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Obesity in Pregnancy and its Implications on Maternal and Fetal Outcomes in a Tertiary Care Centre

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ABSTRACT
Obesity has become a significant health concern globally, with increasing prevalence among pregnant women. This study aims to evaluate the impact of obesity on maternal and fetal outcomes in a tertiary care setting, given the known associations between obesity and various pregnancy-related complications. To investigate the effects of maternal obesity on pregnancy outcomes, including both maternal and fetal health, at KIMS and RF, a tertiary care hospital in Amalapuram, Andhra Pradesh. A retrospective observational study was conducted from July 2023 to June 2024. The study population consisted of 290 pregnant women who delivered at the hospital. Participants were classified based on BMI: normal (18.9-24.9 kg/m²), overweight (25-29.9 kg/m²) and obese (≥30 kg/m²). Data were collected from medical records and analyzed using Chi-square and Fisher's exact tests. Among the study population, 80% were of normal BMI, 10.34% were overweight and 9.65% were obese. Obese women exhibited a significantly higher incidence of maternal complications such as gestational hypertension (10.3%), preeclampsia (15.5%) and gestational diabetes mellitus (34.48%). They also had increased rates of cesarean sections (62.06%), postpartum hemorrhage (25.86%) and wound infections (10.34%). Fetal complications included macrosomia (10.34%), shoulder dysstocia (5.17%), and higher NICU admissions (17.24%). Neonatal mortality was also notably higher among off spring of obese mothers (3.44%). Maternal obesity significantly affects pregnancy outcomes, leading to higher rates of complications for both mothers and their infants. Enhanced prenatal and antenatal care strategies are crucial for managing obesity-related risks in pregnancy.

INTRODUCTION

Obesity is the bane of the modern lifestyle. The World Health Organization and the National Institute of Health (2000) define normal weight as a body mass index (BMI) of 18.5-24.9 kg/m 2, over-weight as 25-29.9 kg/m 2 and obesity as 30 kg/m 2 or greater. Obesity is further classified based on BMI: Class I 30-34.9 kg/m 2, Class II 35-39.9 kg/m 2, Class III ≥40 kg/m2[1]. It's critical to recognize that co-morbidities and obesity-related problems in Asian Indians begin to manifest at a lower BMI. According to Asian Indian guidelines, normal BMI is considered 18.0-22.9 kg/m 2, overweight as 23.0-24.9 kg/m 2 and obesity >25 kg/m2[2].

Prevalence of over-weight and obesity in males and females per NFHS-5 was 44.02% and 41.16%, respectively, compared to 37.71% and 36.14% in NFHS-4[3]. The nationwide prevalence of over-weight or obesity among pregnant women was found to be 12%, whereas the prevalence among postpartum women was found to be 13%, according to a secondary analysis of NFHS-4 data[4].

There is no doubt that obese women have reproductive difficulties[5]. There is difficulty in achieving pregnancy, early and recurrent pregnancy loss, preterm delivery and several obstetrical, medical, and surgical complications with pregnancy, labor, delivery and the puerperium. Women who are overweight or obese are more likely to have preeclampsia, vaginal and urinary tract infections and gestational diabetes. They are also more prone to experience bleeding during delivery and significant postpartum haemorrhage[6]. Obesity is linked to a considerable decrease in uterine contractility and prolongation of the first stage of labor[7-8]. The risks of macrosomia, meconium inhalation, neonatal distress and neonatal mortality are higher in babies born to obese women[9-10]. The aim of this study is to study the impact of obesity in pregnancy on maternal and fetal outcome.

MATERIALS AND METHODS

Study Design and Place of Study: This retrospective observational study was conducted in the Obstetrics and Gynecology Department of KIMS and RF, a tertiary care hospital located in Amalapuram, Andhra Pradesh. The study took place over a period of one year, from July 2023 to June 2024, with the aim of analyzing and evaluating patient data and outcomes relevant to the field of obstetrics and gynecology during this time frame.

Study Population: All pregnant women who were delivered in this hospital.

Selection of Patients: All participants who meet inclusion and Exclusion criteria.

Inclusion Criteria: All the pregnant women who gave birth in this hospital during the stipulated time period whose BMI >or equal to 18.9 Age group 18-35 years.

Exclusion Criteria: All the pregnant women who gave birth in this hospital during the stipulated time period whose BMI <18.9.

Women with miscarriages or abortions.

Women having chronic medical illness like CKD, Diabetes mellitus, Chronic hypertension, heart diseases.

Sample Size:

From the Study: Burden of excessive weight gain and postpartum weight retention among indian women- A systematic review and meta-analysis, Puducherry, India 2023, Prevalance was taken as 25%.

Taking the prevalence value of 25%, the Sample size is calculated at 95% confidence interval using the formula mentioned below:

$$n=\frac{z^2pq}{L^2}$$

z=95% confidence interval (1.96)

p=prevalence (25)

q=100-p (75)

L allowable error of p (20% of p=5)

By substituting the values, we get.

$$n=\frac{1.96x1.96x25x75}{5x5}=288$$

Hence a sample of 290 will be taken, which is adequate.

Data Collection Methods: A population of 290 antenatal women who delivered in the Department of Obstetrics and Gynecology, KIMS and RF, from July 2023 to June 2024, were chosen based on the inclusion and exclusion criteria. Their details were collected using a structured study proforma, which captured information such as personal history, obstetric history, family history, general and systemic examination, and delivery outcomes from the medical records. The study proforma was designed to ensure a comprehensive data collection process.

Statistical Analysis: Chi-square and Fisher Exact tests were used to determine the significant proportions of study characteristics. The data analysis was performed using SPSS version 22.0 and Microsoft Word and Excel were utilized to generate graphs, tables and other visual representations of the results.

Ethical Approval: The study was approved by the Institutional Ethics Committee of KIMS and RF, ensuring adherence to ethical standards in data collection and patient confidentiality.

RESULTS AND DISCUSSIONS

A total of 290 parturients were included in the study. Around 53% of the women were in the age group of less than 25 years and the remaining 47% were between 25-35 years of age. The majority of the women belonged to the lower middle (54.4%) and upper lower (37.58%) socioeconomic classes, followed by the lower class (4.48%) and upper middle class (3.44%) based on the modified Kuppuswamy classification scale (Figure 2). Approximately 66.55% of the women were multigravida, while the remaining 33.44% were primigravida (Figure 1). In terms of BMI, 232 of the pregnant women had a normal BMI (18.9-24.9), while 30 were overweight (BMI 25-29.9), and 28 were classified as obese (BMI >30) (Figure 2).

Table 1: Sociodemographic Characteristics Among Pregnant Women

Characteristics	Pregnant Women (n=290)	95% Confidence Interval (CI)
S< 25	153 (52.75%)	47.1%-58.4%
25-35	137 (47.24%)	41.6%-52.9%
Socioeconomic Status		
Upper Class	0	N/A
Upper Middle	10 (3.44%)	1.7%-6.3%
Lower Middle	158 (54.44%)	48.7%-60.1%
Upper Lower	109 (37.58%)	32.1%-43.3%
Lower	13 (4.48%)	2.3%-7.6%
Gravidity/Parity		
1 Pregnancy (Primigravida)	97 (33.44%)	28.2%-39.1%
2 or More Pregnancies	193 (66.55%)	60.9%-71.8%
BMI		
Normal (18.9-24.9)	232 (80%)	75.1%-84.3%
Overweight (25-29.9)	30 (10.34%)	7.1%-14.4%
Obese (>30)	28 (9.65%)	6.5%-13.6%

Fig. 1: Gravity\Parity Wise Distribution of Parturients

Fig. 2: Distribution of parturients According to BMI

Compared to mothers with a normal BMI, obese mothers were found to have a significantly higher risk of various maternal and fetal complications. Maternal complications observed in obese mothers included a higher risk of gestational hypertension (10.3% vs. 6.89%), preeclampsia (15.51% vs. 2.15%), and gestational diabetes mellitus (34.48% vs. 9.91%)(Table No:2). Additionally, obese mothers showed a significantly higher likelihood of requiring a caesarean section (62.06% vs. 24.56%), increased risk of postpartum hemorrhage (25.86% vs. 12.93%), wound infections (10.34% vs. 2.15%) and a longer duration of hospital stay (12.06% vs. 3.01%).

Table 2: Antenatal Complications

OUTCOME	NORMAL BMI	OBESE
Gestational Hypertension	16(6.89%)	6(10.3%)
Preeclampsia	5(2.15%)	9(15.5%)
Gestational Diabetes Mellitus	23(9.91%)	20(34.48%)

Fig.3: Antenatal Complications

In terms of intrapartum complications, obese mothers experienced a higher rate of preterm deliveries (15.51% vs. 3.87%), as well as an increased incidence of emergency caesarean sections (63.88% vs. 47.36%) compared to normal BMI mothers. Obese mothers were less likely to have a normal vaginal delivery (22.41% vs. 55.6%) but had a similar incidence of instrumental delivery (15.51% vs. 19.82%). While elective caesarean section rates were higher in the normal BMI group (52.63% vs. 36.11%), the rate of emergency caesarean sections was significantly higher in the obese group (63.88% vs. 47.36%)(Table No:3).

Fig.4: Intrapartum Complications

Table 3: Intrapartum Complications

OUTCOME	NORMAL BMI	OBESE
Preterm	9 (3.87%)	9(15.51%)
PROM	25(10.77%)	5(8.62%)
Caesarean section	57(24.56%)	36(62.06%)
Primary	24(42.1%)	17(47.22%)
Repeat	33(57.89%)	19(52.77%)
Elective caesarean section	30(52.63%)	13(36.11%)
Emergency caesarean section	27(47.36%)	23(63.88%)
Normal Vaginal Delivery	129(55.6%)	13(22.41%)
Instrumental delivery	46(19.82%)	9(15.51%)

Regarding postpartum complications, obese mothers had a markedly higher risk of postpartum hemorrhage (25.86% vs. 12.93%) and wound infections (10.34% vs. 2.15%). They also had a longer duration of hospital stay (12.06% vs. 3.01%) compared to those with a normal BMI(Table No:4).

Table 4: Postpartum Complications

OUTCOME	NORMAL BMI	OBESE
Postpartum Haemorrhage	30(12.93%)	15(25.86%)
Wound Infections	5(2.15%)	6(10.34%)
Long duration of hospital stay	7(3.01%)	7(12.06%)

Fig.5: Postpartum Complications

In terms of neonatal complications, obese mothers had a significantly higher risk of macrosomia (10.34% vs. 2.15%), shoulder dystocia (5.17% vs. 0.86%), and low APGAR scores (10.34% vs. 8.18%). There was also an increase in NICU admissions (17.24% vs. 6.03%) and neonatal mortality (3.44% vs. 0.86%) among infants born to obese mothers (T able No:5).

Table 5: Neonatal Outcomes

OUTCOME	NORMAL BMI	OBESE
Macrosomia (LGA)	5(2.15%)	6(10.34%)
Shoulder Dystocia	2(0.86%)	3(5.17%)
Birth Asphyxia (low APGAR)	19(8.18%)	6(10.34%)
NICU Admission	14(6.03%)	10(17.24%)
Neonatal Mortality	2(0.86%)	2(3.44%)

The modern era is characterized by a surge in lifestyle-related factors that negatively impact pregnancy outcomes, such as sedentary lifestyles, maternal smoking, alcohol consumption and late-age pregnancies. The most prevalent among them, obesity, has long-term effects that make childbearing and childbirth more difficult. This study aims to examine

Fig. 6: Neonatal Complications

the impact of obesity in pregnancy on maternal and fetal outcomes.

Endocrine and paracrine factors, which are cytokines specifically referred to as adipokines, lipokines, and exosomal microRNAs, allow fat tissue cells to communicate with other tissues[11]. The main adipokine is adiponectin, which has effects on circulating plasma lipids that are cardioprotective, improves insulin sensitivity and inhibits the release of glucose from the liver. Diabetes, hypertension, endothelial cell activation and cardiovascular disease are all associated with adiponectin deficiency[12]. Pregnancy is associated with elevated amounts of cytokines such as TNF-a, IL-6, resistin and leptin, which can lead to insulin resistance. Adipokines, particularly inflammatory cytokines, may in fact be the main factor causing insulin resistance[13]. Insulin resistance, which causes low-grade inflammation, endothelial activation and increased salt reabsorption, is a characteristic shared by obesity and the metabolic syndrome, as was previously stated[14]. These changes also play an important role in preeclampsia.

In our study, there is a substantial correlation between hypertensive disorders of pregnancy like gestational hypertension and preeclampsia and gestational diabetes mellitus (GDM) with obesity. Comparable findings were published by the Safe Labor Consortium and a large Canadian study[14-15].

Obese women have roughly twice the chances of labor induction as normal-weight women[16]. However, women who are obese have a higher risk of failed induction and this risk increases with obesity[17]. The lengthening of labor leading to vaginal birth increases as the mother's BMI rises[18]. When comparing obese women to gravidas of normal weight, the rates of caesarean birth are noticeably higher, a finding that was consistent with our study. More concerning is the greater incidence of emergency caesarean deliveries among obese women, as well as the longer decision-to-incision and delivery periods associated with obesity[19-20].

The insertion of epidural and spinal analgesia can be challenging for obese women and complications from difficult or unsuccessful intubations can also pose anesthetic issues. It is advised that the anesthesiologist assess gravidas with supermorbid obesity either during prenatal care or upon arrival at the labor unit[21].

Obese women are more likely to experience a failed trial of labor following a caesarean section[22-23].

BMI has a clear correlation with the occurrence of abdominal wound infections. In comparison to patients with a normal BMI, women with obesity have a five-fold increased risk of wound infection. This finding was consistent with a study by Conner and associates (2014)[24S].

The duration of hospital stay also increased four times for women with obesity compared to normal BMI women due to various reasons like postpartum hemorrhage (PPH), genital tract injuries, wound infections, or dehiscence.

Obese women have a higher risk of postpartum venous thromboembolism. The American College of Obstetricians and Gynaecologists (2019b) recommends graduated compression stockings, hydration and early mobilization following caesarean birth in obese women to reduce the risk of thromboembolic consequences[21].

An enoxaparin recommendation is made by the Society for Maternal-Fetal Medicine (2020) if there are risk factors other than class III obesity.

Obesity reduces the precision of prenatal ultrasound exams and antepartum birth defect detection.

One reason for high rates of stillbirths is chronic hypertension and obesity-related preeclampsia during pregnancy. Placental lesions of decidual arteriopathy and infarctions could be linked to these fetal deaths[25].

Chronic hypertension and diabetes, which are both linked to maternal obesity, are two significant and interconnected cofactors that lead to high rates of perinatal morbidity. The higher rates of fetal growth restriction and suggested preterm birth observed in obese mothers may be due to these comorbidities individually[26-27].

Compared to babies born to normal-weight women, obese women who have prematurely ruptured membranes during birth are more likely to experience respiratory difficulties and low APGAR scores[28].

Even when diabetes and hypertension do not exist, offspring of obese women are at increased risk to experience complications from neonatal morbidity[14-15-29].

Childhood obesity was found to be directly correlated with maternal pre-pregnancy obesity. It is also reported that there are associations with central obesity, elevated systolic blood pressure, increased insulin resistance and lipid abnormalities-all elements of the metabolic syndrome[30].

Limitations: A key limitation of this study is the lack of long-term follow-up of the babies after the neonatal period, which prevents the evaluation of potential long-term morbidity in the progeny. As a result, outcomes related to chronic conditions or developmental issues that may arise later in life, such as childhood obesity, metabolic syndrome, or cognitive impairments, could not be assessed. Further studies with extended follow-up are necessary to fully understand the long-term impact of maternal obesity on offspring health beyond the neonatal stage.

CONCLUSION

Obesity, though not a new issue, has reached unprecedented levels in the modern world, posing significant challenges to women's health. This study highlights the considerable impact of obesity on maternal and fetal outcomes, revealing a strong association between obesity and increased maternal complications such as gestational hypertension, preeclampsia, gestational diabetes mellitus (GDM), postpartum hemorrhage, elevated caesarean section rates, wound infections and extended hospital stays. Similarly, fetal complications like macrosomia, shoulder dystocia, respiratory difficulties, increased NICU admissions and neonatal morbidity and mortality were significantly higher in obese mothers. These findings emphasize the critical need for comprehensive prenatal, antenatal and intranatal care tailored to obese patients to mitigate risks and improve maternal and fetal health outcomes. Addressing maternal obesity requires a multidisciplinary approach, combining medical, social and public health efforts to ensure better healthcare and long-term well-being for both mothers and their children.

Conflicts of Interest: There are no conflicts of interest as declared by the authors of this study.

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