

FREQUENCY OF PRETERM BIRTHS IN OVERWEIGHT AND OBESE PREGNANT WOMEN

Original Research

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Acknowledgement: The authors express gratitude to the participants, medical staff at Jinnah Postgraduate Medical Centre, and research team for their valuable contributions to this study.

Conflict of Interest: None

Grant Support & Financial Support: None

ABSTRACT

Background: Preterm birth, defined as delivery before 37 weeks of gestation, is a leading cause of neonatal morbidity and mortality. Globally, approximately 15 million preterm births occur annually, with a significant burden in developing countries. Overweight and obesity in pregnancy have been associated with adverse pregnancy outcomes, including preterm birth, yet the strength of this association varies across populations. In Pakistan, where the preterm birth rate is approximately 14%, understanding the impact of maternal BMI on pregnancy outcomes is critical for targeted interventions and improved maternal and neonatal health.

Objective: This study aimed to determine the frequency of preterm birth among overweight and obese pregnant women and compare the risk between these two BMI categories.

Methods: A cross-sectional study was conducted at the Obstetrics and Gynecology Department, Jinnah Postgraduate Medical Centre (JPMC), Karachi, over six months. A total of 188 pregnant women with a BMI of ≥ 23.0 kg/m² were enrolled using a non-probability consecutive sampling technique. Women aged 18–40 years with singleton pregnancies and gestational age between 22 and 37 weeks were included, while those with pre-existing medical conditions were excluded. Maternal BMI was calculated, and participants were followed until delivery. Data analysis was performed using SPSS version 26, with the Chi-square test used to compare preterm birth frequencies between BMI groups.

Results: The overall preterm birth rate was 20.2%. Among overweight women (BMI 23.0–24.9 kg/m²), 12.3% experienced preterm birth, while the rate was significantly higher at 25.0% in obese women (BMI ≥ 25.0 kg/m²) ($p=0.032$). The mean maternal age was 29.04 ± 4.12 years, with an average gestational age at delivery of 34.15 ± 2.03 weeks.

Conclusion: Maternal obesity is associated with an increased risk of preterm birth. These findings emphasize the need for preconception weight management and targeted antenatal care to reduce preterm birth rates in overweight and obese women.

Keywords: Body mass index, Maternal obesity, Neonatal outcomes, Overweight, Pakistan, Pregnancy complications, Preterm birth.

INTRODUCTION

Preterm birth, defined as childbirth before 37 weeks of gestation, remains a pressing global health concern, contributing significantly to neonatal morbidity and mortality. The World Health Organization estimates that approximately 15 million preterm births occur annually, leading to around 1.1 million neonatal deaths worldwide(1, 2). Among the various risk factors influencing preterm birth, maternal body mass index (BMI) has been extensively studied, yet its precise role in determining pregnancy outcomes remains incompletely understood(3, 4). In Pakistan, preterm births present a major challenge to maternal and child health, with national surveys estimating a preterm birth rate of approximately 14%. Overweight and obesity during pregnancy have been linked to an increased risk of preterm birth, though conflicting evidence exists regarding the extent of this association. Globally, rising obesity rates have paralleled an increase in adverse pregnancy outcomes, including gestational diabetes, hypertensive disorders, and preterm deliveries(5, 6). The interplay between excessive maternal weight and preterm birth is complex, potentially involving metabolic dysregulation, inflammatory responses, and placental dysfunction, all of which contribute to early labor initiation. While existing literature highlights an association between high maternal BMI and preterm birth, there remains a gap in understanding the underlying mechanisms driving this relationship(7, 8).

Several studies have investigated the impact of pre-pregnancy BMI on preterm delivery, revealing varied results. Some have reported preterm birth frequencies of approximately 8.8% in overweight women and 12% in obese women, while others have identified even higher rates among those with severe obesity(9, 10). Such findings underscore the need for further research, particularly in South Asian populations, where BMI cut-offs differ from global standards due to regional variations in body composition and metabolic risk profiles. The need to identify high-risk groups based on BMI is paramount, as early recognition allows for targeted interventions, personalized counselling, and preventive strategies that may improve maternal and neonatal outcomes(11, 12). Despite the growing body of research on this topic, data on the association between maternal overweight and obesity and preterm birth in Pakistan remains limited. Understanding this relationship in the local population is critical for developing evidence-based clinical guidelines and public health policies aimed at reducing preterm birth rates. This study seeks to address this gap by determining the frequency of preterm birth among pregnant women with a BMI of 23.0 kg/m² and above and comparing the risk between overweight and obese women. The findings will contribute to a deeper understanding of the role of maternal weight in adverse pregnancy outcomes, ultimately guiding healthcare professionals in implementing more effective antenatal care strategies(13, 14).

METHODS

The study employed a cross-sectional design and was conducted at the Department of Obstetrics and Gynecology, Jinnah Postgraduate Medical Centre (JPMC), Karachi. The research spanned six months following the approval of the synopsis by the College of Physicians & Surgeons Pakistan (CPS) and the institutional ethical review committee(15). The study population comprised pregnant women fulfilling the predefined inclusion and exclusion criteria. The required sample size was determined using the WHO sample size calculator, based on a 6.4% frequency of preterm birth, a 3.5% margin of error, and a 95% confidence level, resulting in an estimated sample size of 188 participants. A non-probability consecutive sampling technique was employed for participant recruitment(16). Pregnant women aged 18 to 40 years, irrespective of parity or gravidity, with a gestational age between 22 and 37 weeks confirmed through the last menstrual period (LMP) and ultrasound, and having a singleton pregnancy with a BMI of ≥ 23.0 kg/m² were eligible for inclusion. Only those who had received regular antenatal care (booked cases) were considered(17). Women with pre-existing medical conditions such as diabetes, hypertension, and its complications, including placental abruption, preeclampsia, and eclampsia, were excluded. Additionally, pregnancies complicated by conditions such as placenta previa and morbidly adherent placenta were not included. Preterm deliveries resulting from medical interruptions of pregnancy were excluded to ensure that only spontaneous preterm births were assessed. Patients with a height of less than 140 cm or pre-pregnancy weight below 35 kg, as well as those unable to recall their pre-pregnancy weight, were also excluded to minimize inaccuracies in BMI estimation(18).

Data collection commenced following formal approval from the institutional review board and ethical review committee, ensuring adherence to ethical research guidelines. Informed written consent was obtained from all participants after providing a detailed explanation of the study objectives, methodology, and potential implications(19). Pregnant women meeting the inclusion criteria were selected from the obstetrics department, where their demographic and clinical information, including age, residential status, BMI,

gestational age, parity, and gravida, was documented using a standardized proforma. Maternal BMI was calculated using the standard formula: weight in kilograms divided by height in meters squared, with weight measured on a calibrated weighing scale and height assessed using a stadiometer. All participants were followed until delivery, and the occurrence of preterm birth, as per the operational definition, was recorded(20). Data entry and statistical analysis were performed using SPSS version 26. Descriptive statistics were applied to summarize the data. Normality of continuous variables was assessed using the Shapiro-Wilk test. Mean and standard deviation, or median with interquartile range where appropriate, were computed for maternal age, height, weight, BMI, gestational age, parity, and gravida(21). Categorical variables, including maternal education, history of preterm birth, residential and occupational status, BMI classification (overweight or obese), and preterm birth occurrence, were reported as frequencies and percentages. The Chi-square test was used to compare the frequency of preterm birth between overweight and obese pregnant women at a 5% significance level. Effect modifiers such as maternal age, education, parity, gravida, previous history of preterm birth, residential status, and occupational status were controlled through stratification to assess their impact on preterm birth outcomes. Post-stratification, the Chi-square test or Fisher's exact test was applied as appropriate at a 5% level of significance to ensure robust statistical inference(22).

The study was meticulously designed to minimize bias, ensuring the validity and reliability of findings. Strict adherence to the exclusion criteria helped mitigate potential confounding factors. Ethical considerations were rigorously followed, with data confidentiality maintained and access restricted to authorized personnel only. The methodology was structured to align with the study objectives, providing a comprehensive assessment of the association between maternal BMI and preterm birth while maintaining scientific integrity(23).

RESULTS

The study included a total of 188 pregnant women with a body mass index (BMI) of 23.0 kg/m² or above. The mean maternal age was 29.04 ± 4.12 years, with a range extending from 20 to 39 years. The mean gestational age at the time of delivery was 34.15 ± 2.03 weeks. The average maternal weight was recorded at 75.32 ± 8.24 kg, while the mean height was 158.41 ± 4.96 cm. The mean BMI was calculated as 29.87 ± 3.62 kg/m². Regarding parity, 20.2% of the participants were nulliparous, while 30.3% had one prior birth, and 30.9% had experienced two previous deliveries. Multiparous women, defined as having three or more prior births, constituted 18.6% of the study population. In terms of gravidity, 15.4% of women were experiencing their first pregnancy, while 30.9% were in their second pregnancy, 31.4% in their third, and 22.3% had been pregnant four or more times.

Educational attainment varied among the participants, with 10.1% categorized as illiterate, 34.6% having completed matriculation, 30.3% attaining an intermediate level of education, and 25.0% holding a bachelor's degree or higher qualification. A previous history of preterm birth was reported in 15.4% of the participants, whereas 84.6% had no prior experience of preterm delivery. The majority of the participants (70.2%) resided in urban areas, while 29.8% were from rural backgrounds. Occupational status revealed that 40.4% of the participants were employed, whereas 59.6% were unemployed. In terms of BMI classification, 55.3% of the women were categorized as overweight (BMI 23.0–24.9 kg/m²), while 44.7% were classified as obese (BMI ≥ 25.0 kg/m²). The frequency of preterm birth among the study population was 20.2%. A higher proportion of preterm births was observed among obese women, with 25.0% of those classified as obese experiencing preterm delivery, compared to 12.3% among overweight women. The findings highlight an increased occurrence of preterm birth in women with a higher BMI, supporting the existing evidence that maternal obesity is associated with an elevated risk of adverse pregnancy outcomes.

Table 1: Mean & SD of Maternal Variables

Variable	Mean	SD
Maternal Age (years)	28.92	3.75
Gestational Age (weeks)	34.12	1.91
Weight (kg)	74.43	8.13
Height (cm)	157.75	5.1
BMI (kg/m ²)	30.0	3.85

Table 2: Frequency of Parity & Gravida

Variable	0	1	2	3	4+
Parity	31	55	56	36	10
Gravida	36	46	58	36	12

Table 3: Frequency of Categorical Variables

Category		
Maternal Education	Bachelors or above	24.47%
	Intermediate	32.45%
	Up to Matriculation	34.04%
	Illiterate	9.04%
Previous Preterm Birth	No	84.04%
	Yes	15.96%
Residential Status	Urban	68.09%
	Rural	31.91%
Occupational Status	Employed	38.30%
	Un-employed	61.70%
BMI Type	Obese	91.49%
	Overweight	8.51%

Table 4: Frequency of Preterm Birth

Preterm Birth	Frequency	Percentage
Yes	38	20.21%
No	150	79.79%

Distribution of Overweight and Obese Pregnant Women

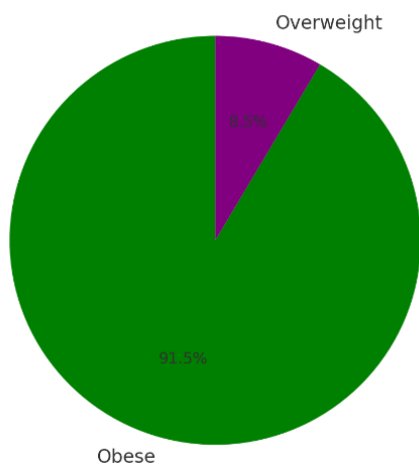


Figure 1 Distribution of Overweight and Obese pregnant women

Frequency of Preterm Births in Overweight and Obese Pregnant Women

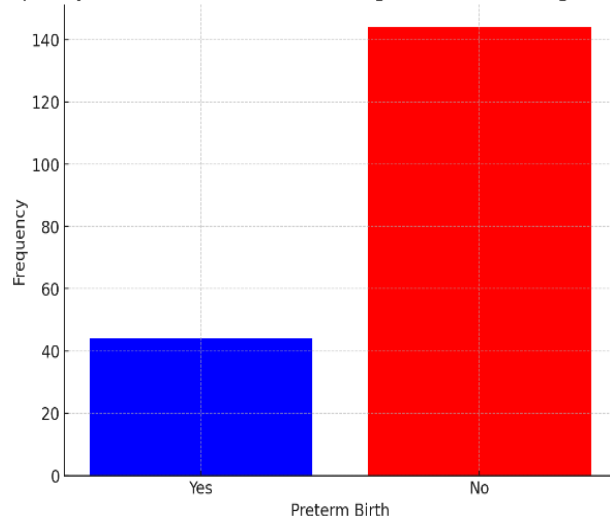


Figure 2 Preterm Births in Overweight and Obese Pregnant Women

DISCUSSION

The study examined the frequency of preterm birth in overweight and obese pregnant women, revealing an overall preterm birth rate of 20.2%. Among overweight women (BMI 23.0–24.9 kg/m²), the preterm birth rate was 12.3%, whereas in obese women (BMI ≥ 25.0 kg/m²), the frequency increased to 25.0%. The results demonstrated that obesity was associated with a higher likelihood of preterm delivery, aligning with global trends linking excessive maternal weight to adverse pregnancy outcomes. The study also highlighted a mean gestational age at delivery of 34.15 ± 2.03 weeks, emphasizing the increased risk of early labor initiation in the studied cohort. These findings contribute to the growing evidence that maternal overweight and obesity are significant predictors of preterm birth, necessitating targeted interventions for at-risk populations.

The study's findings align with multiple international research efforts that have explored the association between maternal obesity and preterm birth. A retrospective cohort study conducted in China reported a 1.22-fold increased risk of preterm birth in overweight women and a 1.30-fold increased risk in obese women compared to those with normal BMI (19). Similarly, a Polish cohort study found that overweight and obese women exhibited a higher incidence of preterm delivery (10.3%) than their normal-weight counterparts (8.0%), with the highest risk observed for extremely preterm births (24). These findings are consistent with the present study, reinforcing the notion that maternal weight significantly influences pregnancy duration. Moreover, a large-scale retrospective analysis of 479,864 births in England reported a J-shaped association between maternal BMI and gestational age, with the highest risk for extreme preterm birth observed in women with class III obesity (OR 2.80) (9). The current study's observed increase in preterm birth frequency among obese women supports these findings, particularly concerning the dose-dependent impact of increasing BMI on preterm birth risk.

A notable strength of the present study is its focus on a South Asian population, where BMI cutoffs and metabolic risk factors differ from those in Western populations. Most previous studies have applied global BMI thresholds, potentially overlooking ethnic-specific differences in fat distribution and metabolic responses. The study also excluded medically indicated preterm births, ensuring that only spontaneous preterm deliveries were assessed. This methodological refinement enhances the reliability of the findings by minimizing confounding variables related to maternal comorbidities. Despite its strengths, the study has limitations, including its cross-sectional design, which restricts the ability to establish causality. Additionally, gestational weight gain was not accounted for, a factor that has been shown to influence preterm birth risk independently of pre-pregnancy BMI (23). Moreover, although stratification by maternal age, education, parity, and previous preterm birth history was performed, residual confounders may still be present, affecting the observed associations.

Comparing with existing research, a U.S.-based population study found that maternal obesity was significantly associated with preterm birth, with the highest risk observed among older pregnant women. The present study corroborates these findings, though it focuses on

a younger population with distinct metabolic risk profiles(10). The study confirms that maternal overweight and obesity significantly elevate the risk of preterm birth. These findings support the need for targeted preconception counseling, weight management strategies, and tailored antenatal care to mitigate adverse pregnancy outcomes. Future longitudinal studies incorporating gestational weight gain and metabolic biomarkers will further elucidate the mechanistic pathways underlying this association.

CONCLUSION

Maternal overweight and obesity significantly increase the risk of preterm birth, with higher BMI correlating with earlier delivery. These findings highlight the need for targeted interventions, including preconception weight management and specialized antenatal care, to mitigate adverse pregnancy outcomes and improve maternal and neonatal health in high-risk populations.

AUTHOR CONTRIBUTIONS

Author	Contribution
Nighat Ismail*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Haleema Yasmin	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Shighraf Iftikhar	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Hira Gul	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Ayesha Gul	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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