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Study of Maternal and Fetal Outcomes in Pregnant Obese and Overweight Women in Tertiary Health Care Centre

Running Title: Study of Maternal and Fetal Outcomes in Pregnant Obese and Overweight Women

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Abstract: ***Background**: The global prevalence of overweight and obesity among pregnant women is increasing and is associated with a higher risk of adverse maternal and fetal outcomes. Excess maternal adiposity contributes to metabolic, obstetric, and neonatal complications, underscoring the importance of evaluating pregnancy outcomes in overweight and obese women, particularly in resource-limited rural settings. **Methods**: A descriptive cross-sectional study was conducted over 18 months in the Department of Obstetrics and Gynaecology at a tertiary care rural hospital. Ethical approval was obtained from the Pravara Institute of Medical Sciences Deemed University (PIMS/DR/RMC/IEC-UG-PG/2024/83), and informed consent was secured from all participants. Pregnant women with a body mass index (BMI) ≥25 kg/m² were enrolled. Clinical evaluation, relevant laboratory tests, and ultrasonographic assessments were performed, and participants were followed until delivery and postpartum discharge. Maternal and fetal outcomes were documented. Statistical analysis was carried out using SPSS version 26, with a p-value <0.05 considered statistically significant. **Results**: A total of 116 pregnant women with BMI ≥25 kg/m² were included, with a mean age of 23.99 ± 5.06 years; 62.9% were overweight and 37.1% were obese. The incidence of antepartum complications, particularly gestational diabetes mellitus and hypertensive disorders, increased with rising BMI. Emergency cesarean section was the most common mode of delivery (62.1%), most frequently due to post-dated pregnancy with a large fetus. Although 94.0% of neonates were live born, 31.9% were large for gestational age and required NICU admission. A significant association was observed between maternal BMI and neonatal birth weight, while postpartum complications were minimal. **Conclusion**: Overweight and obesity during pregnancy are associated with increased maternal and neonatal complications. Early identification and vigilant antenatal and intrapartum care are essential to improve pregnancy outcomes.*

Keywords: Maternal obesity, Overweight pregnancy, fetal outcome, Neonatal outcome, Gestational diabetes mellitus, Hypertensive disorders of pregnancy, Cesarean section, Birth weight, NICU admission

1. Introduction

Overweight and obesity among pregnant women have emerged as major public health challenges worldwide, with their prevalence rising steadily over the past few decades. Maternal obesity is now well recognized as an important contributor to adverse pregnancy outcomes, affecting both maternal health and fetal well-being. Several studies have demonstrated that overweight and obese women are at increased risk of complications such as gestational diabetes mellitus, hypertensive disorders of pregnancy, preeclampsia, operative deliveries, and a range of neonatal morbidities [1,2].

The burden of maternal overweight and obesity is increasing globally as well as in low- and middle-income countries, including India. Recent data indicate that the prevalence of overweight and obesity among women of reproductive age continues to rise, with combined rates reaching nearly 40–50% in certain urban populations. National Family Health Survey (NFHS) reports from India show that approximately 12–20% of pregnant women are overweight or obese, representing a nearly two-fold increase over the past decade, particularly in urban settings [3,4]. This epidemiological transition reflects changing lifestyles, dietary patterns, and reduced physical activity among women of childbearing age.

Evidence suggests a clear dose-dependent relationship between increasing maternal body mass index and adverse obstetric outcomes. Overweight and obese women have significantly higher odds of developing gestational diabetes mellitus, gestational hypertension, and preeclampsia when compared to women with normal body mass index. Meta-analyses have reported odds ratios of 2.92 for gestational diabetes in overweight women and 3.46 in obese women, along with markedly elevated risks of hypertensive disorders of pregnancy [5,6]. These maternal complications often translate into increased intervention during labour, with higher rates of induction, cesarean delivery, postpartum hemorrhage, and intensive care admissions, particularly in tertiary care settings.

Maternal obesity also has important implications for fetal and neonatal outcomes. Infants born to overweight and obese mothers are at higher risk of macrosomia, preterm birth, low Apgar scores, neonatal hypoglycemia, respiratory distress, and increased need for neonatal intensive care [7]. Several studies have demonstrated a two- to three-fold increase in the

risk of stillbirth and neonatal mortality associated with maternal obesity. Data from Indian tertiary care centres similarly report higher rates of neonatal complications, including hyperbilirubinemia and respiratory morbidity, among offspring of overweight and obese mothers [8].

Despite growing global evidence, there remains a relative paucity of prospective data from Indian tertiary health care centres evaluating the spectrum of maternal and fetal outcomes associated with overweight and obesity during pregnancy [9]. Given the rising prevalence of obesity among Indian women and the distinct demographic and healthcare characteristics of the population, region-specific data are essential. Therefore, the present study aims to evaluate maternal and fetal outcomes among overweight and obese pregnant women attending a tertiary health care centre, in order to generate evidence to inform effective preconception counseling, appropriate risk stratification, and optimized antenatal care.

2. Materials and Methods

A descriptive cross-sectional study was conducted over a period of 18 months in the Department of Obstetrics and Gynaecology, Pravara Rural Hospital, Loni, after obtaining approval from the Institutional Ethics Committee. Purposive sampling was used to enroll pregnant women attending the antenatal outpatient department.

Pregnant women with BMI ≥ 25 kg/m² were included and categorized as overweight (25–29.9 kg/m²) and obese (≥ 30 kg/m²). Women with BMI < 25 kg/m², hepatic or renal disease, or acute fatty liver of pregnancy were excluded. Written informed consent was obtained from all participants.

All enrolled women underwent detailed history-taking, general and systemic examination, and relevant hematological, biochemical, and ultrasonographic investigations. Participants were followed throughout the antenatal period, during delivery, and postpartum until discharge.

Maternal outcomes assessed included gestational diabetes mellitus, hypertensive disorders of pregnancy, labor induction, and mode of delivery, intrapartum and postpartum complications, and duration of hospital stay. Fetal outcomes included gestational age at birth, birth weight, Apgar score at 5 minutes, NICU admission, and congenital anomalies.

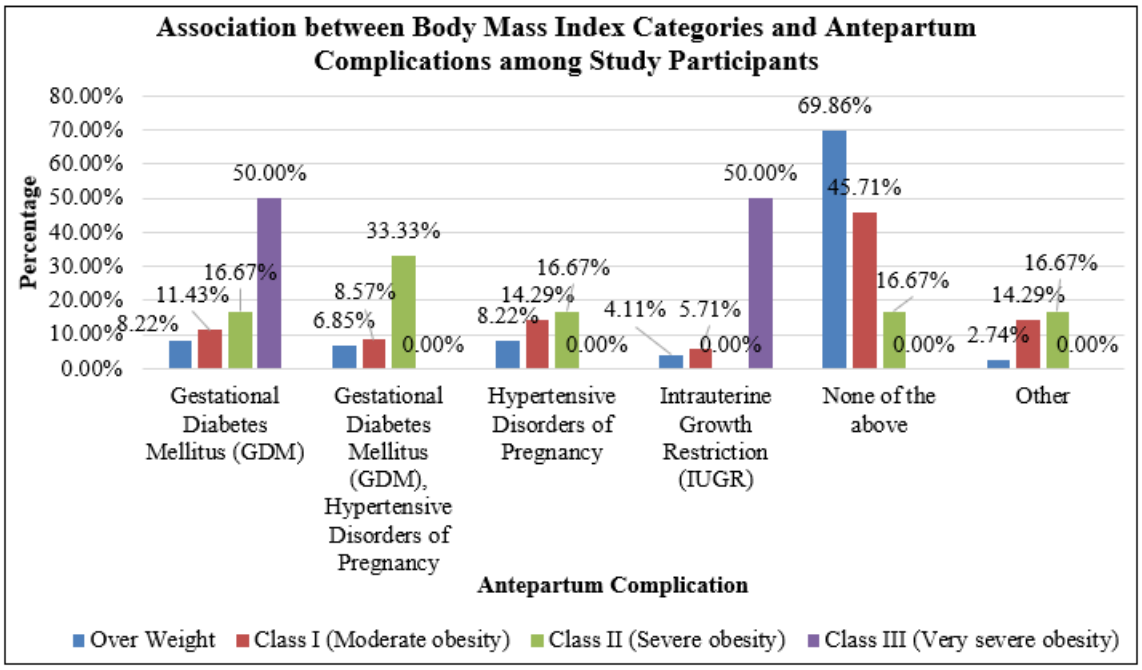
Data were analyzed using IBM SPSS version 26, and results were expressed using appropriate descriptive and inferential statistics. A p-value < 0.05 was considered statistically significant.

3. Observation and Result

Table 1: Baseline Maternal Characteristics of the Study Population

Parameter	Category	Frequency	Percentage (%)
Age (years)	Mean ± SD	23.99 ± 5.06	
BMI Category	Overweight (25–29.9)	73	62.93%
	Class I Obesity (30–34.9)	35	30.17%
	Class II Obesity (35–39.9)	6	5.17%
	Class III Obesity (>40)	2	1.72%
Duration of Marriage (years)	1–3	61	52.59%
	3.1–5	31	26.72%
	>5	24	20.69%
Mode of Conception	Natural	92	79.31%
	Ovulation induction	18	15.52%
	IUI/IVF	6	5.17%
Gravida	Primi	73	62.93%
	Multigravida	43	37.07%
Past Medical History	Nil	104	89.66%
	Present	12	10.34%

Table 1 summarizes the baseline maternal characteristics of the study participants. The mean age of the women was 23.99 ± 5.06 years. The majority of participants were overweight (62.93%), followed by Class I obesity (30.17%). More than half of the women had a duration of marriage between 1 and 3 years (52.59%). Natural conception was observed in most cases (79.31%). Primigravida women constituted 62.93% of the study population, and the majority had no significant past medical history (89.66%) (Table 1).



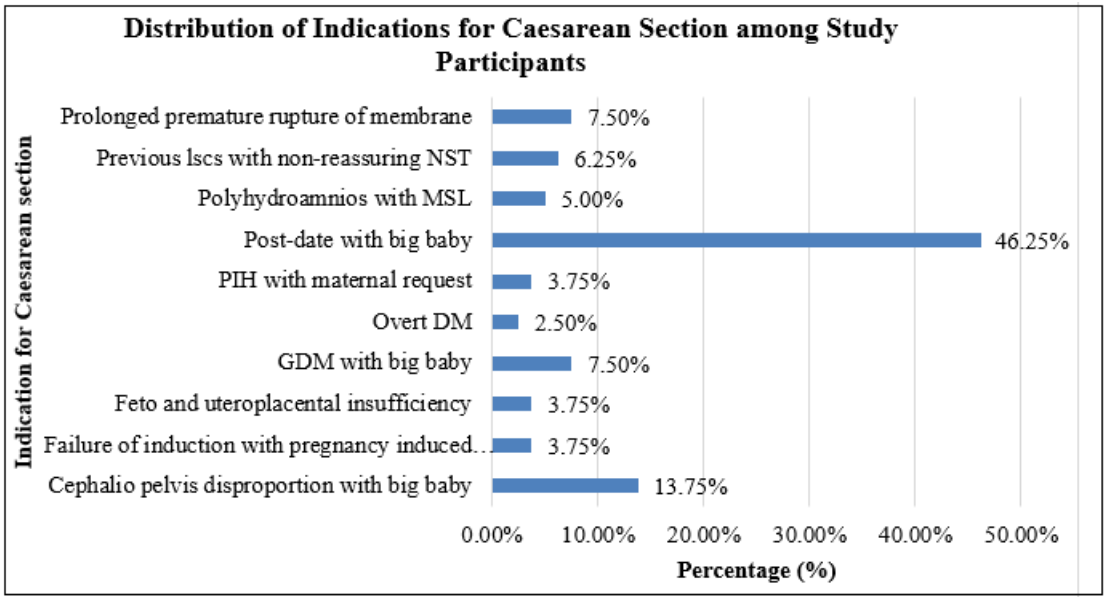
Graph 1: Association of Maternal Body Mass Index with Antepartum Complications

Graph 1 shows the distribution of antepartum complications across different maternal BMI categories. Gestational diabetes mellitus and hypertensive disorders of pregnancy were observed more frequently with increasing BMI. Combined GDM with hypertensive disorders was notably higher among women with Class II obesity (33.33%). Intrauterine growth restriction was more commonly seen in women with severe obesity. A higher proportion of women in the overweight category had no antepartum complications compared to obese categories. Overall, the burden of antepartum complications increased with rising maternal BMI (Graph 1).

Table 2: Mode of Delivery and Labour Complications among Study Participants

A. Mode of Delivery (n = 116)		
Mode of Delivery	Frequency	Percentage (%)
Emergency LSCS	72	62.07%
Planned LSCS	8	6.90%
Normal vaginal delivery	22	18.97%
Assisted vaginal delivery	14	12.07%
B. Labour Complications (n = 116)		
Labour Complication	Frequency	Percentage (%)
Increased LSCS rate	47	40.52%
Prolonged labour	25	21.55%
Non-reassuring FHR	6	5.17%
Prolonged labour + FHR	6	5.17%
None	32	27.59%

Table 2 describes the mode of delivery and labour-related complications among the study participants. Emergency lower segment cesarean section was the most common mode of delivery, accounting for 62.07% of cases, while normal vaginal delivery was observed in 18.97% of women. Assisted vaginal delivery was required in 12.07% of cases. Regarding labour complications, an increased cesarean section rate was the most frequently noted complication (40.52%). Prolonged labour occurred in 21.55% of participants, while 27.59% experienced no labour-related complications (Table 2).



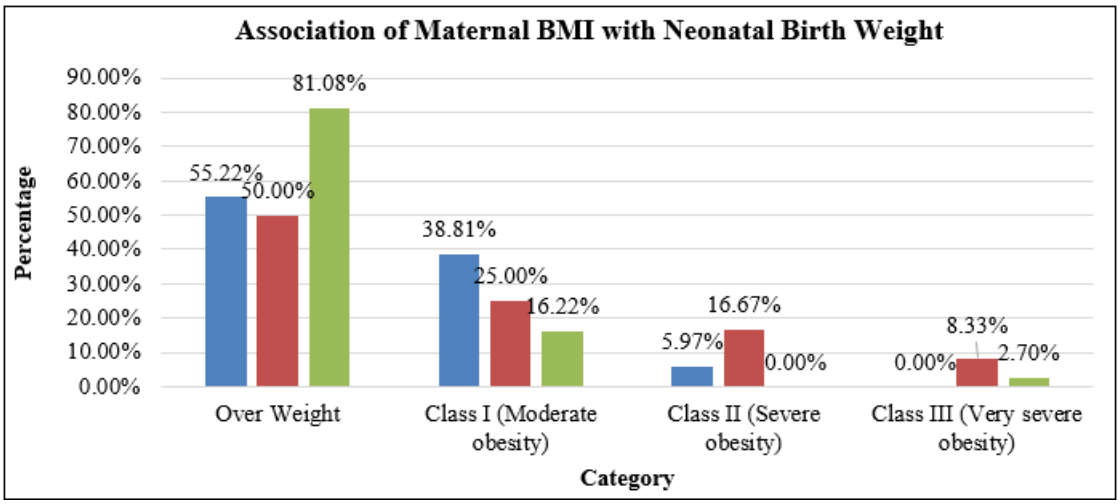
Graph 2: Indications for Caesarean Section among Study Participants

Graph 2 presents the indications for caesarean section among the study participants. Post-dated pregnancy with a big baby was the most common indication, accounting for 46.25% of caesarean deliveries. Cephalopelvic disproportion was noted in 13.75% of cases. Gestational diabetes mellitus with a big baby and prolonged premature rupture of membranes each contributed to 7.50% of indications. Previous caesarean section with non-reassuring non-stress test was observed in 6.25% of women. Other indications, including hypertensive disorders and fetoplacental insufficiency, were less frequent (Graph 2).

Table 3: Distribution of Fetal and Neonatal Outcomes among Study Participants

Parameter	Category	Frequency	Percentage (%)
Birth outcome	Live born	109	93.97%
	Stillbirth	2	1.72%
	Intrauterine death	5	4.31%
APGAR score	0,0,0	5	4.31%
	1,0,0	2	1.72%
	6,7,8	25	21.55%
	7,8,8	3	2.59%
	7,8,9	81	69.83%
Birth weight	Normal (2.5–3.5 kg)	67	57.76%
	Low birth weight (<2.5 kg)	12	10.34%
	LGA (>3.5 kg)	37	31.90%
Neonatal complications	NICU admission	37	31.90%
	Congenital anomaly	1	0.86%

Table 3 summarizes the fetal and neonatal outcomes observed in the study population. The majority of births resulted in live-born neonates (93.97%), while intrauterine deaths and stillbirths accounted for 4.31% and 1.72%, respectively. Most newborns had favorable APGAR scores, with 69.83% scoring 7, 8, and 9 at birth. Normal birth weight was observed in 57.76% of neonates, whereas 31.90% were large for gestational age. NICU admission was required for 31.90% of newborns, and congenital anomalies were rarely noted (0.86%) (Table 3).



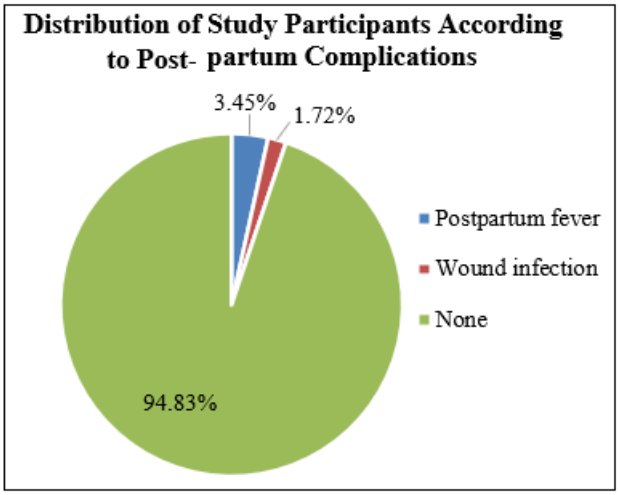
Graph 3: Association between Maternal BMI Category and Neonatal Birth Weight

Graph 3 shows the association between maternal BMI categories and neonatal birth weight. Among overweight women, a significantly higher proportion of large for gestational age babies was observed (81.08%). Class I obese mothers predominantly delivered normal weight babies (38.81%), with a statistically significant association. In Class II and Class III obesity, no significant association with birth weight categories was found. Overall, maternal BMI demonstrated a significant relationship with neonatal birth weight, particularly in overweight and Class I obese groups (Graph3).

Table 4: Distribution of Neonatal Risk Factors across Maternal BMI Categories

BMI category/ Neonatal risk factor	Frequency	Born longer than average	Low Blood Sugar	Needed NICU	NICU Admission	None of the above	other
Over Weight	73	3(4.11%)	2(2.74%)	4(5.48%)	18(24.66%)	46(63.01%)	0(0.00%)
Class I (Moderate obesity)	35	1(2.86%)	2(5.71%)	1(2.86%)	12(34.29%)	14(40.00%)	5(14.29%)
Class II (Severe obesity)	6	2(33.33%)	2(33.33%)	1(16.67%)	0(0.00%)	1(16.67%)	0(0.00%)
Class III (Very severe obesity)	2	0(0.00%)	0(0.00%)	0(0.00%)	1(50.00%)	0(0.00%)	1(50.00%)
Total	116	6	6	6	31	61	6

Table 4 depicts the distribution of neonatal risk factors according to maternal BMI categories. Most neonates born to overweight mothers had no associated risk factors (63.01%), although 24.66% required NICU admission. In the Class I obesity group, NICU admission was observed in 34.29% of neonates, with other complications occurring less frequently. Class II obese mothers showed a higher proportion of low blood sugar and babies born longer than average (33.33% each). In the Class III obesity category, half of the neonates required NICU admission, while the remaining had other complications (Table 4).



Graph 4: Distribution of Postpartum Complications among Study Participants

Graph 4 illustrates the postpartum complications observed among the study participants. The majority of women (94.83%) did not experience any postpartum complications. Postpartum fever was noted in 3.45% of cases, while wound infection occurred in 1.72% of women. Overall, postpartum morbidity was low in the study population. These findings indicate a relatively favorable postpartum course among overweight and obese women included in the study (Graph4).

4. Discussion

Maternal overweight and obesity are increasingly recognized as important risk factors influencing pregnancy outcomes. The present study evaluated maternal, obstetric, and neonatal outcomes among overweight and obese pregnant women attending a tertiary health care centre and demonstrated a clear association between increasing maternal BMI and adverse antepartum, intrapartum, and neonatal outcomes.

In the present study, the majority of women were young, with a mean age of 23.99 ± 5.06 years, and most belonged to the overweight or Class I obesity category. This reflects the rising prevalence of early-onset obesity in reproductive-age women in India. A predominance of primigravida women and natural conception in this cohort is comparable to observations from other Indian studies, suggesting that obesity-related complications are not limited to women with prolonged infertility or advanced maternal age.

A significant finding of this study was the increasing burden of antepartum complications with rising BMI. GDM and hypertensive disorders of pregnancy were more frequently observed among obese women, with the highest proportion of GDM noted in Class III obesity. This dose-dependent relationship aligns with the 2024 meta-analysis by **Zhang et al.**,[10] which reported significantly higher odds of GDM in overweight (OR 2.92) and obese (OR 3.46) women compared to those with normal BMI. The coexistence of GDM and hypertensive disorders in higher BMI categories further emphasizes the shared metabolic and inflammatory pathways associated with maternal obesity. Although intrauterine growth restriction (IUGR) was less common overall, its occurrence in severe obesity supports findings from **Xiong et al. [11] (2025)**, who reported a nonlinear but increasing risk of placental dysfunction at higher BMI levels.

The intrapartum outcomes in this study highlight the impact of maternal obesity on labour progress and delivery mode. Emergency lower segment caesarean section (LSCS) was the predominant mode of delivery, considerably exceeding rates reported in the general obstetric population. Post-dated pregnancy with a big baby and cephalopelvic disproportion were the leading indications for caesarean delivery. These findings are consistent with **Zhang et al.**, [10] who demonstrated increased odds of caesarean section among overweight and obese women, and with **Horwood et al. [12] (2025)**, who reported high caesarean rates following induction in obese parturients. The increased incidence of prolonged labour observed in this study also parallels findings by **Kolli et al. [13] (2023)**, suggesting impaired uterine contractility and soft-tissue dystocia as contributing mechanisms in obesity.

Neonatal outcomes in the present study revealed a high proportion of live births; however, obesity-related neonatal risks were evident. A substantial number of neonates were large for gestational age (LGA), particularly among overweight women, with a statistically significant association between maternal BMI and birth weight. These findings are in agreement with studies by **Yilmaz et al. [14]**, which linked maternal obesity with fetal macrosomia and increased NICU admissions. The elevated requirement for NICU care observed in obese categories may be attributed to metabolic complications such as neonatal hypoglycemia, respiratory distress, and birth-related trauma, as also reported by **Kureshi et al. [15]**. Although stillbirth and intrauterine death rates were relatively low compared to some international cohorts, transient low APGAR scores were noted in a small proportion of neonates, indicating early neonatal compromise associated with maternal obesity.

Postpartum morbidity in the present study was relatively low, with most women experiencing an uncomplicated recovery. The low incidence of wound infection and postpartum fever contrasts with some reports, including **Zhang et al.**, [10] who observed higher risks of postpartum hemorrhage and wound complications in obese women. This difference may be attributed to vigilant intrapartum monitoring, timely surgical intervention, and standardized postoperative care protocols followed at the study centre.

Overall, the findings of this study reinforce existing evidence that increasing maternal BMI is associated with adverse maternal and fetal outcomes, including metabolic complications, higher operative delivery rates, and increased neonatal morbidity. Early identification of overweight and obese women, preconception counseling, appropriate antenatal surveillance, and multidisciplinary management are essential to mitigate these risks and improve pregnancy outcomes.

5. Conclusion

Overweight and obesity in pregnancy were associated with increased maternal and fetal complications, particularly gestational diabetes, hypertensive disorders, higher cesarean section rates, and delivery of large-for-gestational-age neonates. Neonatal morbidity, reflected by increased NICU admissions, was also more common with rising maternal BMI. These findings emphasize the need for early risk identification, close antenatal monitoring, and appropriate obstetric and neonatal care in overweight and obese pregnant women.

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