



Comparison of Maternal and Fetal Outcomes Between Obese and Non-Obese Women

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ABSTRACT

Background: Maternal obesity is an emerging issue in the world, and it is becoming a common issue among women in their reproductive years. Pregnant obesity is a problem with major metabolic, hypertensive and obstetric complications that do not benefit the mother and fetus in any way. Oversaturation of adiposity leads to insulin resistance in the body, inflammation of the system, and dysfunction of endothelium, which predisposes to pregnancy complications. In spite of a significant international evidence, current local statistics on low- and middle-income settings are low.

Objective: To compare maternal and fetal outcomes in obese pregnant women and non-obese pregnant women.

Methodology: The proposed cohort study took place in the Department of Obstetrics and Gynecology, Peoples Medical University/Civil Hospital, Nawabshah. One hundred seventy-two (172) pregnant women who have gestational age of more than 24 weeks is recruited by non-probability consecutive sampling and divided into obese and non-obese groups (BMI of 30kg/m² and below). The participants were tracked until delivery. The maternal outcomes are measured were gestational diabetes mellitus, pre-eclampsia, cesarean section, and postpartum hemorrhage. The outcomes of fetuses is preterm birth, low birth weights, intrauterine growth retardation, low Apgar score in the first 5 minutes after birth, and neonatal intensive care unit admission. The SPSS version 25.0 is used for analysis of the data. Comparison done using Chisquare test and relative risk are computed where a p-value less than 0.05 is regarded as significant. **Expected Results:** It is observed that obese pregnant women have a very high rate of poor maternal and fetal outcomes in contrast to non-obese women.

Conclusion: It is expected that maternal obesity has quite a close relationship with the adverse fetomaternal outcome, which explains the need to focus on preconception education, its early detection, and more efficient antenatal care to minimize obesity-related pregnancy complications.

Keywords: Obesity in the mother; BMI; Pregnancy outcome; Fetal outcome; Pre-eclampsia; Gestational diabetes mellitus.



INTRODUCTION

Obesity may be described as an excess build up of fat tissues which are considerably dangerous to health and is often measured by body mass index (BMI) the weight in kilograms by the height in meters squared. As the World Health Organization (WHO) states, a BMI of 30kg/9kg/m² or above makes it obese and this is the global increase in the prevalence of obesity in adults and especially women of reproductive age [1]. During the past twenty years, maternal obesity has increased exponentially as a burden of disease in the world, owing to sedentary lifestyles, unhealthy dieting habits and urbanization among other factors and has become one of the most prevalent modifiable risks factors during pregnancy [1][2].

The problem of maternal obesity has become one of the key issues of the public health due to the predisposition of pregnant women to a range of metabolic, hypertensive, and obstetric problems negatively influencing the outcomes of pregnancy [3]. The physiological changes that take place during pregnancy among women with obesity are not the same as those that occur in normal-weight women since there is insulin resistance, low grade chronic inflammation and dyslipidemia [4]. These metabolic derangements predispose a gestational diabetes mellitus (GDM) a condition that has both immediate and prolonged effects on the mother and the baby [5]. As evidenced by meta-analysis, maternal obesity has a distinct effect on the risk of large-for-gestational-age (LGA) neonates and macrosomia but when combined with GDM the risk factor of premature birth and neonatal adiposity is further intensified [6].

Hypertensive pregnancy disorders such as pregnancy induced hypertension and pre-eclampsia occur more frequently in those women who have a higher BMI. Several cohort studies have cited that pregnant women who are obese are highly prone to preeclampsia against the non-obese counterparts and consequently the level of maternal morbidity is elevated [3][7]. Endothelial dysfunction mediated by adiposity has a role to play in the aberrant placentation and vascular resistance, which play a crucial role in the pathophysiology of hypertensive gestational disorders [8]. In addition to this, obese pregnancy is linked to the necessity to deliver via an operative mode especially cesarean section because of dysfunctional labor patterns, cephalopelvic disproportion, and fetopelvic mismatches [3][9].

Other than metabolic and hypertensive complications, maternal obesity exposes women to risks of thromboembolic conditions, protracted labor, failure to induce labor, and postpartum hemorrhage, which complicates the intrapartum and postpartum care [10]. The birth and neonatal conditions are also put at risk in pregnancies that are complicated by maternal obesity. Research has always shown the increased incidences of preterm birth, low Apgar levels, respiratory stress, and follow-up neonatal intensive care unit (NICU) hospitalizations of the babies born out of the obese mothers [6][11]. Not only do these adverse outcomes cause immediate neonatal morbidity, but are also known to play a role in future health harms such as childhood obesity, metabolic syndrome and neurodevelopment impairment [12].

Although abundant international evidence has been available on the negative effects of maternal obesity, recent and high-quality evidence in local settings and resource-limited settings is still lacking [3]. In South Asia, regional research carried out in Pakistan shows that high maternal BMI and low fetomaternal outcomes have significant relationships, although much of the current, retrospective research has been constrained by either retrospective or old data [1][2]. As an example, a tertiary care hospital in Jamshoro carried out a prospective study, which reported a high risk rate of pre-eclampsia, GDM, cesarean section and neonatal complications in obese women, as compared to non-obese women [1]. A recent study based in a hospital also found that maternal obesity had been significantly



linked to elevated incidences of GDM, hypertensive conditions, macrosomia, and operative delivery at one of the largest public hospitals, which underscores the clinical impact of obesity among the obstetric population [2].

The dynamic between maternal adiposity and pregnancy outcomes is intricate and therefore important to understand since obesity is a risk factor that is not fixed. The preconception counseling emphasizing on weight optimization and nutritional education and lifestyle modification is necessary to enhance the outcomes of pregnancy [13]. The methods of obesity-related complication identification and personalized care pathways can also be further assisted through the use of antenatal risk stratification [14]. The world practice guidelines suggest screening of GDM and hypertensive disorders at early stages in obese pregnant women who are known to have diabetes and even without diabetes, there might be the mitigation of negative outcomes [15].

There exists an urgent need to produce new evidence on comparative maternal and fetal outcomes of obese and non-obese woman in local healthcare facilities due to the existing gaps in the area of local statistics and the dynamic obstetric care. The current research is thus expected to offer a current analysis of these consequences based on a prospective cohort research design, thus contributing to the clinical practice and prevention modules in the same community.

METHODOLOGY

The study was a prospective cohort study conducted in the Department of Obstetrics and Gynecology, Peoples Medical University/Civil Hospital, Nawabshah within six months after obtaining the permission of the Institutional Ethical Review Committee. Non-probability consecutive sampling was used to recruit 172 pregnant women. Respondents were divided into two groups according to body mass index (BMI): the obese group (BMI 30 kg/m² and above) and the non-obese group (BMI 30 kg/m² and below). BMI data were measured using digital weighing scale and a wall-mounted stadiometer to measure the height in meters and the weights in kilograms respectively.

The study involved women aged 18-40 years with singleton pregnancies and cephalic presentation and a gestational age of over 24 weeks as assessed by the last menstrual period. Women were eligible both as primiparous and multiparous and as booked and unbooked cases. The women whose number of gestations exceeded one, malpresentation, or already had underlying medical conditions, including hypertension, diabetes mellitus, epilepsy, or heart disease, a scarred uterus, or were most unwilling to participate were excluded to limit confounding and selection bias.

Informed written consent was obtained after which the baseline demographic and obstetric records such as age, gestational age, parity, booking status, place of residence, educational level and monthly income were captured on a structured proforma. Every participant was observed till delivery. The outcomes of the mothers considered were gestational diabetes mellitus, pre-eclampsia, mode of delivery, and postpartum hemorrhage. The outcomes measures were preterm birth, birth weight of less than 2500g, intrauterine growth retardation, Apgar score of less than seven at five minutes, and neonatal intensive care unit admission. The principal investigator assessed all the outcomes and noted them to maintain consistency. The SPSS version 25.0 was used in data entry and analysis. The continuous variables were checked on the basis of normality and presented in the form of mean and standard deviation or median and interquartile range, as needed. Frequencies and percentages were used to show categorical variables. The chi-square test was used to compare the results of the maternal and fetal outcomes between the two populations obese and non-obese and a p-value less than or equal to 0.05 deemed statistically significant. Relative risk was used to test the strength of association. Stratification was used to control potential effect modifiers (age, parity, booking status, and socioeconomic factors) and then analyzed post-stratification.



RESULTS

The sample of the study population comprised 172 pregnant women, including 86 women in the obese group and 86 women in the non-obese group. The two groups were similar in their regards to the baseline characteristics. The age of the women in the obese group was 29.8 ± 4.6 years and that of the non-obese group was 27.3 ± 4.1 years. Obese women had a mean gestational age of delivery of 36.1 weeks and 36.8 weeks in non-obese women respectively. The percentage of primiparity was 47.7 in obese and 52.3 in nonobese women. The proportion of women that were booked was higher in the non-obese group than the obese group (67.4% vs 60.5%). Table 1 presents the summary of baseline characteristics. **Table 1: Baseline Characteristics of Obese and Non-Obese Women**

Characteristic	Obese Group (BMI ≥ 30 kg/m ²)	Non-Obese Group (BMI < 30 kg/m ²)
Mean Age (years)	29.8 ± 4.6	27.3 ± 4.1
Mean Gestational Age (weeks)	36.1 ± 2.4	36.8 ± 2.1
Primiparity (%)	47.7%	52.3%
Booking Status (Booked)	60.5%	67.4%

Maternal Outcomes

Complications in the mothers were much more common among the obese women than the non-obese women. Gestational diabetes mellitus occurred in 34.9 percent of the obese women as compared to 12.8 percent of non-obese women. In the same way, pre-eclampsia was prevalent in 26.7% of the obese women as opposed to 11.6% of the non-obese. Obese women (55.8) had a higher rate of cesarean section in comparison with non-obese women (32.6). The occurrence of post-partum hemorrhage was also higher among the obese population with rates of 18.6 and 7.0 in the obese and non-obese groups respectively. These results portray that maternal obesity is statistically significant and relates to adverse maternal outcomes. Table 2 describes maternal outcomes and Figure 1 demonstrates them graphically. **Table 2: Comparison of Maternal Outcomes Between Obese and Non-Obese Women**

Maternal Outcome	Obese Group (BMI ≥ 30 kg/m ²)	Non-Obese Group (BMI < 30 kg/m ²)	pvalue
Gestational Diabetes Mellitus	34.9%	12.8%	< 0.05
Pre-Eclampsia	26.7%	11.6%	< 0.05



Cesarean Section	55.8%	32.6%	<0.05
Postpartum Hemorrhage	18.6%	7.0%	<0.05

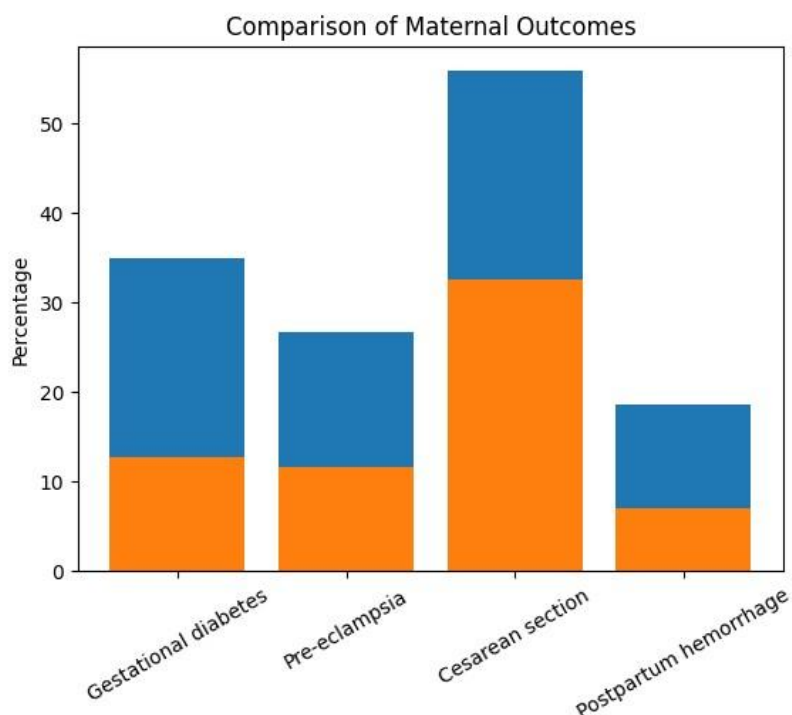


Figure 1 Comparison of maternal outcomes between obese and non-obese women **Fetal Outcomes**

The negative fetal outcome was more common in pregnancies that had maternal obesity. Obese women had a preterm delivery in 22.1 percent as compared to 10.5 percent of non-obese women. The low birth weight was observed in 24.4 of the neonates made by obese mothers and the same was 11.6 of the non-obese. The obese group was found to have an intrauterine growth restriction in 16.3 compared to 7.0 cases in nonobese group. Apgar, below seven at five minutes observed in 14.0 percent of the neonates born by obese women whereas in non-obese women was 6.9 percent. Moreover, the NICU admission in 24 hours of birth was necessary in 20.9% of the neonates in the obese group, but only 9.3% of the neonates in the non-obese group had to be in the NICU. The existence of these differences shows a distinct pattern of worse fetal outcomes in obese women. Table 3 shows detailed fetal outcome, which is also represented in graphical mode (Figure 2).

Table 3: Comparison of Fetal Outcomes Between Obese and Non-Obese Women

Fetal Outcome	Obese Group (BMI ≥ 30 kg/m ²)	Non-Obese Group (BMI <30 kg/m ²)	pvalue
Preterm Delivery	22.1%	10.5%	<0.05
Low Birth Weight	24.4%	11.6%	<0.05



Intrauterine Growth Restriction	16.3%	7.0%	<0.05
Apgar Score < 7 at 5 minutes	14.0%	6.9%	<0.05
NICU Admission	20.9%	9.3%	<0.05

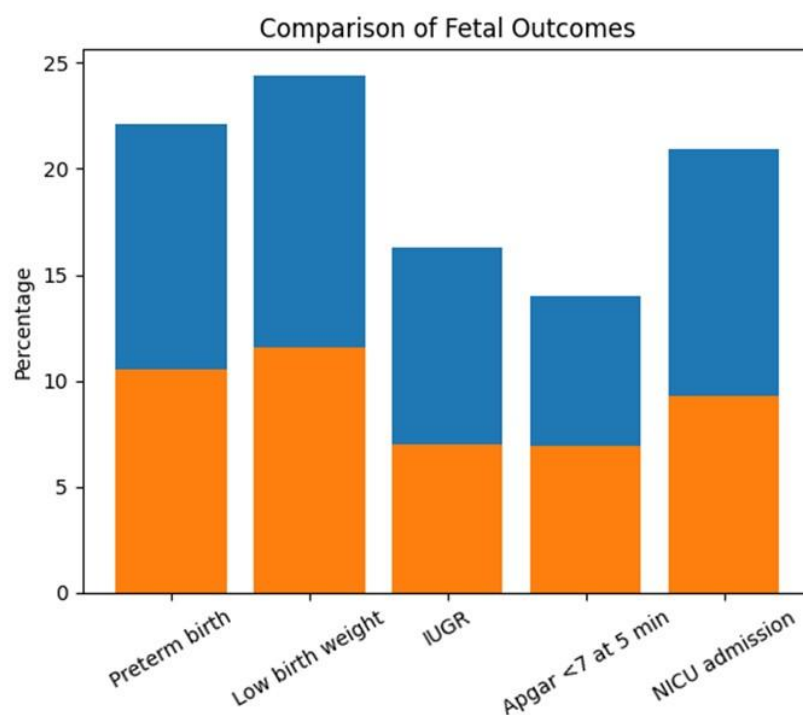


Figure 2: Comparison of fetal outcomes between obese and non-obese women

DISCUSSION

The results of the current study indicate that maternal obesity is a significant factor that leads to negative maternal and fetal outcomes. The incidences of gestational diabetes mellitus, pre-eclampsia, cesarean delivery, and post partum hemorrhage were found to be high in obese pregnant women than in non-obese pregnant women. Besides this, preterm birth, low birth weight, intrauterine growth restriction, low Apgar score five minutes after birth, and high rates of neonatal intensive care unit admission were more prevalent among neonates born by obese mothers. These results also support the concept of maternal obesity being a significant risk factor that affects the outcome of pregnancy.

This study showed a significant prevalence of gestational diabetes mellitus among the obese women. This finding aligns with a number of large cohort studies and meta-analyses which demonstrate that maternal BMI involving high levels of glucose tolerance in pregnancy [16–18]. Combine the physiological insulin resistance induced by pregnancy with insulin resistance caused by obesity and the chances of pregnancy-induced diabetes are significantly high. This



metabolic imbalance does not just affect pregnancy, since the mothers and the offspring develop a higher risk of developing type 2 diabetes mellitus in adulthood [19]. There was also a significant prevalence of hypertensive disorders among obese women especially preeclampsia. It has been proposed in the previous studies that excessive adipose tissue accounts to chronic inflammation, oxidative stress, and endothelial dysfunction, which, together, lead to abnormal placentation and the emergence of pre-eclampsia [20,21]. The increased rate of pre-eclampsia in this research supports the idea that early detection and close blood pressure detection should be used among obese pregnant women to minimize maternal morbidity and negative perinatal outcomes.

The prevalence rate of cesarean section was significantly increased among overweight women, which is consistent with the existing literature [22,23]. Obese women have been associated with longer labour periods, the unsuccessful process of induction, foetal macrosomia and problematic anesthesia as reasons behind increased rates of cesarean section. The high cesarean section rates are also clinically relevant because they are linked with high risks of surgical complications, postpartum bleeding, infection and complications during subsequent pregnancies such as placenta accreta spectrum disorders [24].

The current study has noticed that postpartum hemorrhage is more prominent among obese women. The same results have been realized in previous studies indicating that this heightened risk is as a result of uterine atony, protracted labor and operative delivery [25]. Taking into consideration the potentially lifethreatening character of the postpartum bleeding, proactive planning and preparedness in the intrapartum management of the obese parturients is critical.

In terms of the fetal outcomes, preterm birth was more prevalent in obese women. This correlation has been reported in the past literature, and spontaneous and medically indicated preterm births are found to be more frequent in obese pregnancies [26]. The complications faced by the mothers like pre-eclampsia and gestational diabetes usually lead to the need to deliver early, and this increases the neonatal morbidity related to prematurity. The obese group was also characterized by low birth weight and intrauterine growth restriction. Despite the association of obesity with fetal macrosomia, placental insufficiency that is a consequence of hypertensive disorders can cause impairment of fetal growth in some obese women [27]. This brings out the two-way and multifaceted interaction between maternal obesity and fetal malformations in growth.

Neonates with obese mothers had worse Apgar scores and NICU admission rates, which are consistent with other findings in the past [28,29]. Maternal obesity means that poor neonatal adaptation can be based on prematurity, metabolic issues, and respiratory complications. The escalated NICU admissions do not only indicate the escalated morbidity among the neonates, but also exert a significant burden on the healthcare systems, especially the resource-based slim settings.

The findings of this research make it apparent that maternal obesity as a community health concern should be addressed. The aspects that should be part of reproductive healthcare are preconception counseling, weight optimization, nutritional guidance, and lifestyle modification. Obese women during pregnancy are supposed to be treated as high-risk group, where the antenatal surveillance should be enhanced, prenatal screening of metabolic screening and hypertensive disorders as well as multidisciplinary care with obstetricians, anesthetists, nutritionists, and neonatologists [30].

Although this study has its strengths, such as a prospective design and standardized outcome assessment, the study has weaknesses. It might not be generalizable due to the single-center setting, and the long-term maternal and neonatal outcomes were not evaluated. Multicenter studies of a larger scale with long term follow up are



recommended in the future to shed more light on the effect of maternal obesity on pregnancy and the health of the offspring.

To sum up, maternal obesity has a substantial connection with poor maternal and fetal outcomes. Such results highlight the necessity to develop prevention approaches, timely risk identification, and the most effective use of antenatal and intrapartum support to reduce the harmful impact of obesity on pregnancy outcomes.

LIMITATIONS

There are some limitations to this study which need to be taken into account when interpreting the results. To begin with, it was carried out in one tertiary care hospital and this might not be able to generalize the findings to other health institutions or populations. Second, the sample size, though sufficient to identify the differences in key outcomes, might not have been adequate to assess less common complications of mothers or newborns. Thirdly, the body mass index was measured at the time of enrollment, and increase in weight during pregnancy was not assessed, which would have also contributed to the fetomaternal outcomes. Also, not long-term maternal and neonatal outcomes were evaluated, preventing the determination of the long-term implication of maternal obesity in the post-perinatal period. Lastly, even with the best attempts to manage confounding factors by stratification, the effect of unmeasured determinants like diet, physical activities and genetic determinants cannot be fully removed.

CONCLUSION

Maternal obesity has been linked to poor maternal and fetal consequences. It was also found that obese pregnant women were more likely to develop gestational diabetes mellitus, pre-eclampsia, cesarean section and postpartum hemorrhage than the non-obese women. Moreover, the infants born to obese mothers had a higher rate of neonatal complication, such as preterm birth, low birth weight, intrauterine growth retardation, low Apgar scores, and high rates of NICU hospitalization. The above results put maternal obesity in the limelight as a significant risk factor that adversely affects the outcomes of pregnancy and also leads to maternal and neonatal morbidity. The antenatal surveillance of obese women and the optimal obstetric care must be targeted at the early detection of obesity to decrease the number of complications that accompany obesity.

RECOMMENDATIONS

According to the results of the present research, preconception counseling aiming at maximum weight optimization, proper nutrition, and lifestyle change should be highly recommended among the women in reproductive age. Pregnant obese women are to be treated as a high-risk cohort and early gestational diabetes mellitus and hypertensive disorders screening and more close antenatal observation should be provided. The multidisciplinary approach to management should be adopted and the obstetricians, the anesthetists, nutritionists, and neonatologists involved to enhance the maternal and neonatal outcomes. The health education programs would need to be enhanced to create more awareness on the dangers of obesity during pregnancy. Moreover, multicentric, long-term, studies should be conducted on a large scale to learn more about the long-term effects of maternal obesity on maternal health and child outcomes and how to prevent the issue with the help of evidences.



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