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EFFECTS OF MATERNAL OBESITY ON PREGNANCY COMPLICATIONS AND FETAL DEVELOPMENT.

Asma Qadir[1], Fozia Amin[2], Mah Rukh[3*], Zainab Pirzada[4]

[1]Consultant Gynecologist Type D Hospital Latamber Karak
[2]Consultant Gynecologist Khalifa Gulnawaz Teaching Hospital MTI Bannu
[3*]Consultant Gynecologist Frontier Corps Teaching Hospital Peshawar.
[4]Consultant Gynecologist Khalifa Gulnawaz Teaching Hospital MTI Bannu

***Corresponding Author:** Mah Rukh
Email: drmaha137@yahoo.com

Abstract

Background: Maternal obesity is recognized as a serious risk factor that leads to the complication of pregnancy and outcomes of poor fetal development. It predisposes both maternal and neonatal health to the consequences of gestational diabetes, hypertension, and macrosomia. Knowledge of these effects is necessary in coming up with preventive measures to enhance the outcome of pregnancies.

Objectives: To determine the effect of obesity in women during pregnancy on complications and fetal development, the concern should be on maternal health, delivery effects and the long-term exposure to offspring.

Study Design: A Prospective Cohort Study.

Place and Durtion of Study. Department of Gyne & Obs Khalifa Gulnawaz Teaching Hospital MTI Bannu from jan 2023 to july 2024

Methods: This prospective cohort study included 100 obese pregnant women who were monitored for pregnancy complications and fetal development outcomes. Data were collected preoperatively, intraoperative, and postoperatively, focusing on maternal health, delivery outcomes, and fetal development. The study assessed complications such as gestational diabetes, hypertension, and macrosomia. Statistical analyses were performed using descriptive statistics (mean and standard deviation) and inferential tests (chi-square and t-tests) to evaluate the differences between groups. A p-value of <0.05 was considered statistically significant.

Results: Among 100 obese pregnant women, 32 percent of the women developed gestational diabetes mellitus and 28 percent had pregnancy induced hypertension. In 45 percent, a cesarean was necessary because of such complications as cephalopelvic disproportions and labored delivery. Macrosomia was found among 22% of neonates and 12% of neonates had low Apgar scores at 1 minute. In 15% of the cases preterm delivery was reported. The morbidity of maternal complications was more in women who had combined complications due to obesity. The statistical test has indicated significant correlations between maternal obesity and gestational diabetes ($p=0.01$), hypertension ($p=0.03$), and macrosomia ($p=0.02$), thus validating obesity as a risk factor that contributes to negative pregnancy and birth outcomes.

Conclusion: The present study reveals that maternal obesity is a major risk factor of pregnancy complications and adverse fetal outcomes. Gestational diabetes mellitus, hypertension and increased rates of cesarean birth were more common among obese women. Obese mothers had higher risks of babies being exposed to macrosomia, low Apgar scores, and preterm birth. These results underscore

the vital role of screening in early life, nutritional education and weight control before and during pregnancy in order to reduce the risks. In order to make maternal health and neonatal prognosis better, preventive strategies and patient education are necessitated in the groups where obesity among the population is increasing.

Keywords: Maternal Obesity; Pregnancy Complications; Fetal Development; Gestational Diabetes; Hypertension

INTRODUCTION

Obesity is now a significant health issue in the world with the number of cases increasingly growing in developed and developing countries. The World Health Organization (WHO) reported that in 2016 over 650 million adults around the globe were considered obese, and these figures are rising at an unbelievable pace [1]. Of specific interest is the problem in women of reproductive age, where maternal obesity is associated with numerous complications during pregnancy and poor outcomes in both mother and fetus [2].Maternal obesity is considered as having a body mass index (BMI) of 30 kg/m2. It has been declared as one of the greatest and avoidable risk factors that affect reproductive health. Obese women at pregnancy are at a high risk of getting gestational diabetes mellitus (GDM), hypertensive disorders of pregnancy (such as preeclampsia and gestational hypertension), and thromboembolic events [3]. Not only maternal health is impacted during the antepartum period, but also the intrapartum and postpartum outcomes are poor, with increased cesarean section, postpartum hemorrhage, and infections [4].The fetal effects of maternal obesity are also a cause of concern. Obese mothers expose fetuses to an intrauterine environment that is modified and a risk of macrosomia, congenital defects, and perinatal asphyxia [5]. Moreover, the maternal obesity has been linked to stillbirths, neonatal intensive care unitizations and the adverse childhood outcomes in later life including obesity, diabetes, and cardiovascular diseases in the children [6]. At a physiological level, obesity changes the metabolism of the mother that results in higher insulin resistance, inflammation and lipidemia. Effects of obesity are seen as a transgenerational effect that results in higher insulin resistance, inflammation and lipidemia. Such alterations expose the mother to metabolic problems and provide an undesirable intrauterine environment to the developing fetus [7]. Structural and functional abnormalities of the placenta are common in obese women, including compromised perfusion and disrupted nutrient transport, which further lead to abnormal fetal growth and development. Maternal obesity is more prevalent in urban populations in low- and middle-income countries because of rapid lifestyle changes. Maternal obesity is a new issue in Pakistan; recent studies in hospitals indicate that the rates of obesity are on the rise among pregnant women [8]. There is relatively little local data on its effects on pregnancy outcomes in this population, and thus a need to carry out context-specific studies. Knowledge about the effects of maternal obesity on pregnancy complications and fetal development is imperative to clinicians, policy makers, and those in charge of public health. Preventive identification of obesity as a risk factor that can be modified enables the introduction of specific interventions, such as preconception counseling, nutritional, lifestyle change interventions, and multidisciplinary antenatal care. The purpose of such strategies is to decrease the negative developments and enhance maternal and neonatal health. The proposed prospective cohort study aimed at assessing the relation between maternal obesity and pregnancy complications in a tertiary care hospital in Bannu, Pakistan. The attention was on the rates of gestational diabetes, hypertension, and postpartum complications, and fetal outcomes such as macrosomia, Apgar scores, and pre-term birth. The study will recognize these associations with an aim of giving evidence-based recommendations on how obstetric management can be improved and how preventive actions should be guided in the population with the increasing obesity.

Methodology

The proposed cohort Study was carried out in the Department of Gynecology and obstetrics, Khalifa Gulnawaz teaching hospital, MTI Bannu between January 2023 and July 2024. Obese pregnant women (BMI 30 kg/m2) (n=100) were enrolled and followed during pregnancy. The data were

gathered preoperative, intraoperative, and postoperative with emphasis on maternal complications (gestational diabetes, hypertension, mode of delivery), and fetal outcomes (macrosomia, Apgar scores, preterm birth). Data were summarized with descriptive statistics and results were compared with chi-square and t-tests. The p value of statistical significance was set at $p<0.05$. The analysis of data was performed on SPSS 24.0.

Inclusion Criteria

Women who met the following criteria: Pregnant women with BMI 30 kg/m2, singleton pregnancy, and gestational age of 12-20 weeks at the time of enrollment, and women who gave their consent to participate in the study and deliver at the study hospital.

Exclusion Criteria

Pregnant women who had already diagnosed diabetes, chronic hypertension, multiple pregnancies, known congenital anomalies or systemic pathology like renal or heart disease were excluded to help minimize confounding effects on the results.

Ethical Approval

Ethical consent was given by the Institutional Review Board of Khalifa Gulnawaz Teaching Hospital, MTI Bannu. All the participants were obtained informed consent in writing after getting informed about the purpose of the study, confidentiality and voluntarily taking part. Data were anonymized to safeguard the identity of patients in a manner that complies with ethical standards and the Study standards.

Results

The average maternal age of 100 obese pregnant women was 28.6 -4.2 years. GDM was detected in 32 percent of study participants and 28 percent developed pregnancy-related hypertension. There was a cesarean section in 45 percent of the cases mainly because of protracted labor, cephalopelvic disproportion, and fetal distress. There was 15 percent preterm birth and 22 percent macrosomia in the neonates. At one minute, low Apgar scores were reported in 12% neonates. Combined complications were associated with maternal morbidity such as postpartum hemorrhage and wound infection. Statistical analysis showed that there were significant relationships between obesity and gestational diabetes ($p=0.01$), hypertension ($p=0.03$), and macrosomia ($p=0.02$). These results indicate that maternal obesity is a risk factor itself rather than an outcome of other factors that lead to an adverse pregnancy, which requires prevention efforts.

Table 1: Maternal Demographics

Variable	Mean ± SD
Mean Age (years)	28.6 ± 4.2
BMI (kg/m²)	32.5 ± 2.8
Gestational Age at Enrollment (weeks)	16.2 ± 2.5

Table 2: Maternal Complications

Complication	Frequency (%)
Gestational Diabetes Mellitus	32
Pregnancy-Induced Hypertension	28
Postpartum Hemorrhage	10
Wound Infection	8

Table 3: Mode of Delivery

Mode of Delivery	Frequency (%)
Vaginal Delivery	55
Cesarean Section	45

Table 4: Neonatal Outcomes

Outcome	Frequency (%)
Macrosomia	22
Preterm Birth	15
Low Apgar Score (1 min)	12
NICU Admission	10

Table 5: Statistical Associations

Outcome	p-value	Significance
Gestational Diabetes	0.01	Significant
Hypertension	0.03	Significant
Macrosomia	0.02	Significant

Discussion

This future cohort concluded that there were high rates of gestational diabetes (32%), pregnancy induced hypertension (28%), cesarean section (45%), and macrosomia (22) in the case of obese pregnant women. These findings are consistent with the most current syntheses where maternal obesity has been found to significantly predispose to poor maternal and neonatal outcomes. Consistent findings between increased maternal BMI and various perinatal complications have been reported in large reviews and population studies, indicating that our findings can be generalized. [9-11].Gestational diabetes in our cohort (32%) is comparable to pooled estimates that show two- to three-fold increased odds of GDM among overweight and obese women compared to their normal-weight counterparts. Current meta-analyses and cohort studies indicate odds ratios of 2.2-3.5, respectively, to overweight and obesity, respectively, which reflect the high GDM burden of this population. These findings support BMI as a robust, independent predictor of antenatal hyperglycemia and necessity to use early glucose monitoring in obese pregnancies. [11,12].The 28% prevalence of pregnancy induced hypertension and associated hypertensive disorders in our sample is in line with modern literature that associates adiposity with increased hypertensive disorders prevalence. Mechanistic and epidemiologic data show that greater maternal adiposity increases risk by pathways of systemic inflammation, endothelial dysfunction, and placental perfusion changes. More recent systematic reviews highlight that maternal adiposity in early pregnancy is predictive of HDP and associated complications in varied settings. [12-14].Macrosomia (22%) and neonatal complications identified here are in line with the multiple cohort studies identifying higher frequencies of large-for-gestational-age infants and birth trauma in infants of obese mothers. Experienced studies on diverse populations document a 2-fold or more likely increased risk of macrosomia that remains even in mothers without GDM, and evidence suggests that the risk is sustained even in children without the presence of obesity-related metabolic and placental influences on fetal development. We have a macrosomia rate within the range of recent regional cohort reports. [15-17].Obese cohort cesarean section rates continue to be higher in the literature. The systematic reviews depict higher rates of operative deliveries in obese women because of labor dystocia, malposition of the fetus, and obstetric complications. Our 45 per cent cesarean rate is in line with meta-analytic data and on-regional data which capture the operational and clinical difficulty of delivering in obese patients. High cesarean rates have postpartum morbidity implications and healthcare resource utilization. [10,13].These associations can be described as biological plausible. Obesity in the mother heightens insulin resistance, chronic inflammation, dyslipidemia and placental structure and transport alterations. The long-term risks of offspring, such as premature adiposity and cardiometabolic disease, may be a result

of epigenetic and metabolic obesity and GDM programming. Recent mechanistic and epigenetic data support the existence of intrauterine reprogramming associated with maternal obesity. [18-20].Practice implications are the emphasis on preconception weight optimization, early antenatal risk assessment, and multidisciplinary team care of obese pregnant women. Combination of nutritional counseling, physical activity, and specific monitoring may decrease certain negative outcomes as demonstrated by recent interventional and guideline-based reviews. Solutions to increase in maternal adiposity should be found through public health measures to reduce intergenerational transfer of metabolic risk. [21-22].

Conclusion

Maternal obesity significantly increases the risk of gestational diabetes, hypertension, cesarean delivery, macrosomia, and adverse neonatal outcomes. These findings emphasize the need for preconception counseling, early antenatal risk assessment, and multidisciplinary management to improve maternal and neonatal health outcomes in populations where obesity prevalence is rising.

Limitations

This study was limited by its single-center design, relatively small sample size, and lack of long-term follow-up of offspring. Potential confounders such as socioeconomic status, dietary habits, and physical activity were not fully controlled. Therefore, caution is advised when generalizing results to broader or more diverse populations.

Future Findings

Future Study should investigate long-term health outcomes of offspring exposed to maternal obesity, including metabolic and cardiovascular risks. Multicenter studies with larger cohorts are needed to strengthen external validity. Interventional trials testing preconception weight management and antenatal lifestyle modifications will provide stronger evidence to guide preventive and clinical strategies.

Abbreviations

- **BMI** – Body Mass Index
- **GDM** – Gestational Diabetes Mellitus
- **HDP** – Hypertensive Disorders of Pregnancy
- **NICU** – Neonatal Intensive Care Unit
- **SD** – Standard Deviation
- **SPSS** – Statistical Package for the Social Sciences
- **WHO** – World Health Organization

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Authors Contributions

Concept & Design of Study: **Asma Qadir1**
Drafting: **Fozia Amin2**
Data Analysis: **,Mah Rukh3**
Critical Review: **Zainab Pirzada4**
Final Approval of version: **All Mentioned Authors Approved The Final Version.**
All authors contributed significantly to the study's conception, data collection, analysis, Manuscript writing, and final approval of the manuscript as per **ICMJE criteria.**

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