Section: Obstetrics and Gynecology

Original Research Article

IMPACT OF MATERNAL OBESITY ON MATERNAL AND NEONATAL OUTCOMES: A PROSPECTIVE OBSERVATIONAL COHORT STUDY

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ABSTRACT

Background: Maternal obesity is an increasing public health concern associated with adverse maternal and neonatal outcomes. This study aimed to evaluate the impact of maternal obesity on pregnancy and neonatal outcomes among women delivering at a tertiary care teaching hospital.

Materials and Methods: A prospective observational cohort study was conducted in the Department of Obstetrics and Gynaecology, Sri Venkateshwara Medical College and Research Institute, from July 2025 to June 2026 (12months). A total of 200 pregnant women aged 18–40 years with singleton pregnancies of ≥28 weeks' gestation were enrolled. Participants were divided into two groups: 100 obese women (BMI ≥30 kg/m²) and 100 women with normal BMI (18.5–24.9 kg/m²). Maternal and neonatal outcomes were compared using the independent Student's t-test and Chi-square/Fisher's exact test, with a p-value <0.05 considered statistically significant.

Results: Obese women had significantly higher incidences of gestational diabetes mellitus (24% vs. 8%; p=0.002), gestational hypertension (18% vs. 6%; p=0.009), preeclampsia (14% vs. 5%; p=0.030), induction of labour (36% vs. 20%; p=0.012), cesarean section (46% vs. 24%; p=0.001), postpartum haemorrhage (12% vs. 4%; p=0.037), and wound infection (8% vs. 2%; p=0.050). Neonates born to obese mothers had significantly higher birth weight, increased macrosomia (18% vs. 5%; p=0.004), NICU admission (22% vs. 10%; p=0.021), and respiratory distress syndrome (14% vs. 6%; p=0.049).

Conclusion: Maternal obesity is significantly associated with increased maternal and neonatal morbidity. Early identification, preconception counseling, nutritional intervention, and close antenatal surveillance may improve pregnancy outcomes and reduce obesity-related complications.

Keywords: Maternal obesity; Body mass index; Pregnancy outcomes; Gestational diabetes mellitus; Cesarean section; Neonatal outcomes; Macrosomia; NICU admission.

INTRODUCTION

Maternal obesity has emerged as one of the most important public health challenges worldwide and is increasingly recognized as a significant contributor to adverse maternal and neonatal outcomes. The World Health Organization (WHO) defines obesity as a body mass index (BMI) of 30 kg/m² or greater, and its prevalence has risen substantially among women of reproductive age over the past few decades.[1] The increasing burden of maternal obesity has become a major concern in obstetric practice because of its association with numerous pregnancy-related complications and increased healthcare utilization.

Obesity during pregnancy is associated with complex metabolic, inflammatory, and hormonal changes that adversely influence placental function and fetal development. Increased maternal adiposity contributes to insulin resistance, endothelial dysfunction, oxidative stress, and chronic low-grade inflammation, thereby predisposing pregnant women to gestational diabetes mellitus (GDM), gestational hypertension, preeclampsia, prolonged

labour, operative vaginal delivery, cesarean section, postpartum haemorrhage, and wound infections.[2,3] These complications are associated with increased maternal morbidity and prolonged hospital stay.

In addition to maternal complications, obesity has a substantial impact on fetal growth and neonatal outcomes. Excess maternal nutrient availability and insulin resistance promote fetal hyperinsulinemia, resulting in increased fetal growth and a higher incidence of macrosomia and large-for-gestational-age infants. Maternal obesity has also been associated with preterm birth, birth trauma, neonatal respiratory distress syndrome, low APGAR scores, hypoglycaemia, admission to the neonatal intensive care unit (NICU), and increased perinatal morbidity and mortality.[4,5]

Recent systematic reviews and meta-analyses have consistently demonstrated that obese pregnant women experience significantly higher rates of adverse maternal and neonatal outcomes compared with women having normal BMI. Furthermore, the risk of complications increases progressively with increasing maternal BMI, emphasizing obesity as an independent risk factor for poor pregnancy outcomes [6].

India is currently witnessing a rapid epidemiological transition characterized by increasing rates of overweight and obesity among women of reproductive age due to urbanization, sedentary lifestyles, and dietary changes. Although several international studies have evaluated the effects of maternal obesity, data from Indian tertiary care hospitals remain relatively limited. Regional studies are important because maternal nutritional status, socioeconomic factors, healthcare accessibility, and obstetric practices vary considerably across different populations.[7]

Considering the growing prevalence of maternal obesity and its potential impact on pregnancy outcomes, the present prospective observational cohort study was undertaken to compare maternal and neonatal outcomes between obese pregnant women and women with normal BMI attending the Department of Obstetrics and Gynaecology, Sri Venkateshwara Medical College and Research Institute. The findings of this study may contribute to improved antenatal risk assessment, early intervention, and appropriate obstetric management to reduce maternal and neonatal morbidity.

MATERIALS AND METHODS

Study Design and Setting: This prospective observational cohort study was conducted in the Department of Obstetrics and Gynaecology, Sri Venkateshwara Medical College and Research Institute, to evaluate the impact of maternal obesity on maternal and neonatal outcomes. The study was carried out over a period of 12 months, from July 2025 to June 2026. Pregnant women attending the antenatal outpatient clinic and subsequently delivering at the study institution during the study period were considered for enrollment. The study was designed and reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) recommendations for observational research.[8].

Study Population and Sample Size: The study included 200 pregnant women aged between 18 and 40 years. Participants were recruited by consecutive sampling and categorized into two groups according to their body mass index (BMI). Group A consisted of 100 obese pregnant women with a BMI of ≥30 kg/m², while Group B consisted of 100 pregnant women with a normal BMI ranging from 18.5 to 24.9 kg/m². Body mass index was calculated using the standard formula of weight in kilograms divided by the square of height in metres (kg/m²), and the BMI recorded at the first antenatal booking visit was used for classification according to the World Health Organization criteria.[9].

Eligibility Criteria

Inclusion Criteria:

The study included pregnant women who fulfilled the following criteria:

1. Women aged 18–40 years.
2. Singleton pregnancy.
3. Gestational age of 28 weeks or more.
4. Body mass index (BMI) classified as either ≥30 kg/m² (obese group) or 18.5–24.9 kg/m² (normal BMI group) at the first antenatal booking visit.
5. Willingness to participate in the study and provide written informed consent.

Exclusion Criteria:

Pregnant women with any of the following conditions were excluded from the study:

1. Multiple pregnancy.
2. Major fetal congenital anomalies.
3. Pre-existing diabetes mellitus.
4. Chronic hypertension.
5. Chronic renal disease.
6. Chronic cardiac disease.

Data Collection Procedure:

Following approval from the Institutional Ethics Committee, eligible participants were enrolled after obtaining written informed consent. Baseline demographic characteristics, obstetric history, and relevant clinical information were collected using a structured case record proforma. Maternal height and weight were measured using standardized equipment, and BMI was calculated accordingly. Routine antenatal investigations, including complete blood count, blood grouping and Rh typing, urine analysis, blood glucose estimation, and obstetric ultrasonography, were performed as per institutional protocol. Additional investigations were undertaken whenever clinically indicated. Participants were followed prospectively until delivery, and maternal as well as neonatal outcomes were documented from antenatal records, labour room registers, operative records, postnatal case sheets, and neonatal records

using standard obstetric definitions and institutional management protocols.[10].

Outcome Measures: The primary outcome of the study was to compare maternal and neonatal outcomes between obese pregnant women and women with normal BMI. Maternal outcomes assessed included gestational diabetes mellitus, gestational hypertension, preeclampsia, induction of labour, mode of delivery, postpartum haemorrhage, and wound infection. Neonatal outcomes included gestational age at delivery, birth weight, macrosomia, low birth weight, preterm birth, APGAR score at five minutes, neonatal intensive care unit (NICU) admission, respiratory distress syndrome, and perinatal mortality. Definitions of maternal and neonatal outcome variables were based on internationally accepted obstetric and neonatal guidelines.[11].

Statistical Analysis: The collected data were entered into Microsoft Excel and analyzed using IBM Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, whereas categorical variables were summarized as frequencies and percentages. Comparisons between the two groups for continuous variables were performed using the independent Student's t-test, while categorical variables were analyzed using the Chi-square test or Fisher's exact test whenever appropriate. A p-value of less than 0.05 was considered statistically significant.[8].

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Sri Venkateshwara Medical College and Research Institute before the commencement of the study. Written informed consent was obtained from all participants prior to enrollment. Participant confidentiality was maintained throughout the study, and all procedures were carried out in accordance with the ethical principles of the Declaration of Helsinki.[12].

RESULTS

Baseline Characteristics of the Study Participants: A total of 200 pregnant women were included in the study, with 100 women in the obese group (BMI ≥30 kg/m²) and 100 women in the normal BMI group (BMI 18.5–24.9 kg/m²). The baseline demographic and obstetric characteristics are presented in [Table 1].

Table 1. Baseline Characteristics of the Study Participants

Variable	Obese (n=100)	Normal BMI (n=100)	Test Statistic	p-value
Age (years), Mean ± SD	28.9 ± 4.2	27.8 ± 4.5	t = 1.78	0.076
Primigravida	42 (42%)	46 (46%)	χ^2 = 0.32	0.572
Multigravida	58 (58%)	54 (54%)	χ^2 = 0.32	0.572
Gestational age at delivery (weeks), Mean ± SD	38.2 ± 1.4	38.6 ± 1.2	t = 1.91	0.058

The mean maternal age was 28.9 ± 4.2 years in the obese group and 27.8 ± 4.5 years in the normal BMI group (t = 1.78, p = 0.076). The proportion of primigravida and multigravida women was comparable between the two groups (χ^2 = 0.32, p = 0.572). Similarly, there was no statistically significant difference in the mean gestational age at delivery (38.2 ± 1.4 weeks vs. 38.6 ± 1.2 weeks; t = 1.91, p = 0.058). These findings indicate that the study groups were comparable with respect to baseline characteristics. The comparison is illustrated in [Figure 1].

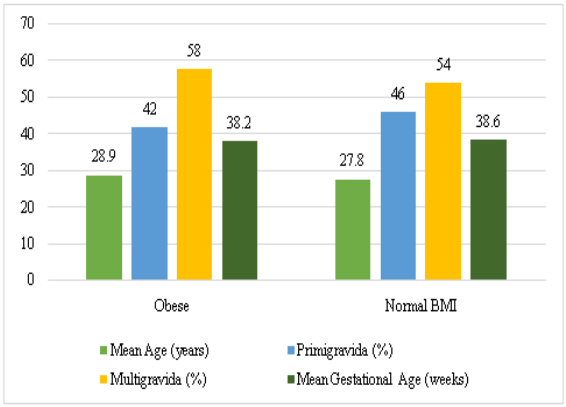

Figure 1: Baseline Characteristics of Study Participants

Comparison of Maternal Pregnancy Complications: The maternal pregnancy complications observed in both groups are summarized in [Table 2].

Table 2: Comparison of Maternal Pregnancy Complications

Maternal Outcome	Obese (n=100)	Normal BMI (n=100)	Chi-square (χ^2)	p-value
Gestational diabetes mellitus	24 (24%)	8 (8%)	9.52	0.002
Gestational hypertension	18 (18%)	6 (6%)	6.78	0.009
Preeclampsia	14 (14%)	5 (5%)	4.71	0.030
Induction of labour	36 (36%)	20 (20%)	6.31	0.012

Gestational diabetes mellitus occurred significantly more frequently among obese women than women with normal BMI (24% vs. 8%, χ^2 = 9.52, p = 0.002). Likewise, gestational hypertension was significantly higher in the obese group (18% vs. 6%, χ^2 = 6.78, p = 0.009). The incidence of preeclampsia was also significantly greater among obese women (14% vs. 5%, χ^2 = 4.71, p = 0.030). Furthermore, induction of labour was required more often in obese women (36% vs. 20%, χ^2 = 6.31, p = 0.012).

These findings demonstrate a significant association between maternal obesity and pregnancy-related complications. The distribution of these complications is shown in [Figure 2].

Comparison of Mode of Delivery and Maternal Complications: The mode of delivery and maternal intrapartum and postpartum complications are presented in [Table 3].

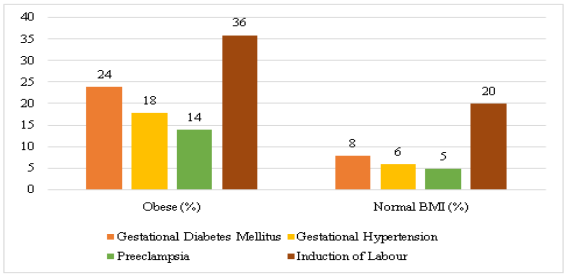

Figure 2: Maternal Pregnancy Complications

Table 3: Comparison of Mode of Delivery and Maternal Complications

Variable	Obese (n=100)	Normal BMI (n=100)	Chi-square (χ^2)	p-value
Normal vaginal delivery	48 (48%)	70 (70%)	10.81	0.001
Caesarean section	46 (46%)	24 (24%)	10.81	0.001
Instrumental delivery	6 (6%)	6 (6%)	0.00	1.000
Postpartum haemorrhage	12 (12%)	4 (4%)	4.35	0.037
Wound infection	8 (8%)	2 (2%)	3.84	0.050

Normal vaginal delivery was more common among women with normal BMI (70%) than obese women (48%). In contrast, the caesarean section rate was significantly higher in obese women (46% vs. 24%, $\chi^2 = 10.81$, $p = 0.001$). Instrumental delivery occurred equally in both groups (6% each, $p = 1.000$). Postpartum haemorrhage was significantly more frequent among obese women (12% vs. 4%, $\chi^2 = 4.35$, $p = 0.037$). Similarly, wound infection occurred more commonly in obese women (8% vs. 2%, $\chi^2 = 3.84$, $p = 0.050$). These findings are illustrated in [Figure 3].

Comparison of Neonatal Outcomes: The neonatal outcomes in both study groups are summarized in [Table 4].

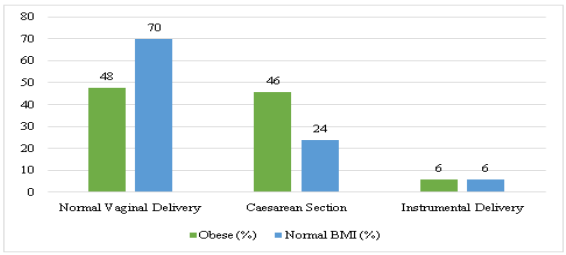

Figure 3: Mode of Delivery

Table 4: Comparison of Neonatal Outcomes

Neonatal Outcome	Obese (n=100)	Normal BMI (n=100)	Test Statistic	p-value
Birth weight (kg), Mean ± SD	3.48 ± 0.46	3.08 ± 0.39	t = 6.62	0.00000003
Macrosomia	18 (18%)	5 (5%)	$\chi^2 = 8.25$	0.004
Low birth weight	4 (4%)	12 (12%)	$\chi^2 = 4.35$	0.037
Preterm delivery	16 (16%)	8 (8%)	$\chi^2 = 2.99$	0.084

The mean birth weight was significantly higher among neonates born to obese mothers (3.48 ± 0.46 kg) compared with those born to mothers with normal BMI (3.08 ± 0.39 kg) ($t = 6.62$, $p = 0.00000003$). Macrosomia occurred significantly more frequently in the obese group (18% vs. 5%, $\chi^2 = 8.25$, $p = 0.004$). Conversely, low birth weight was more common among neonates born to mothers with normal BMI (12% vs. 4%, $\chi^2 = 4.35$, $p = 0.037$). Although preterm delivery was observed more frequently among obese women (16% vs. 8%), the difference was not statistically significant ($\chi^2 = 2.99$, $p = 0.084$). The comparison of neonatal outcomes is depicted in [Figure 4]

Comparison of Neonatal Morbidity: The neonatal morbidity observed in the two study groups is shown in [Table 5].

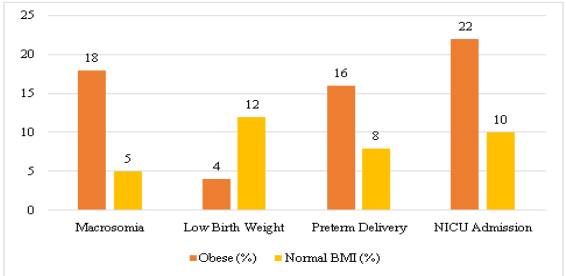

Figure 4: Neonatal Outcomes

Table 5: Comparison of Neonatal Morbidity

Variable	Obese (n=100)	Normal BMI (n=100)	Chi-square (χ^2)	p-value
APGAR score <7 at 5 minutes	12 (12%)	5 (5%)	3.03	0.082
NICU admission	22 (22%)	10 (10%)	5.36	0.021
Respiratory distress syndrome	14 (14%)	6 (6%)	3.76	0.049
Perinatal mortality	2 (2%)	1 (1%)	0.34	0.559

A low APGAR score (<7 at 5 minutes) was observed more frequently among neonates born to obese mothers (12% vs. 5%); however, the difference was not statistically significant ($\chi^2 = 3.03$, $p = 0.082$). NICU admission was significantly higher in the obese group (22% vs. 10%, $\chi^2 = 5.36$, $p = 0.021$). Respiratory distress syndrome was also significantly more common among neonates of obese mothers (14% vs. 6%, $\chi^2 = 3.76$, $p = 0.049$). Perinatal mortality was low in both groups (2% vs. 1%) and did not differ significantly ($\chi^2 = 0.34$, $p = 0.559$).

Overall, maternal obesity was associated with an increased risk of adverse maternal outcomes, including gestational diabetes mellitus, hypertensive disorders, induction of labour, caesarean section, postpartum haemorrhage, and wound infection. In addition, maternal obesity was associated with adverse neonatal outcomes, including higher birth weight, macrosomia, increased NICU admission, and respiratory distress syndrome.

DISCUSSION

The present prospective observational cohort study evaluated the impact of maternal obesity on maternal and neonatal outcomes among pregnant women attending a tertiary care teaching hospital. The findings demonstrated that maternal obesity was significantly associated with an increased incidence of gestational diabetes mellitus, gestational hypertension, preeclampsia, induction of labour, cesarean section, postpartum haemorrhage, wound infection, macrosomia, neonatal intensive care unit (NICU) admission, and neonatal respiratory distress. These observations are consistent with previous studies that have identified maternal obesity as an independent risk factor for adverse pregnancy outcomes.[13,14].

In the present study, gestational diabetes mellitus was observed significantly more frequently among obese women than among women with normal BMI. Obesity is known to increase insulin resistance and impair glucose metabolism during pregnancy, thereby predisposing women to gestational diabetes mellitus. Similar findings have been reported in previous systematic reviews and clinical studies.[13,15].

Hypertensive disorders of pregnancy, including gestational hypertension and preeclampsia, were also significantly higher among obese women in the present study. The underlying mechanisms include chronic inflammation, endothelial dysfunction, oxidative stress, and abnormal placental vascular development associated with obesity. These findings are comparable with those reported by previous investigators, who observed a significantly increased risk of hypertensive disorders among obese pregnant women.[14,15].

The rate of cesarean section was significantly higher among obese women compared with women having normal BMI. Increased fetal size, dysfunctional labour, failed induction, and obstetric complications may explain the higher operative delivery rate in obese mothers. Furthermore, postpartum haemorrhage and wound infection occurred more frequently in the obese group, findings that are in agreement with previous reports evaluating maternal obesity and surgical morbidity.[14,16].

Regarding neonatal outcomes, infants born to obese mothers had significantly higher mean birth weight and an increased incidence of macrosomia. Maternal obesity enhances placental nutrient transfer and fetal insulin secretion, leading to excessive fetal growth. Similar associations between maternal obesity and fetal macrosomia have been consistently demonstrated in large cohort studies and meta-analyses.[15,17].

The present study also demonstrated significantly higher NICU admission and neonatal respiratory distress among infants born to obese mothers. These findings support previous evidence indicating that maternal obesity adversely affects neonatal adaptation and contributes to increased neonatal morbidity requiring specialized care.[13,17].Although low APGAR scores and perinatal mortality were more frequent among neonates born to obese mothers, these differences were not statistically significant, possibly because of the relatively modest sample size.

Overall, the findings of the present study are consistent with existing literature and reinforce the importance of maternal obesity as a modifiable risk factor for adverse maternal and neonatal outcomes [13–17]. Early preconception counselling, appropriate weight management, nutritional intervention, and close antenatal surveillance are essential to reduce obesity-related pregnancy complications and improve both maternal and neonatal health outcomes.[14,15].

CONCLUSION

The present prospective observational cohort study demonstrated that maternal obesity is significantly associated with adverse maternal and neonatal outcomes. Obese pregnant women had a significantly higher incidence of gestational diabetes mellitus, gestational hypertension, preeclampsia, induction of labour, cesarean section, postpartum haemorrhage, and wound infection compared with women with normal BMI. In addition, maternal obesity was associated with increased neonatal birth weight, a higher incidence of macrosomia, greater NICU admissions, and neonatal respiratory distress.

These findings highlight maternal obesity as an important and potentially modifiable risk factor affecting pregnancy outcomes. Early identification of obese women during the preconception period or at the first antenatal visit, along with appropriate nutritional counseling, lifestyle modification, optimized gestational weight gain, and close

antenatal surveillance, may reduce obesity-related maternal and neonatal complications. Public health initiatives aimed at promoting healthy body weight among women of reproductive age and strengthening antenatal care services are essential to improve pregnancy outcomes and reduce the burden of obesity-related morbidity.

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