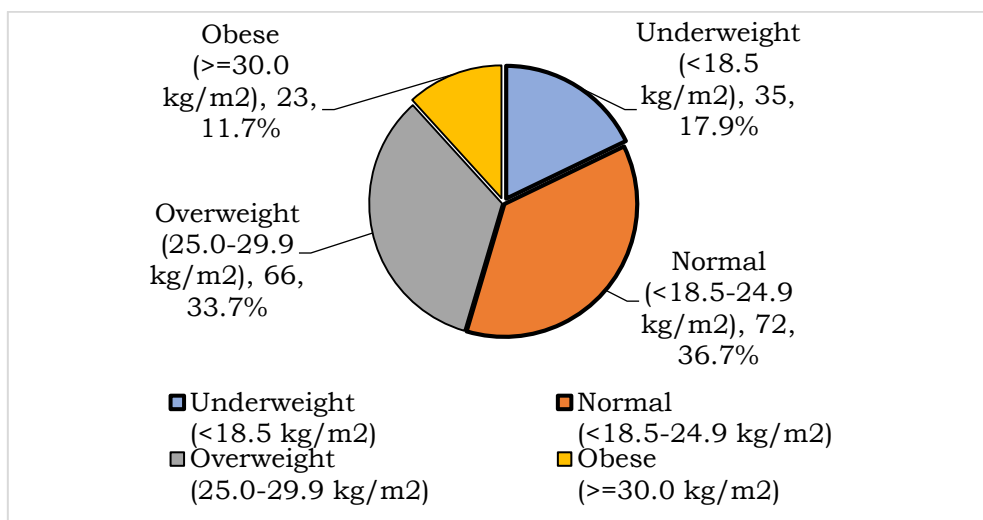


Table 1: Antenatal Complication and First trimester BMI

Antenatal Complication	Underweight (n=35)		Normal (n=72)		Overweight (n=66)		Obese (n=23)	
	n	%	n	%	n	%	n	%
Oligohydramnios	1	2.9%	2	2.8%	2	3.0%	1	4.3%
Polyhydramnios	1	2.9%	3	4.2%	1	1.5%	0	0.0%
Ante-partum Hemorrhage	0	0.0%	1	1.4%	2	3.0%	3	13.0%
GDM	2	5.7%	6	8.3%	10	15.2%	5	21.7%
GHTN	0	0.0%	1	1.4%	4	6.1%	3	13.0%
IUGR	2	5.7%	2	2.8%	6	9.1%	5	21.7%
Pre-eclampsia	6	17.1%	4	5.6%	10	15.2%	6	26.1%

Out of total 35 cases in underweight category, common antenatal complications were 2 (5.7%) GDM, 2 (5.7%) IUGR, 1 (2.9%) Oligohydramnios, 1 (2.9%) Polyhydramnios and 6 (17.1%) Pre-eclampsia. In normal category out of 72 cases, common antenatal complications were 6 (8.3%) GDM, 4 (5.6%) Pre-eclampsia, 3 (4.2%) Polyhydramnios, 2 (5.7%) IUGR, 2 (2.8%)

Oligohydramnios, 1 (1.4%) Ante partum Haemorrhage and 1 (1.4%) GHTN. In the Overweight category out of 66 cases, common antenatal complications were 10 (15.2%) GDM, 6 (9.1%) IUGR, 10 (15.2%) Pre-eclampsia, 4 (6.1%) GHTN, 2 (3.0%) Oligohydramnios, 1 (1.5%) Polyhydramnios, and 2 (3.0%) Ante partum Haemorrhage. In Obese category out of 23 cases, common antenatal complications were 5 (21.7%) GDM, 5 (21.7%) IUGR, 6 (26.1%) Pre-eclampsia, 3 (13.0%) GHTN, 1 (4.3%) Oligohydramnios, and 3 (13.0%) Ante partum Haemorrhage. GDM, GHTN and IUGR was significantly higher in obese compared other group (p value<0.05). Pre-eclampsia was significantly higher in obese (p<0.05) and well as in underweight (p<0.05) compared to Normal BMI group. Other complications are non-significant (p>0.05)(Table 1)

Table 2: Type of Delivery according to First trimester BMI

Type of Delivery	Underweight (n=35)		Normal (n=72)		Overweight (n=66)		Obese (n=23)	
	n	%	n	%	n	%	n	%
Normal Delivery	27	77.1%	51	70.8%	34	51.5%	10	43.5%
LSCS	7	20.0%	18	25.0%	26	39.4%	11	47.8%
Instrumental	1	2.9%	3	4.2%	6	9.1%	2	8.7%
Total	35	100%	72	100%	66	100%	23	100%

P value: 0.031

Out of total 35 cases in underweight category, 27 (77.1%) were found Normal delivery, 7 (20%) were found LSCS and 1 (2.9%) were found Instrumental delivery. In Overweight category out of 66 cases, 34 (51.5%) were found Normal delivery, 26 (39.4%) were found LSCS and 6 (9.1%) were found Instrumental delivery. In Obese category out of 23 cases, 10 (43.5%) were found Normal delivery, 11 (47.8%) were found LSCS and 2 (8.7%) were found Instrumental delivery. Comparison of mode of delivery among study groups shows p value 0.031 indicating that the LSCS rate was significantly higher in overweight and obese group (p <0.05). Instrumental delivery rate was also higher in overweight and obese compared to normal and underweight.(Table 2)

Table 3: Birth weight and NICU admission according to First trimester BMI

Neonatal Complication	Underweight (n=35)		Normal (n=72)		Overweight (n=66)		Obese (n=23)	
	n	%	n	%	n	%	n	%
Birth weight*								
Low BW(<2500gm)	3	8.6%	2	2.8%	2	3.0%	1	4.3%
Normal BW (2500-4000gm)	32	91.4%	69	95.8%	62	93.9%	20	87.0%
Macrosomia (>4000gm)	0	0.0%	1	1.4%	2	3.0%	2	8.7%
NICU Admission#	3	8.6%	3	4.2%	7	10.6%	6	26.1%

*P value 0.346, #P value 0.026

Table 3 shows Birth weight and NICU admission according to First trimester BMI. Out of total 35 cases in underweight category, 32 (91.4%) cases were belonged to Normal BW, and 3 (8.6%) were belong to Low BW. In Overweight category out of 66 cases, 62 (93.9%) cases were belonged to Normal BW, 2 (3%) were belong to Low BW, and 2 (3.0%) were belong to Macrosomia. In Obese category out of 23 cases, 20 (87.0%) cases were belonged to Normal BW, 1 (4.3%) were belong to Low BW, and 2 (8.7%) were belong to Macrosomia. P value (>0.05)

indicate that there is no significant difference in birth weight among the study group. However, NICU admission rate was significant higher in overweight and obese groups ($p < 0.05$).

Table 4: Gestational weight gain according to First trimester BMI category

Gestational weight gain (GWG)	Underweight (n=35)		Normal (n=72)		Overweight (n=66)		Obese (n=23)	
	n	%	n	%	n	%	n	%
Lower weight gain	20	57.1%	23	31.9%	2	3.0%	1	4.3%
Normal weight gain	14	40.0%	41	56.9%	21	31.8%	16	69.6%
Higher weight gain	1	2.9%	8	11.1%	43	65.2%	6	26.1%
Total	35	100.0%	72	100.0%	66	100.0%	23	100.0%

p value: <0.001

Out of total 35 cases in underweight category, 20 (57.1%) were found LWG, 14 (40%) were found NWG and 1 (2.9%) were found HWG. In normal category out of 72 cases, 23 (31.9%) were found LWG, 41 (56.9%) were found NWG and 8 (11.1%) were found HWG. In Overweight category out of 66 cases, 2 (3%) were found LWG, 21 (31.8%) were found NWG and 43 (65.2%) were found HWG. In Obese category out of 23 cases, 1 (4.3%) were found LWG, 16 (69.6%) were found NWG and 6 (26.1%) were found HWG. P value <0.01 indicates that the GWG was significantly higher in overweight and obese while GWG was significantly lower in underweight BMI women.(Table 4)

Table 5: Antenatal Complication and gestational weight gain

Antenatal Complication	Lower weight gain (n=46)		Normal weight Gain (n=92)		Higher weight Gain (n=58)	
	n	%	n	%	n	%
Oligohydramnios	2	4.3%	2	2.2%	2	3.4%
Polyhydramnios	2	4.3%	1	1.1%	2	3.4%
Antepartum haemorrhage	1	2.2%	2	2.2%	3	5.2%
GDM	1	2.2%	10	10.9%	12	20.7%
GHTN	1	2.2%	4	4.3%	3	5.2%
IUGR	3	6.5%	4	4.3%	8	13.8%
Pre-eclampsia	7	15.2%	7	7.6%	12	20.7%

The common antenatal complication in LWG were GDM 1 (2.2%), IUGR 3 (6.5%), Oligohydramnios 2 (4.3%), Polyhydramnios 2 (4.3%) and pre-eclampsia 7 (15.2%). In NWG, common complications were GDM 10 (10.9%), Pre-eclampsia 7 (7.6%), GHTN 4 (4.3%) and IUGR 4 (4.3%). In HWG group common complications were GDM 12 (20.7%), IUGR 8 (13.8%), Pre-eclampsia 12 (20.7%) and antepartum haemorrhage 3 (5.2%).(Table 5)

Table 6: Type of Delivery according to gestational weight gain

Type of Delivery	Lower weight gain (n=46)		Normal weight Gain (n=92)		Higher weight Gain (n=58)	
	n	%	n	%	n	%
Normal Delivery	32	69.6%	61	66.3%	29	50.0%
LSCS	12	26.1%	28	30.4%	22	37.9%

Instrumental	2	4.3%	3	3.3%	7	12.1%
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P value: 0.372

Out of total 46 cases in LWG, 32 (69.6%) were found Normal delivery and 12 (26.1%) were found LSCS. Out of total 92 cases in NWG, 61 (66.3%) were found Normal delivery, 28 (30.4%) were found LSCS and 3 (3.3%) were found Instrumental delivery. Out of total 58 cases in HWG, 29 (50%) were found Normal delivery, 22 (37.9%) were found LSCS and 7 (12.1%) were found Instrumental delivery. P value was 0.372. There is no significance difference in mode of delivery among the study groups in the study groups. (Table 6)

Table 7: Birth weight and NICU admission according to GWG

Neonatal Complication	Lower weight gain (n=46)		Normal weight Gain (n=92)		Higher weight Gain (n=58)	
	n	%	n	%	n	%
Birth weight*						
Low birth weight (<2500gm)	4	8.7%	3	3.3%	1	1.7%
Normal birth Weight (2500-4000gm)	42	91.3%	88	95.7%	53	91.4%
Macrosomia (>4000gm)	0	0.0%	1	1.1%	4	6.9%
NICU Admission#	3	6.5%	9	9.8%	7	12.1%

*p value 0.637, #P value 0.324

Out of total 46 cases in LWG, 42 (91.3%) cases were found Normal BW, 4 (8.7%) were found Low BW, none was found Macrosomia and 3 (6.5%) were required NICU admission. Out of total 58 cases in HWG, 53 (91.4%) cases were found Normal BW, 1 (1.7%) were found Low BW, 4 (6.9%) were found Macrosomia and 7 (12.1%) were required NICU admission. P value (>0.05) indicate that there is no significant difference in birth weight and NICU admission rate among the study groups. (Table. 7)

Discussion:

The present study was conducted among 196 pregnant women to study first trimester maternal Body Mass Index and gestational weight gain and their association with maternal and perinatal outcomes.

According to recent studies, a baby's birth weight and prenatal BMI are related each other^{13,14} Preeclampsia and gestational diabetes mellitus are two conditions that obese or overweight women are more likely to acquire. In turn, it is discovered that this has an impact on neonatal outcomes like perinatal mortality, macrosomia, and congenital abnormalities¹⁵. Additionally, maternal obesity increases the likelihood of anaesthesia and caesarean sections. Maternal weight retention, postpartum obesity, and obesity exacerbation are some of the long-term effects of maternal obesity. Not much Indian research have examined how well the IOM recommendations apply to expectant mothers^{16, 18}.

In present study, out of total 196 cases, 82 (41.8%) were belong to 25-29 years followed by 77 (39.3%) were belong to 20-24 years.

In the study by Soltani H et al¹⁷ (2017), the mean age of the study participants was 28.5 ± 5.6 years, 82.4 percent of the women were between the ages of 20 and 34. Sun Y et al¹⁸ (2020), found significant difference in age distribution. Similar results also found in study Bhattacharya S et al¹⁹ (2007). (P value less than 0.05)

In present study, the mean height of the study participants was 151.4 cm. The mean of First trimester weight was 50.2 kg. The mean of First trimester BMI was 21.3 kg/m².

Similar result found in the study by Soltani H et al^{109/17} (2017). In the study by Soltani H et al¹⁷ (2017), the mean height of the participants with delivery data was 153.4 cm. The mean pregnancy weight was 50.2 ± 9.1 Kg and mean of pre-pregnancy BMI was 21.3 ± 3.5 kg/m².

In present study, out of total 196 cases, First trimester BMI of 72 (36.7%) were found normal (<18.5-24.9 kg/m²) followed by 66 (33.7%) were found overweight (25.0-29.9 kg/m²)^{35/20}. (17.9%) were found in underweight (<18.5 kg/m²) whereas 23 (11.7%) were found Obese (≥ 30.0 kg/m²).

Sun Y et al¹⁸ (2020), found significant difference in pre-pregnancy BMI of cases. In the study by Bhattacharya S et al¹⁹, out of total 24241 cases 58.1 percent cases were found normal BMI, 11.7 percent were underweight followed by 7.7 percent were obese, 21.9 percent were overweight and 0.6 percent were morbidly obese. Pre-eclampsia risk increased by 5 to 7 Kg/m² for every increase in pre-pregnancy BMI, according to a meta-analysis of the pre-eclampsia risk linked with maternal BMI.²⁰

In this study prior to overweight category out of 66 cases, common antenatal complications were 10 (15.2%) GDM, 6 (9.1%) IUGR, 10 (15.2%) Pre-eclampsia, 4 (6.1%) GHTN, 2 (3.0%) Oligohydramnios, 1 (1.5%) Polyhydramnios, 2 (3.0%) Ante partum Haemorrhage. In Obese category out of 23 cases, common antenatal complications were 5 (21.7%) GDM, 5 (21.7%) IUGR, 6 (26.1%) Pre-eclampsia, 3 (13.0%) GHTN, 1 (4.3%) Oligohydramnios, 3 (13.0%) Ante partum Haemorrhage.

In terms of maternal problems, a study by Sun Y et al¹⁸ (2020) found that being overweight prior to conception increased the incidence of gestational diabetes mellitus (GDM), which is in line with previous recent findings^{21,22}. The health of mothers and children can be significantly threatened by GDM²³. Related investigations have demonstrated that insulin resistance is primarily brought on by a number of physiological and pathological changes that occur during pregnancy, despite the fact that the etiology is still unknown²⁴.

In present study, out of total 35 cases in underweight category, 27 (77.1%) were found Normal delivery, 7 (20%) were found LSCS and 1 (2.9%) were found Instrumental delivery. In normal category out of 72 cases, 51 (70.8%) were found Normal delivery, 18 (25%) were found LSCS and 3 (4.2%) were found Instrumental delivery. In Overweight category out of 66 cases, 34 (51.5%) were found Normal delivery, 26 (39.4%) were found LSCS and 6 (9.1%) were found Instrumental delivery. In Obese category out of 23 cases, 10 (43.5%) were found Normal delivery, 11 (47.8%) were found LSCS and 2 (8.7%) were found Instrumental delivery.

In the Ramya S et al²⁵ (2019) study, in underweight out of 16 cases, 87.5% were found vaginal delivery and 12.5% were found LSCS. In normal category out of 36 cases, 29 were found VD, LSCS and 1 instrumental. In overweight category out of 38 cases, 22 (57.89%) were found VD, 14 (36.84%) LSCS and 2 (5.26%) were found instrumental.

In present study, out of total 35 cases in underweight category, 32 (91.4%) cases were belonged to Normal BW, 3 (8.6%) were belong to Low BW, none was belonged to Macrosomia and NICU admission was 3 (8.6%). In normal category out of 72 cases, 69 (95.8%) cases were belonged to Normal BW, 2 (2.8%) were belong to Low BW, 1 (1.4%) were belong to Macrosomia and NICU admission was 3 (4.2%). In Overweight category out of 66 cases, 62 (93.9%) cases were belonged to Normal BW, 2 (3%) were belong to Low BW, 2 (3.0%) were belong to Macrosomia and NICU admission was 7 (10.6%). In Obese category out of 23 cases, 20 (87.0%) cases were belonged to Normal BW, 1 (4.3%) were belong to Low BW, 2 (8.7%) were belong to Macrosomia and NICU admission was 6 (26.1%).

Early pregnancy miscarriage is more likely in obese women. 123/28 Neonatal outcomes showed significant variations in birth weights and GA (both $P < 0.001$) across the 4 pre-pregnancy BMI groups in the study by Sun Y et al (2020)¹⁸.

In present study, out of total 35 cases in underweight category, 20 (57.1%) were found LWG, 14 (40%) were found NWG and 1 (2.9%) were found HWG. In normal category out of 72 cases, 23 (31.9%) were found LWG, 41 (56.9%) were found NWG and 8 (11.1%) were found HWG. In Overweight category out of 66 cases, 2 (3%) were found LWG, 21 (31.8%) were found NWG

and 43 (65.2%) were found HWG. In Obese category out of 23 cases, 1 (4.3%) were found LWG, 16 (69.6%) were found NWG and 6 (26.1%) were found HWG.

Mohapatra J et al²⁶ discovered that the BMIs of every instance in the LGA group were either obese or overweight. 13 of the 17 women in the LGA group belonged to the GWG, which was above the IOM recommendation. None of the LGA group's female participants belonged to a GWG that fell below IOM guidelines. Every woman in the SGA group had a BMI that was either normal or underweight. Twelve out of the fourteen women in the SGA group were members of the GWG that fell below the IOM recommendation, and none was members of the GWG that rose above the IOM recommendation.

In the study by Sun Y et al¹⁸ (2020), it was found that pregnant women with pre-pregnancy BMIs between 20 and 25 years old did not regulate them to be within the normal range.

In contrast to earlier studies that indicated that these women had an increased risk for such complications, the Bhavadharini B et al²⁷ study found that normal weight and overweight women gained less weight than was recommended and that this weight gain was associated with a lower risk of caesarean sections and macrosomia^{28, 29}.

In present study, out of total 46 cases in Lower weight gain category, 31 (67.4%) were belong to AGA, followed by 8 (17.4%) SGA and 7 (15.2%) were LGA. Out of total 92 cases in Normal weight gain category, 63 (68.5%) were belong to AGA, followed by 13 (14.1%) SGA and 16 (17.4%) were LGA. Out of total 58 cases in Higher weight gain category, 41 (70.7%) were belong to AGA, followed by 11 (19%) LGA and 6 (10.3%) were SGA. P value was 0.879. There is no significance difference found in the study groups.

According to Mohapatra J et al²⁶, 86% of women who gave birth to neonates with low birth weights (<2.5 kg) belonged to the GWG group that fell below the IOM's criteria. Most LGA newborns (76.5%) belonged to mothers whose GWG was higher than the IOM's suggested level. It was determined that this distributional difference was statistically significant ($p < 0.05$).

In present study, the common antenatal complication in LWG were GDM 1 (2.2%), IUGR 3 (6.5%), Oligohydramnios 2 (4.3%), Polyhydramnios 2 (4.3%) and pre-eclampsia 7 (15.2%). In NWG, common complications were GDM 10 (10.9%), Pre-eclampsia 7 (7.6%), GHTN 4 (4.3%) and IUGR 4 (4.3%). In HWG group common complications were GDM 12 (20.7%), IUGR 8 (13.8%), Pre-eclampsia 12 (20.7%) and antepartum haemorrhage 3 (5.2%).

The delivery style, GDM, and GHP among the 4 First trimester BMI groups varied significantly (all $P < 0.001$) in the study by Sun Y et al 110 (2020) on mother outcomes.

In the Ramya S et al²⁵(2019) study, 13% of participants had GDM overall. Obesity increased the rate of GDM by 30% ($n=3$) and overweight by 18.42% ($n=7$) when compared to normal 8.34% ($n=3$) (P-Value: 0.084). Therefore, there was a statistically significant rise in the incidence of GDM in groups with high BMI. With regard to blood pressure, 8.34% ($n=3$) of 36 women with normal BMI developed gestational hypertension (GHTN), 18.42% ($n=7$) of 38 women who were overweight, and 30% ($n=3$) of 10 women who were obese. The overall incidence of gestational hypertension in the Ramya S et al study was 13%, and the rate of GHTN was higher in obese people ($n = 3$), overweight people ($n = 7$), and normal women ($n = 3$), who had a rate of 8.34%. P value of 0.084 indicating a statistically significant rise in the incidence of GHTN in the group with high BMI²⁵.

In present study, out of total 46 cases in LWG, 32 (69.6%) were found Normal delivery and 12 (26.1%) were found LSCS. Out of total 92 cases in NWG, 61 (66.3%) were found Normal delivery, 28 (30.4%) were found LSCS and 3 (3.3%) were found Instrumental delivery. Out of total 58 cases in HWG, 29 (50%) were found Normal delivery, 22 (37.9%) were found LSCS and 7 (12.1%) were found Instrumental delivery.

When maternal weight growth was taken into account, Edwards et al³⁰ and Graham et al³¹ discovered that there was no conclusive link between obesity and caesarean delivery. However, according to some reports, obese pregnant women who gain more weight during their pregnancies are more likely to have caesarean sections³².

In present study, out of total 46 cases in LWG, 42 (91.3%) cases were found Normal BW, 4 (8.7%) were found Low BW, none was found Macrosomia and 3 (6.5%) were required NICU admission. Out of total 92 cases in NWG, 88 (95.7%) were found Normal BW, 3 (3.3%) were found Low BW, 1 (1.1%) were found Macrosomia and 9 (9.8%) were required NICU admission. Out of total 58 cases in HWG, 53 (91.4%) cases were found Normal BW, 1 (1.7%) were found Low BW, 4 (6.9%) were found Macrosomia and 7 (12.1%) were required NICU admission.

Verma A et al³³ (2012), found significant results in NICU admission. Out of total 116 cases in LWG, 7 (6.03%) were required to NICU admission. In Normal category 19 (4.68%) out of 406 cases, in overweight group 13 (7.87%) out of 165 cases and in obese group 8(9.5%) out of 84 cases were required to NICU admission. (P= 0.03) The neonatal ICU admission rate was higher in the morbidly obese group (25%) and was mostly related to LGA infants and moms with diabetes.

RamyaS et al²⁵ (2019), found out of 16 cases in underweight group 6 (37.5%) were required to NICU admission. In normal category 3 (8.34%) out of 36 cases, in overweight group 1 (2.63%) out of 38 cases were required to NICU admission.

Conclusion

From this study we conclude that First trimester underweight and overweight/obesity is associated with higher antenatal, intra-natal and postnatal complications as well as neonatal complications. Caesarian rate and instrumental deliver are also common in First trimester overweight and obese women. Though macrosomia is uncommon, it is higher in obese women. NICU admission rate was also higher in extreme of BMI. Gestational weight gain is higher in higher First trimester BMI. Oligohydramnios, polyhydramnios, preterm, post-partum hemorrhage are not associated with First trimester BMI. Gestational diabetes, gestational hypertension and intrauterine growth retardation are associated with higher First trimester BMI, especially overweight and obesity. Preeclampsia is associated with extreme of First trimester BMI.

In clinical practice, this study recommend that women of childbearing age can be advised on the importance of maintaining an optimal BMI when planning to become pregnant. Obstetrician can advise pregnant women to manage and control excessive weight gain during pregnancy in order to reduce the risk of adverse pregnancy outcomes.

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