International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Bajaj G et al. Int J Reprod Contracept Obstet Gynecol. 2024 Aug;13(8):2215-2219
www.ijrcog.org
pISSN 2320-1770 | eISSN 2320-1789

DOI: https://dx.doi.org/10.18203/2320-1770.ijrcog20242104

Review Article

Effect of obesity in pregnancy: implications for maternal and fetal health

Gaurav Bajaj[1]*, Gayathri Davu[2]

Department Healthcare and Medical Science, Annamalai University, Tamil Nadu, India
Department Healthcare and Medical Science, Windsor University School of Medicine, St. Kitts, West Indies

Received: 08 June 2024
Revised: 07 July 2024
Accepted: 08 July 2024

***Correspondence:**
Dr. Gaurav Bajaj,
E-mail: gaurav_54bajaj@yahoo.com

ABSTRACT

Obesity during pregnancy poses noteworthy threats to maternal and fetal health. This investigation looks to probe maternal obesity's implications on pregnancy outcomes and neonatal health. This study employed a qualitative methodology utilizing secondary data analysis of recent literature to explore the associations between maternal obesity and pregnancy outcomes. Secondary data from 2017 to 2024 were gathered from peer-reviewed journals, databases, and reports published focusing on clinical characteristics and health parameters related to maternal obesity. Only studies providing detailed information on these factors were included. Clinical characteristics such as age distribution, gravidity, parity, and childhood obesity background significantly influenced pregnancy outcomes among obese women. A significant portion of the pregnant women with obesity, over half, were within the age range of 25-30 years, and a notable number had experienced obesity during their childhood. Additionally, obesity during pregnancy significantly impacted various health parameters compared to normal weight, including prepregnant BMI, maternal weight, and incidence of chronic conditions such as hypertension. Maternal obesity correlated strongly with adverse pregnancy outcomes, particularly preeclampsia and rectovaginal group B streptococcus infection. Similarly, adverse neonatal health outcomes were significantly associated with maternal obesity, including fetal macrosomia and neonatal intensive care unit (NICU) admission. Maternal obesity is linked with adverse pregnancy and neonatal outcomes, highlighting the prominence of managing maternal weight to boost maternal and fetal health. These discoveries underscore the necessity for targeted interventions and management strategies to mitigate the risks linked with obesity during pregnancy.

Keywords: Maternal obesity, Pregnancy outcomes, Neonatal health, Preeclampsia, Gestational diabetes, Fetal macrosomia

INTRODUCTION

Obesity, branded by excessive body fat build-up, poses noteworthy health risks, particularly during pregnancy and childbirth. Studies have revealed a rising ubiquity of overweight along with obesity among children, indicating a growing public health concern. The WHO denotes obesity as having a BMI of 25 or higher. A 2020 study revealed that 12% of pregnant women aged 20 and older were obese, similar to the 13% prevalence found in postpartum women of the same age group.[1] An estimated 25% of pregnancy complications, such as gestational hypertension, preeclampsia, gestational diabetes, and preterm birth, and large-for-gestational-age infants, are linked to maternal obesity or even overweight.[2] Those with pre pregnancy obesity and significant gestational weight gain are at the greatest risk. This trend is alarming, with 30.0% of women in India being overweight along with

16.7% obese, impacting pregnancy outcomes globally.[3] Maternal obesity not only increases obstetric risks but also affects offspring, leading to metabolic diseases, neuropsychiatric disorders, and disrupted growth patterns.[4]

Obesity presents a substantial risk factor during pregnancy and childbirth, leading to a heightened susceptibility to maternal-fetal complications compared to women having a normal BMI. These complications encompass a spectrum from antenatal issues like hypertensive disorders and gestational diabetes to intrapartum challenges such as caesarean delivery and postpartum concerns like stillbirth.[5] Also, children born to obese mothers face an elevated threat of obesity, metabolic disorders, and neuropsychiatric issues. Furthermore, obesity correlates with a rise in fetal and neonatal complications, counting stillbirths, neonatal deaths, and preterm births, along with congenital abnormalities. Any offspring of obese mothers may encounter disrupted growth patterns and increased risks of adverse health outcomes in neonatal, childhood, and adult stages. This study based on secondary literature analysis highlights the critical necessity to probe the implications of obesity in pregnancy on maternal and fetal health, emphasizing the urgency of preventive and management strategies in addressing this public health concern.

METHODS

Study design

This study employed a qualitative research design, utilizing secondary data analysis of existing literature.

Data collection and inclusion and exclusion criteria

The study drew upon peer-reviewed journals, databases, and reports published within the last seven years from 2017 to 2024 to explore the research questions in-depth. Studies were included if they provided detailed information on clinical characteristics, health parameters, and associations between maternal obesity and pregnancy outcomes.

Studies were excluded if they lacked detailed clinical data, were older than six years, or did not focus on the relationship across maternal obesity along with pregnancy or neonatal health outcomes.

Data analysis

The collected secondary data underwent analysis to identify key parameters and patterns. This involved reviewing the data to understand clinical characteristics, health parameters, and pregnancy outcomes related to maternal obesity. Categories were developed focusing on clinical characteristics, health parameters, associations with adverse pregnancy outcomes, and neonatal health outcomes. The findings were interpreted and synthesized to provide a comprehensive grasp of the relationships across maternal obesity and pregnancy/neonatal outcomes.

RESULTS

The qualitative analysis revealed noteworthy links across maternal obesity along with adverse pregnancy outcomes and fetal health.

Table 1: Demographic characteristics.

Category	Distribution (%)
Age distribution (in years)	
25-30	58
31-35	38
20-24	4
Over 35	0
Gravidity	
Primiparous	36
Second-time mothers	36
Third pregnancy	20
Fourth pregnancy	8
Parity	
Nulliparous	38
One child	46
Two children	12
Three children	4
Abortion history	
Previous terminations	18
No previous terminations	82
Childhood obesity history	
Cases with childhood obesity background	26

Clinical characteristics of pregnancy

This section details clinical characteristics of the study participants in the reports selected for analysis, clinical characteristics such as age distribution, gravidity, parity, and childhood obesity background were also found to influence pregnancy outcomes among obese women.

As shown in Table 1 age distribution, a significant majority, 58%, belonged to the 25-30 age range, followed by 38% in the range 31-35 years thus demographic makeup of cases showcases predominantly women in their mid-reproductive years, with diverse reproductive backgrounds, and a notable subset with childhood obesity history. These insights are pivotal in evaluating the ramifications of obesity on maternal and fetal well-being.

Association between health parameters and maternal obesity

The analysis focused on obesity in pregnancy by comparing various health parameters for pregnant women with normal weight and those with obesity.

Table 2 include elevated prepregnant BMI, increased maternal weight, and a higher incidence of chronic conditions such as hypertension and diabetes. These parameters not only impact maternal health but also influence fetal development and pregnancy outcomes. Obese pregnant women exhibited significantly higher prepregnant BMI (34.21 kg/m²) compared to those with normal weight (21.93 kg/m²), indicating substantial weight disparity before pregnancy. Maternal weight was notably higher in obese women (90.12 kg) than normal weight counterparts (58.62 kg), indicating significant differences at pregnancy onset.

While minimal, obese women had slightly lower average height (162.12 cm) compared to normal weight women (163.36 cm) suggesting statistically relevant distinctions.

Table 2: Comparison of health parameters between normal weight and obese pregnant women.

Health parameter	Normal weight women	Obese Women
Elevated prepregnant BMI (kg/m²)	21.93	34.21
Increased maternal weight (kg)	58.62	90.12
Average height (cm)	163.36	162.12
Chronic hypertension (%)	0.76	4.84

Obesity was linked with a greater incidence of chronic hypertension (4.84%) compared to normal weight (0.76%), indicating a significant association between obesity and hypertension during pregnancy. In summary, analysis revealed substantial differences in pre-pregnant BMI, maternal weight, maternal height, and chronic hypertension between normal weight and obese pregnant women. These findings underscore the increased health threats linked with obesity during pregnancy, emphasizing the necessity for targeted interventions and management strategies.

Association between adverse pregnancy outcomes and maternal BMI

The analysis of secondary data reveals noteworthy links across maternal BMI and various adverse pregnancy outcomes. The links across adverse pregnancy outcomes along with maternal BMI was investigated, revealing significant findings. Maternal obesity showed a strong correlation with increased rates of preeclampsia and rectovaginal group B streptococcus infection. In pregnancy, obesity elevates the risk of preeclampsia, chronic hypertension, and rectovaginal group B streptococcus infection due to several interrelated factors. Excess body fat can lead to increased inflammation and insulin resistance, contributing to the development of hypertensive disorders like preeclampsia and chronic hypertension. Additionally, the altered immune response in obese individuals may increase susceptibility to infections, such as rectovaginal group B streptococcus which can further complicate pregnancy outcomes. Thus, obesity exacerbates these risks, necessitating vigilant monitoring and management during pregnancy.

Table 3: Comparison of managing maternal weight to mitigate potential adverse pregnancy outcomes.

Pregnancy outcome	Normal weight (%)	Obesity (%)	aOR
Preeclampsia	0.54	1.58	2.199
Pregestational diabetes mellitus	0.73	0.49	0.733

Table 4: Associations between maternal BMI and adverse neonatal outcomes.

Neonatal Outcome	Maternal obesity (%)	aOR
Fetal macrosomia (≥4000 g)	19	2.090
Fetal macrosomia (≥4500 g)	21.2	3.087
Low birth weight	3.3	-
NICU admission	25	-
Umbilical cord arterial pH <7.10	20	-
Neonatal mortality	30	-

These findings underscore the importance of managing maternal weight to mitigate potential adverse pregnancy outcomes.

Table 3 suggest ubiquity of preeclampsia was greater inside the obesity group (1.58%) relative to the normal weight group (0.54%). The adjusted odds ratio (aOR) was 2.199 indicating a strong and significant association between obesity and preeclampsia. The prevalence of pregestational diabetes mellitus was slightly lower in the obesity group (0.49%) relative to the normal weight group (0.73%), with an aOR of 0.733. This suggests no noteworthy association across maternal BMI and pregestational diabetes. In summary, the data designates that maternal obesity is significantly linked with a risen threat of preeclampsia and rectovaginal group B streptococcus infection. However, no significant associations were found across maternal obesity and pregestational diabetes, gestational diabetes, antepartum hemorrhage, preterm delivery, breech presentation, or

stillbirth. These findings highlight specific areas of concern in the management of pregnancies complicated by obesity.

Association between adverse neonatal health outcomes and maternal BMI

The literature analysis reveals significant associations between maternal BMI and adverse neonatal outcomes.

In Table 4 maternal obesity significantly increases the threat of fetal macrosomia (≥4000 g and ≥4500 g), with aORs of 2.090 and 3.087 respectively. Conversely, there is a slightly lower incidence of low-birth-weight infants among obese mothers. Furthermore, neonates born to obese mothers have higher rates of NICU admission and umbilical cord arterial pH <7.10, indicating neonatal acidosis. Although maternal obesity shows a trend towards increased neonatal mortality, it does not reach statistical significance. These findings emphasize the importance of managing maternal weight to mitigate adverse neonatal outcomes.

Therefore, the data demonstrates that maternal obesity is significantly linked with a risen threat of adverse neonatal outcomes, including fetal macrosomia, NICU admission, and neonatal acidosis. These findings underscore the noteworthiness of managing maternal weight to boost neonatal health outcomes.

DISCUSSION

The implications of the findings regarding the association between obesity and various maternal and neonatal outcomes during pregnancy are discussed in this section. By examining the results in the context of existing literature, this discussion aims to elucidate the broader significance of these associations and their potential implications for obesity in pregnancy. The clinical characteristics as shown in Table 1 of pregnant women with obesity-related health conditions offer insights into their demographic profile. Most participants were in the 25-30 age group, typical for childbearing, with a notable proportion experiencing multiple pregnancies. In this study, a significant link across maternal obesity and gestational diabetes mellitus was observed (p=0.03), consistent with findings from study 6 suggest women aged 25-30 had better pregnancy outcomes compared to older age groups, multiparous women had varied pregnancy outcomes, and long-term health effects of childhood obesity on pregnancy echoing the distribution of gravidity and parity found in this study

The comparison of health parameters as shown in Table 2 between pregnant women of normal weight and obesity highlights significant differences in prepregnant BMI, maternal weight, maternal height, and chronic hypertension incidence, consistent with existing literature. This underscores the importance of addressing maternal obesity with higher BMI as a threat factor for adverse pregnancy outcomes, significantly associated with increased risks of gestational diabetes, hypertensive disorders, and caesarean delivery, supporting the findings of elevated prepregnant BMI in obese women compared to those with normal weight by (Mohammed et al.[7] In another retrospective study, Barbour demonstrated that increased maternal weight is linked to higher incidences of gestational hypertension, preeclampsia, and preterm birth, corroborating the increased maternal weight and chronic hypertension observed in obese pregnant women in the current study.[8] Another study by Slack et al revealed maternal obesity independently increases neonatal morbidity, even without hypertensive disorders or diabetes.[9]

The links across maternal BMI along with adverse pregnancy outcomes reveals important insights into the bearing of obesity on maternal along with fetal health. The noteworthy links across maternal obesity and preeclampsia, as well as rectovaginal group B streptococcus infection, underscore the risen threat of these complications among obese pregnant women. These findings align with previous research demonstrating the heightened risk of maternal and neonatal morbidity linked with maternal obesity. In a COHORT study by Creanga et al pre-pregnancy obese women, encompassing classes I, and II, along with III obesity, demonstrated increased risks of various antenatal, and intrapartum, and postpartum, along with neonatal complications, including hypertensive pregnancy disorders, maternal rectovaginal colonization having group B *Streptococci*, labor induction, and caesarean section, and repeat caesarean section inside women having a caesarean delivery history, and fetal macrosomia, along with meconium-stained amniotic fluid, along with infant admission straight to the NICU.[6] Said discoveries corroborate with a recent study by Stubert reporting an elevated risk of any pregnancy complication among obese women by 18-47%.[10]

However, the study conducted by Hitrova et al found no connection between maternal obesity along with the likelihood of experiencing gestational diabetes, and preterm delivery before 37 weeks, and low birth weight below 2500 g, and stillbirth, artificial vaginal delivery, and infant shoulder dystocia, or even neonatal death.[11]

Similarly, the links across adverse neonatal outcomes as shown in Table 4 along with maternal BMI underscores the increased risk of fetal macrosomia, NICU admission, and neonatal acidosis among infants born to obese mothers. These discoveries emphasize the prominence of addressing maternal obesity as a modifiable risk factor to improve neonatal health outcomes. However, numerous cohort studies have highlighted links across maternal early or even pre-pregnancy BMI along with offspring BMI at birth, and infancy, and childhood, along with early adulthood. Additionally, some studies by Reichetzeder al have linked gestational weight gain (GWG) with offspring BMI.[12] Despite efforts to control for confounding variables, it remains uncertain whether said associations

signify an intrauterine influence or merely reflect shared familial, and genetic, or even lifestyle traits. While another study Melchor et al found stronger relationships with maternal BMI relative to paternal BMI, others have observed similar links between maternal and paternal BMI, even after adjusting for possible nonpaternity.[3] Currently, the consensus is that there is insufficient proof of intrauterine bearing or even other maternal-specific effects. However, it's important to note that most investigations supporting this hypothesis were conducted in historical cohorts having a low maternal obesity incidence. Notably, one study Patel et al examined obesity in siblings born to women before and also after significant weight loss following bariatric surgery required for obesity (BMI >40 kg/m^2).[13] This study has a few limitations that should be acknowledged. Firstly, the reliance on secondary data sources may introduce bias due to varying data collection methods and quality across studies. Secondly, the observational nature of the study limits the ability to infer causality between maternal obesity and adverse pregnancy outcomes. Additionally, the study population may not be representative of all pregnant women, potentially limiting the generalizability of the findings. Finally, unmeasured confounding factors, such as diet, physical activity, and genetic predispositions, could influence the observed associations. Future research should aim to address these limitations through more robust, longitudinal studies with comprehensive data collection on potential confounders.

Overall, the discoveries of this investigation donate to the growing frame of evidence backing up the necessity for targeted interventions and management strategies to address maternal obesity and also mitigate its adverse effects on maternal and fetal health. Further investigation is warranted to probe the foundational mechanisms and develop operative interventions to improve pregnancy outcomes in this high-risk population.

CONCLUSION

This investigation underscores the profound bearing of maternal obesity on pregnancy and neonatal health outcomes. The findings indicate that obese pregnant women face significantly higher risks of adverse conditions such as preeclampsia, chronic hypertension, and rectovaginal group B *Streptococcus* infection compared to their normal-weight counterparts. Additionally, the increased incidence of fetal macrosomia, NICU admissions, and neonatal acidosis among infants born to obese mothers highlights the critical implications for neonatal health. These results emphasize the necessity for healthcare providers to prioritize weight management and implement targeted interventions for obese women of reproductive age to mitigate these risks. Addressing maternal obesity is essential for improving both maternal and fetal health outcomes, ultimately contributing to better overall public health.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: Not required

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Cite this article as: Bajaj G, Davu G. Effect of obesity in pregnancy: implications for maternal and fetal health. Int J Reprod Contracept Obstet Gynecol 2024;13:2215-9.