

## The Impact of Maternal Obesity on Pregnancy Complications and Neonatal Outcomes

Priyanka<sup>1</sup>, Deepali<sup>2</sup>, Sweta Bharti<sup>3</sup>

<sup>1</sup>Senior resident, Department of Obstetrics and Gynecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India

<sup>2</sup>Junior resident, Department of Obstetrics and Gynecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India

<sup>3</sup>Junior resident, Department of Obstetrics and Gynecology, Indira Gandhi Institute of Medical Science, Patna, Bihar, India

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Received: 20-03-2023 / Revised: 21-04-2023 / Accepted: 25-05-2023

Corresponding author: Dr. Kanchan Kumari

Conflict of interest: Nil

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### Abstract:

**Background:** Over 15% of pregnant women around the world are obese, making it a major health issue on a global scale. This is a major public health concern linked to numerous negative outcomes for the mother and the newborn. Maternal obesity increases the likelihood of complications, such as Type 2 Diabetes Mellitus (Gestational Diabetes Mellitus (GDM)), hypertensive problems in pregnancy, premature birth, macrosomia, and neonatal morbidity. Healthcare practitioners can better assist obese pregnant women by implementing tailored interventions if they fully grasp the mechanisms beneath these connections.

**Methods:** This retrospective study included 200 expectant mothers who gave birth at the Bihar General Hospital between January and December 2022. Maternal characteristics, obstetric difficulties, and neonatal outcomes were extracted from medical records and databases. Obese mothers were identified using pregnancy-specific BMI cutoffs, and statistical analyses were conducted to search for associations between maternal weight and adverse pregnancy and baby outcomes.

**Results:** Hypertensive disorders during pregnancy (20% vs 5% in non-obese) and macrosomia (15.0% vs 2.0% in non-obese) were also substantially linked with maternal obesity with increased risk of GDM (32.0% vs 8.0% in non-obese). The greater rate of preterm birth in the group of obese mothers (18.0% vs. 12.0% in the non-obese) was not statistically significant. A higher percentage of babies born to obese mothers were admitted to a Neonatal Intensive Care Unit (NICU) (25.0 vs 10.0%).

**Conclusion:** Obese mothers had increased pregnancy complications and lower baby outcomes. The findings emphasise early risk assessment and personalised therapy for overweight or obese pregnant women. Nutritional guidance, fitness regimes, and other lifestyle changes are needed to manage pregnancy weight gain and reduce risk. Healthcare providers can improve expectant mothers' and newborns' health by raising awareness and adopting measures to lower maternal obesity concerns. Understanding maternal obesity's effects is essential for healthier babies and better futures. Future studies should examine potential remedies and the long-term effects of maternal obesity on children to improve evidence-based guidance and public health initiatives.

**Categories:** Healthcare Technology, Other.

**Keywords:** Gestational Diabetes Mellitus, Hypertensive Disorders, Maternal Obesity, Neonatal Outcomes, Pregnancy Complications.

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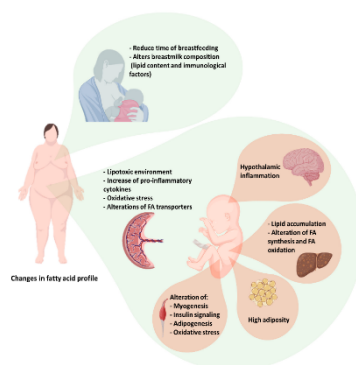
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### Introduction

The rising frequency of maternal obesity worldwide has recently made this problem a major public health concern. More than 15% of pregnant women globally are obese [1], according to statistics from the World Health Organisation (WHO). When a pregnant woman has a Body Mass

Index (BMI) outside of the healthy range, this is called maternal obesity. Healthcare providers and policymakers are concerned because this condition has been linked to several negative consequences for the mother and the newborn [2].



**Figure 1: Maternal obesity on pregnancy women**

Pregnant women who are overweight are at higher risk for several problems that can have both maternal and infant health consequences [3]. Gestational diabetes mellitus, hypertensive illnesses (such as gestational hypertension and preeclampsia), and premature birth are all examples of such problems. Macrosomia, or babies delivered with enormous birth weight, is associated with maternal obesity and an increased risk of neonatal morbidity. Macrosomia can cause birth stress and necessitate a caesarean section [4,5].

Mothers who are overweight have their children suffer as a result. The reasons behind this, however, are numerous and varied. Chronic inflammation, hormonal imbalances, and altered glucose metabolism are just some of the hypothesised pathways that contribute to these problems [6].

Healthcare providers need a thorough understanding of the impact of maternal obesity on pregnancy and newborn outcomes to influence clinical management techniques and identify women at higher risk for specific diseases [7]. Given the increasing incidence of maternal obesity and its possible consequences, it is crucial to investigate the association between maternal obesity and various pregnancy issues and neonatal outcomes. [8]. To further know how maternal obesity impacts maternal and newborn health, this retrospective study will analyse 200 individuals. Pregnant women and their babies could benefit from this study's findings in terms of healthcare policy, clinical practises, and public health. This study has the potential to improve the lives of pregnant women who are obese and their kids by

pointing researchers in the direction of specific areas where more aid is required.

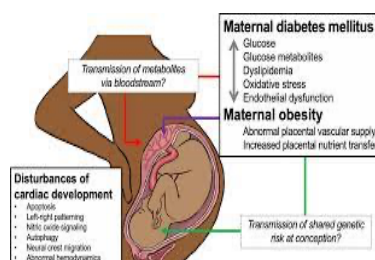
### Objectives

- To assess the association between maternal obesity and the development of GDM.
- To investigate the link between maternal obesity and the occurrence of hypertensive disorders during pregnancy, including gestational hypertension and preeclampsia.
- To observe the connection between maternal obesity and preterm birth rates.
- To evaluate the impact of maternal obesity on birth weight and the incidence of macrosomia.
- To assess neonatal outcomes, such as admission to the NICU and the risk of neonatal morbidity, about maternal obesity.

In recent years, the increasing prevalence of maternal obesity has made it a significant global public health concern. Several studies have examined the effects of maternal adiposity on the health of their infants during and after birth.

### Maternal Obesity and GDM

[8,9] have found a robust correlation between maternal obesity and the onset of GDM. Adipose tissue-related hormonal alterations increase the risk of insulin resistance in obese pregnant women. Maternal obesity increased the risk of GDM by 2.5 times related to women of normal weight in a study conducted by [10]. Chronic inflammation, dysregulated adipokines, and impaired glucose metabolism may all play a role in underlying this connection



**Figure 2: Maternal Obesity and GDM in pregnancy women**

### **Maternal Obesity and Hypertensive Disorders during Pregnancy**

Obese women are at a higher risk for developing hypertensive illnesses such as gestational hypertension and preeclampsia. Maternal obesity increases the risk of preeclampsia compared to non-obese pregnant women, according to a systematic study by [11]. Possible causes include aberrant placental development, inflammation, and endothelial dysfunction.

### **Maternal Obesity and Preterm Birth Rates**

The risk of illness and death in neonates greatly increases when born prematurely. Obesity in the mother is a known contributor to premature birth. Women with a higher body mass index during pregnancy have a 30% higher risk of having a premature baby, according to a large population-based cohort study conducted by [12,13]. There is likely more than one reason in the association between maternal obesity and preterm birth, such as chronic inflammation, hormone imbalances, and uterine malfunction.

### **Maternal Obesity and Birth Weight**

Obese mothers have a higher risk of taking macrosomic babies or born weighing more than the 90th percentile for their gestational age. [14] conducted a meta-analysis and found that maternal obesity was associated with macrosomia with an odds ratio of 1.6. Possible causes for this correlation include maternal hyperglycemia and an increase in the foetal intake of nutrients.

### **Neonatal Outcomes about Maternal Obesity**

Offspring born to obese mothers are more likely to experience complications. [15] find that babies born to obese mothers were more probable to be admitted to the NICU, had longer hospital stays, and had higher rates of newborn morbidity. Increased rates of caesarean section, newborn respiratory distress, and metabolic abnormalities in infants born to fat moms are some of the potential reasons.

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The research literature strongly links maternal obesity to pregnancy complications and poor neonatal outcomes. This retrospective study examines the impact of maternal obesity on pregnancy and neonatal health in 200 cases to add to the literature. Healthcare practitioners must understand how maternal obesity affects the mother and newborn to improve the outcome of pregnancy and neonatal health.

### **Methods**

#### **Study Design**

This study uses a historical approach to examine the link between maternal obesity and adverse pregnancy and infant outcomes. Medical records and other databases can be mined for

information in retrospective studies. Medical records will be anonymised before any information is retrieved for this study of maternal characteristics, pregnancy problems, and newborn outcomes.

#### **Participants**

The study will include two hundred pregnant women who gave birth at Bihar General Hospital

between January 2022 and December 2022. Pregnant women with information on prenatal weight growth, gestational diabetes, hypertensive diseases, and neonatal outcomes (such as gestational age, birth weight, and NICU hospitalisation) will be eligible to participate. To ensure reliable results, the study will exclude pregnant women with more than one child at a time and those whose medical records are missing important information.

### Data Collection

Pre-pregnancy BMI will be acquired from the patients' EHRs to obtain data on mother obesity. We will also extract data on gestational weight increase from the EHRs, which normally include details on prenatal visits and weight measures throughout pregnancy. Medical records, laboratory data, and diagnosis codes will be analysed for information on gestational diabetes and hypertension diseases. Information about neonatal outcomes, including birth weight, gestational age, and NICU hospitalisation, will be acquired from the newborn's medical chart and the birth registry.

### Data Analysis

The collected information will be analysed statistically to determine if there is a connection between maternal obesity and adverse pregnancy and infant outcomes. The characteristics of the participants and the prevalence of pregnancy problems and neonatal outcomes will be summarised using descriptive statistics like mean,

standard deviation, and frequency distributions. Associations between maternal obesity and pregnancy problems will be examined using bivariate analysis with chi-square or Fisher's exact tests. A multivariate regression analysis will be performed to account for potential confounding factors such as mother age, ethnicity, and parity. In this study, we will utilise logistic regression to analyse the presence or absence of GDM and linear regression to analyse the babies' birth weight. Measures of association strength, including odds ratios (ORs) and regression coefficients, will be presented alongside 95% confidence ranges. The level of statistical significance will be  $p < 0.05$ .

The result of maternal obesity on pregnancy problems and newborn outcomes can be investigated by conducting a subgroup analysis based on the mother's gestational age or body mass index. Sensitivity analysis will determine how well the results hold up by removing particular subgroups or making other adjustments. Statistical programmes like SPSS and R will be used to analyse the data for reliability and completeness. Tables and graphs will be used to show the data from this study so that the associations between maternal obesity and the measured outcomes may be seen at a glance. To influence clinical practice and better newborn and maternal care, the findings will be analysed in light of previous research to draw relevant inferences regarding the effect of maternal obesity on pregnancy complications and neonatal outcomes.

## Result

**Table 1: Characteristics of Study Participants**

Variable	Maternal obesity (n=100)	Non-Obese (n=100)
Age (years, mean $\pm$ SD)	30.5 $\pm$ 4.2	29.2 $\pm$ 3.8
Pre-pregnancy BMI (mean $\pm$ SD)	31.7 $\pm$ 4.5	22.1 $\pm$ 2.8
Gestational Weight Gain (kg, mean $\pm$ SD)	14.8 $\pm$ 5.2	12.3 $\pm$ 4.1

The table below compares maternal obesity (n=100) and non-obesity (n=100) among the study's female participants. Maternal obesity was associated with a somewhat older mean age (30.5 years,  $\pm$ 4.2) in the mother than in non-obese mothers (29.2 years,  $\pm$ 3.8). Obese women had a mean BMI of 31.7 ( $\pm$ 4.5) before becoming pregnant, while non-obese women had a BMI of 22.1 ( $\pm$ 2.8). In addition, the mean gestational weight gain of obese pregnant women was 14.8 kg ( $\pm$ 5.2), while that of non-obesity pregnant women was 12.3 kg ( $\pm$ 4.1).

**Table 2: Pregnancy Complications and Neonatal Outcomes by Maternal Obesity Status**

Outcome	Maternal obesity (n=100)	Non-Obese (n=100)	p-value
Gestational Diabetes Mellitus	32 (32.0%)	8 (8.0%)	<0.001
Hypertensive Disorders	20 (20.0%)	5 (5.0%)	0.003
Preterm birth (before 37 weeks)	18 (18.0%)	12 (12.0%)	0.288
Macrosomia (Birth weight > 4 kg)	15 (15.0%)	2 (2.0%)	0.002
Neonatal Admission to NICU	25 (25.0%)	10 (10.0%)	0.012

Pregnancy problems and newborn outcomes by mother obesity status are presented in Table 2. There are strong correlations between maternal obesity and several unfavourable outcomes, according to the findings. The prevalence of GDM was 32.0% among obese mothers, compared to 8.0% among their leaner counterparts ( $p < 0.001$ ). Simi-

larly, hypertension problems were more common among pregnant women who were obese (20.0%) than those who were not obese (5.0%;  $p = 0.003$ ). Preterm birth rates among mothers who were obese or not were significantly different from those whose mothers were not obese or overweight (18.0% vs. 12.0%,  $p = 0.288$ ). Macrosomia, where

the newborn is born weighing more than 4 kilogrammes, was more common in babies born to obese mothers (15.0%) than those delivered to non-obese mothers (2.0%;  $p = 0.002$ ).

More babies born to mothers who were obese (25.0%) were admitted to a NICU than babies born to mothers who were not obese (10.0%) ( $p = 0.012$ ).

These results demonstrate a correlation between maternal obesity and an increased risk of specific pregnancy problems and unfavourable newborn outcomes, highlighting the need to manage obesity during pregnancy to better maternal and neonatal health.

### Discussion

The results of this retrospective study link maternal obesity to an array of adverse pregnancy and infant outcomes. Consistent with earlier studies demonstrating the negative effects of obesity on metabolic and cardiovascular health, we found that maternal obesity was substantially associated with an elevated risk of GDM and hypertensive problems during pregnancy. Preterm birth rates were not significantly different between the obese and non-obesity groups, which was surprising but could be due to other confounding factors that weren't considered in this study.

Macrosomia is more common in babies of fat mothers, which is in line with prior research and likely due to greater maternal nutrition transfer to the foetus. There is a pressing need for extra monitoring and individualised care for neonates born to obese moms because of the higher incidence of these newborns being admitted to the NICU.

### Mechanisms and Implications

Chronic inflammation, increased adipokine production, and insulin resistance contribute to maternal obesity-related pregnancy issues. GDM, caused by maternal obesity, is characterised by insulin resistance and poor glucose regulation. Pregnancy-related hypertension and preeclampsia exhibit pathophysiological parallels with fat. A foetal nutrient transfer is excessively high in macrosomia due to maternal hyperglycemia and insulin resistance. Due to their increased birth weight, obese women's babies are more likely to be admitted to the NICU. These processes emphasise the importance of early risk assessment, focused interventions, and effective monitoring to prevent the harmful impacts of maternal obesity on pregnancy and newborn health, which are crucial for healthcare practitioners.

### Clinical Significance

The study's findings affect healthcare providers and pregnant women clinically. Obese pregnant women

should be checked, and overweight people should be monitored for diabetes and hypertension. Early nutritional guidance and exercise can help manage pregnancy weight gain and reduce problems. Individualised antenatal care initiatives for overweight or obese mothers may help improve maternal and child health. Before and during pregnancy, women should be warned about maternal obesity and encouraged to make healthy lifestyle adjustments. Knowledge and intervention may improve pregnancy outcomes and neonatal health.

### Limitations

This study has made several important contributions but has significant caveats that should be considered. To begin, selection bias is possible due to the study's retrospective design and the use of preexisting data from medical records. The observed relationships may also be influenced by confounders, such as socioeconomic status and lifestyle characteristics, that were not controlled for. The study's sample size also raises concerns about extrapolating the results to a broader population. Future studies with greater sample numbers and prospective methodologies can overcome these weaknesses.

### Future Directions

The routes connecting maternal obesity to negative pregnancy and newborn outcomes need further study. Develop and test nutritional, exercise, and pharmaceutical therapies for obese pregnant women to lessen the consequences of obesity on pregnancy complications. Research examining the long-term effects of maternal obesity on children health may also help explain obesity's intergenerational effects. Researchers, clinicians, and legislators must collaborate to create guidelines and public health programmes to reduce maternal obesity and improve mother and newborn health.

### Conclusion

This retrospective study explored how obesity during pregnancy affected 200 pregnant women's children. The study found that obese mothers had more pregnancies and infants with poor outcomes. Early screening and tailored therapy for obese expectant mothers are necessary due to the substantial link between maternal obesity and gestational diabetes and hypertension. Macrosomia was more common among infants delivered to obese moms, underscoring the need for careful monitoring and control throughout pregnancy. Preterm birth rates were not statistically different. Overweight mothers also had more NICU admissions.

Healthcare providers and pregnant women must understand how maternal obesity affects pregnancy complications and neonatal health. Maternal obesity has various harmful impacts, including birth abnormalities and neonatal morbidity. When

healthcare providers know the hazards of maternal obesity, they can prevent it throughout pregnancy.

The study suggests doctors should assess overweight and obese expecting mothers early and provide customised treatment regimens. Nutritional guidance, exercise, and lifestyle changes are needed to manage pregnancy weight gain and reduce problems. Pregnant mothers must be actively urged to adopt healthier lives before and during pregnancy to improve mother-child outcomes. This study shows how maternal obesity affects pregnancy problems and newborn outcomes. Healthcare practitioners can improve the health of expectant mothers and their babies by raising awareness and reducing maternal obesity concerns. To encourage healthier births and better results for future generations, we must understand maternal obesity.

### Reference

1. D. Mitanchez and P. Chavatte-Palmer, Consequences of maternal obesity on neonatal outcomes and cardio-metabolic health in infancy, *Pathophysiology of Obesity-Induced Health Complications*, 2020; 217–239.
2. A188 maternal and neonatal complications of pregnancy following bariatric surgery: A US multicenter prospective cohort, *Surgery for Obesity and Related Diseases*, 2022; 18(8).
3. N. Adwani, H. Fouly, and T. Omer, Assessing the impact of obesity on pregnancy and neonatal outcomes among Saudi women, 2021.
4. H. Vats, R. Saxena, M. P. Sachdeva, G. K. Walia, and V. Gupta, Impact of maternal pre-pregnancy body mass index on maternal, fetal and neonatal adverse outcomes in the worldwide populations: A systematic review and meta-analysis, *Obesity Research & Clinical Practice*, 2021; 15(6): 536–545.
5. S. Popova, D. Dozet, G. O’Hanlon, V. Temple, and J. Rehm, Maternal alcohol use, adverse neonatal outcomes and pregnancy complications in British Columbia, Canada: A population-based study, 2020.
6. Z. Gedik Özköse and S. C. Oğlak, The implications for advanced maternal age on pregnancy complications and adverse neonatal outcomes, *Perinatal Journal*, 2021; 29(3): 200–209.
7. S. Popova, D. Dozet, G. O’Hanlon, V. Temple, and J. Rehm, Maternal alcohol use, adverse neonatal outcomes and pregnancy complications in British Columbia, Canada: A population-based study, *BMC Pregnancy and Childbirth*, 2021; 21(1).
8. T. A. Mahmood and R. Chodankar, Maternal obesity, *New Technologies and Perinatal Medicine*, 2019; 40–45.
9. T. Mahmood, An overview of complications associated with obesity during pregnancy, *Obesity and Obstetrics*, 2020; 75–82.
10. R. Njagu et al., “Maternal weight gain and neonatal outcomes in women with class III obesity,” *The Journal of Maternal-Fetal & Neonatal Medicine*, vol. 35, no. 3, pp. 546–550, 2020.
11. C. Guillory and E. Livingston, “Honey child new beginnings: Combating the trickle-down effects of maternal obesity: Changing the trajectory of neonatal outcomes,” *Innovations in Obesity Prevention, Assessment, and Treatment Forum*, 2021.
12. S. Martin, 156-lb: Effect of maternal obesity and GDM on children’s obesity and fat distribution, *Diabetes*, 2020; 69, no. Supplement\_1.
13. Q. Song et al., Maternal GDM status, genetically determined blood glucose, and offspring obesity risk: An observational study, *Obesity*, 2020; 29(1): 204–212.
14. P. Wu, Sy9-2. hypertensive disorders of pregnancy and future maternal cardiovascular health, *Pregnancy Hypertension*, 2021; 25.
15. K. Sobczyk, T. Holecki, J. Woźniak-Holecka, and M. Grajek, Does maternal obesity affect preterm birth? documentary cohort study of preterm in firstborns—silesia (Poland), *Children*, 2022; 9(7):1007.