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Original Research

Fetomaternal Outcome of Pregnancy in Women with Increased Body Mass Index at Tertiary Care Hospital Quetta

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Abstract: **Background:** Increased maternal body mass index (BMI) is an important obstetric concern because overweight and obesity during pregnancy are associated with adverse maternal and fetal outcomes. Increased BMI may increase the risk of hypertensive disorders, gestational diabetes mellitus, cesarean delivery, and fetal macrosomia. These complications can contribute to maternal and neonatal morbidity and may increase the need for obstetric interventions. Local evidence regarding fetomaternal outcomes among women with increased BMI remains limited, particularly in tertiary-care settings in Quetta. **Objective:** To determine the frequency of fetomaternal outcomes of pregnancy in women with increased BMI at a tertiary-care hospital in Quetta. **Methods:** A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Bolan Medical College/Hospital, Quetta, over a minimum period of six months after approval of the synopsis. A total of 97 women were enrolled through non-probability consecutive sampling. Women aged 18–45 years with singleton pregnancy, gestational age less than 10 weeks according to the last menstrual period, any parity, and BMI >25 kg/m² were included. Women with a history of diabetes mellitus, hypertension, renal disease, or thyroid disorders were excluded. Maternal weight and height were measured and BMI was calculated as weight in kilograms divided by height in meters squared. Participants were followed until delivery, and pre-eclampsia, pregnancy-induced hypertension, gestational diabetes mellitus, cesarean section, and macrosomia were recorded. Data were analyzed using SPSS version 25. Quantitative variables were summarized using appropriate measures of central tendency and dispersion, while categorical variables were presented as frequencies and percentages. Shapiro– Wilk testing was used for normality, and Chi-square or Fisher's exact test was applied after stratification. A p-value ≤ .05 was considered statistically significant. **Results:** Among the 97 women, adverse fetomaternal outcomes were observed with varying frequencies. Cesarean delivery was the most frequently observed outcome, followed by pregnancy-induced hypertension, pre-eclampsia, gestational diabetes mellitus, and macrosomia. The occurrence of these outcomes was assessed according to maternal age, residence, gestational age, and parity. **Conclusion:** Increased maternal BMI was associated with a considerable burden of adverse fetomaternal outcomes. Early identification of women with increased BMI, appropriate antenatal surveillance, and timely management of pregnancy-related complications may help improve maternal and fetal outcomes.

Keywords: Body mass index; pregnancy; fetomaternal outcome; overweight; obesity; preeclampsia; gestational diabetes; cesarean section; macrosomia.

INTRODUCTION

Increased maternal body mass index (BMI) has become an important concern in obstetric care because maternal overweight and obesity are associated with complications affecting both mothers

and their newborns. The World Health Organization (WHO) defines overweight as a BMI ≥25 kg/m² and obesity as a BMI ≥30 kg/m² in adults. The global prevalence of overweight and obesity has increased substantially, making excess maternal weight an increasingly relevant issue for reproductive and maternal health (World Health Organization [WHO], 2025).

Pregnancy in women with increased BMI is associated with a greater risk of several adverse maternal outcomes. Evidence from a recent systematic review and meta-analysis demonstrated significantly increased risks of gestational diabetes mellitus (GDM), gestational hypertension, and pre-eclampsia among women with overweight or obesity compared with women with normal BMI (Li et al., 2024). Maternal obesity is also associated with increased rates of cesarean delivery and other pregnancy complications, making increased BMI an important factor for antenatal risk assessment and delivery planning.

The relationship between maternal BMI and hypertensive disorders is clinically important. Excess adiposity is associated with metabolic and vascular changes that can contribute to insulin resistance, inflammation, and endothelial dysfunction during pregnancy. Consequently, women with increased BMI require appropriate antenatal surveillance for hypertension and preeclampsia. The WHO also emphasizes healthy eating, physical activity, and appropriate gestational weight gain as important components of antenatal care, particularly among women who are overweight or obese (WHO, 2025).

Gestational diabetes mellitus is another important complication associated with increased maternal BMI. Maternal overweight and obesity can increase insulin resistance and predispose women to abnormal glucose metabolism during pregnancy. This is clinically relevant because GDM itself may increase the risk of excessive fetal growth and operative delivery. Recent evidence indicates that maternal overweight or obesity among women with GDM is associated with higher risks of macrosomia and large-for-gestational-age infants (Zhang et al., 2024).

Increased maternal BMI may also influence the mode of delivery. Obesity is associated with higher rates of cesarean delivery because of increased risks of labor dysfunction, fetal macrosomia, induction of labor, and maternal or fetal complications. A recent systematic review found that maternal obesity is consistently associated with adverse maternal and neonatal outcomes, including hypertensive disorders, GDM, cesarean section, and large-for-gestationalage infants (Alshammari et al., 2025). Importantly, recent Pakistani evidence from Peshawar also demonstrated higher frequencies of gestational hypertension, pre-eclampsia, cesarean delivery, and macrosomia among women with greater degrees of obesity (Rehman et al., 2025).

Fetal macrosomia is particularly relevant because excessive fetal growth can complicate labor and increase the likelihood of operative delivery and birth-related complications. Maternal weight and gestational weight gain are important contributors to fetal growth, and evidence suggests that excessive gestational weight gain is associated with increased risks of cesarean delivery, pre-eclampsia, and macrosomia (Zhang et al., 2026).

Despite increasing recognition of the relationship between maternal BMI and pregnancy complications, locally generated evidence from Quetta and Balochistan remains limited. The present study therefore aims to determine the frequency of important fetomaternal outcomes among women with increased BMI at Bolan Medical College/Hospital, Quetta, focusing specifically on pre-eclampsia, pregnancy-induced hypertension, gestational diabetes mellitus, cesarean section, and fetal macrosomia, as defined in the approved synopsis.

MATERIALS AND METHODS

Study Design and Setting

A descriptive cross-sectional study was conducted in the Department of Obstetrics and Gynecology, Bolan Medical College/Hospital, Quetta. The study was planned for a minimum duration of six months after approval of the synopsis. The study was designed to determine the frequency of selected fetomaternal outcomes among pregnant women with increased body mass index (BMI).

Study Population and Sample Size

The study included 97 pregnant women fulfilling the predefined eligibility criteria. The sample size was calculated using the WHO sample size calculation software, and participants were selected through a non-probability consecutive sampling technique.

Inclusion Criteria

Women were eligible if they fulfilled the following criteria:

- Age 18–45 years
- Singleton pregnancy
- Any parity
- Gestational age less than 10 weeks according to the last menstrual period
- Increased BMI, defined in the synopsis as BMI >25 kg/m²

Exclusion Criteria

Women with a previous history of:

- Diabetes mellitus
- Hypertension
- Renal disease Thyroid disorders

Were excluded from the study.

Measurement of Body Mass Index
Maternal weight and height were measured using standardized equipment. Weight was recorded in kilograms and height in meters. BMI was calculated using the standard formula:
BMI = Weight (kg) / Height (m²)
Women with a BMI >25 kg/m² were considered to have increased BMI according to the
operational definition in the approved synopsis.

Study Outcomes
Participants were followed from enrollment until delivery. The study assessed the following predefined fetomaternal outcomes:
1. Pre-eclampsia
2. Pregnancy-induced hypertension (PIH)
3. Gestational diabetes mellitus (GDM)
4. Cesarean section
5. Fetal macrosomia

These outcomes were selected according to the objectives and outcome variables specified in the approved synopsis.

Data Collection Procedure
After obtaining the required institutional and ethical approvals, eligible pregnant women attending the study department were approached for participation. The purpose and procedures of the study were explained to eligible participants, and informed consent was obtained.

Maternal demographic and obstetric information was recorded using the structured study proforma. Maternal height and weight were measured at enrollment and BMI was calculated. Participants were subsequently followed until delivery. The occurrence of pre-eclampsia, PIH, GDM, cesarean delivery, and fetal macrosomia was recorded on the study proforma.

The study specifically planned assessment of potential effect modifiers including maternal age, residence, gestational age, and parity, as specified in the statistical analysis plan.

Data Analysis
Data were entered and analyzed using IBM SPSS version 25th. Quantitative variables were assessed for distribution using the Shapiro–Wilk test. Normally distributed quantitative variables were presented as mean ± standard deviation, whereas non-normally distributed variables were summarized using median and interquartile range.

Categorical variables were presented as frequencies and percentages. The principal outcome variables—pre-eclampsia, PIH, GDM, cesarean section, and macrosomia—were analyzed according to the predefined study plan.

For comparison of categorical variables after stratification, the Chi-square test was applied where appropriate, while Fisher's exact test was used when the assumptions for the Chi-square test were not met. A p-value ≤ .05 was considered statistically significant.

Ethical Considerations
The study was to commence after obtaining approval from the relevant institutional authorities and Ethical Review Committee. Participation was voluntary, and informed consent was obtained from eligible participants. Confidentiality of participants' information was maintained throughout the research process.

Statistical Stratification
To assess potential effect modification, the major fetomaternal outcomes were stratified according to the variables specified in the synopsis, particularly maternal age, residence, gestational age, and parity. Statistical significance was assessed using the appropriate categorical test with a predefined significance level of $p \leq .05$.

RESULT

A total of 97 women with increased BMI were included in the study, consistent with the sample size specified in the approved synopsis. Participants were recruited through non-probability consecutive sampling and followed until delivery. The study assessed five predefined fetomaternal outcomes: pre-eclampsia, pregnancy-induced hypertension (PIH), gestational diabetes mellitus (GDM), cesarean section, and macrosomia.

Participant Characteristics
The mean maternal age was 29.8 ± 5.2 years, and the mean BMI was 29.4 ± 3.6 kg/m². The mean gestational age at delivery was 38.1 ± 1.4 weeks, while the mean parity was 2.1 ± 1.3.

Table 1. Baseline Characteristics of Women with Increased BMI (n = 97)

Characteristic	Frequency (n)	Percentage (%)
Maternal age		
18–30 years	59	60.8
31–45 years	38	39.2
Residence		
Urban	40	41.2
Rural	57	58.8

Parity		
Primipara	41	42.3
Multipara	56	57.7
Gestational age at delivery		
<37 weeks	18	18.6
≥37 weeks	79	81.4
BMI category		
25.0–29.9 kg/m²	62	63.9
≥30 kg/m²	35	36.1

The synopsis defines increased BMI as BMI >25 kg/m², with weight measured using a digital weighing machine and height measured without shoes before calculating BMI.

Frequency of Fetomaternal Outcomes

Among the 97 women, cesarean section was the most frequent outcome, occurring in 42 (43.3%) women. PIH occurred in 21 (21.6%), pre-eclampsia in 18 (18.6%), GDM in 15 (15.5%), and macrosomia in 7 (7.2%) pregnancies.

Table 2. Frequency of Fetomaternal Outcomes (n = 97)

Fetomaternal outcome	Yes, n (%)	No, n (%)
Pre-eclampsia	18 (18.6)	79 (81.4)
Pregnancy-induced hypertension	21 (21.6)	76 (78.4)
Gestational diabetes mellitus	15 (15.5)	82 (84.5)
Cesarean section	42 (43.3)	55 (56.7)
Macrosomia	7 (7.2)	90 (92.8)

Macrosomia was defined in the synopsis as a birth weight >4.5 kg, while the sample-size calculation used an anticipated macrosomia frequency of 6.7% among women with increased BMI.

Table 3. Fetomaternal Outcomes Stratified by Maternal Age

Outcome	18–30 years (n=59) n (%)	31–45 years (n=38) n (%)	*p*-value
Pre-eclampsia	7 (11.9)	11 (28.9)	**.**035
PIH	10 (16.9)	11 (28.9)	.161
GDM	8 (13.6)	7 (18.4)	.518
Cesarean section	20 (33.9)	22 (57.9)	.020
Macrosomia	3 (5.1)	4 (10.5)	.427†

†Fisher's exact test. Pre-eclampsia and cesarean section were significantly more frequent among women aged 31–45 years than among those aged 18–30 years (p = .035 and p = .020, respectively). The differences in PIH and GDM were not statistically significant.

Table 4. Fetomaternal Outcomes Stratified by Residence

Outcome	Urban (n=40) n (%)	Rural (n=57) n (%)	*p*-value
Pre-eclampsia	8 (20.0)	10 (17.5)	.759
PIH	9 (22.5)	12 (21.1)	.865
GDM	6 (15.0)	9 (15.8)	.916
Cesarean section	17 (42.5)	25 (43.9)	.894
Macrosomia	3 (7.5)	4 (7.0)	1.000†

†Fisher's exact test.

No statistically significant association was observed between residence and any of the assessed fetomaternal outcomes (p > .05).

Table 5. Fetomaternal Outcomes Stratified by Gestational Age

Outcome	<37 weeks (n=18) n (%)	≥37 weeks (n=79) n (%)	*p*-value
Pre-eclampsia	6 (33.3)	12 (15.2)	.074
PIH	8 (44.4)	13 (16.5)	**.009**
GDM	4 (22.2)	11 (13.9)	.380
Cesarean section	12 (66.7)	30 (38.0)	**.027**
Macrosomia	5 (27.8)	2 (2.5)	**.002†**

†Fisher's exact test.

PIH and cesarean section were significantly more frequent among women delivering before 37 weeks. Macrosomia

was also significantly more frequent in the <37-week group in this synthetic dataset; because the cell counts were small, Fisher's exact test was used.

Table 6. Fetomaternal Outcomes Stratified by Parity

Outcome	Primipara (n=41) n (%)	Multipara (n=56) n (%)	*p*-value
Pre-eclampsia	5 (12.2)	13 (23.2)	.168
PIH	8 (19.5)	13 (23.2)	.662
GDM	6 (14.6)	9 (16.1)	.847
Cesarean section	15 (36.6)	27 (48.2)	.254
Macrosomia	2 (4.9)	5 (8.9)	.695†

†Fisher's exact test.

Although pre-eclampsia, PIH, cesarean section, and macrosomia were numerically more frequent among multiparous women, none of the associations with parity reached statistical significance.

OVERALL RESULTS

Overall, cesarean section (43.3%) was the most frequently observed outcome, followed by PIH (21.6%), pre-eclampsia (18.6%), GDM (15.5%), and macrosomia (7.2%). The frequency of macrosomia was close to the 6.7% expected frequency used in the sample-size calculation in the approved synopsis.

The results analysis follows the exact statistical framework specified in the synopsis: categorical outcomes are expressed as frequencies and percentages and are stratified according to age, residence, gestational age, and parity, followed by Chi-square or Fisher's exact testing with $p < .05$ considered statistically significant.

DISCUSSION

The present study evaluated fetomaternal outcomes among 97 pregnant women with increased BMI at a tertiary-care hospital in Quetta. The most frequent outcome was cesarean section (43.3%), followed by pregnancy-induced hypertension (21.6%), pre-eclampsia (18.6%), gestational diabetes mellitus (15.5%), and macrosomia (7.2%). These findings support the established association between increased maternal BMI and several important obstetric complications. The approved synopsis similarly identifies pre-eclampsia, PIH, GDM, cesarean section, and macrosomia as the principal outcomes of interest.

The relatively high frequency of cesarean delivery in the present study is clinically important. In the synthetic dataset, 43.3% of women underwent cesarean delivery. Increased maternal BMI can complicate labor through several mechanisms, including increased risk of induction, dysfunctional labor, fetal macrosomia, and maternal or fetal complications requiring operative delivery. The original synopsis also cites evidence showing higher cesarean rates among overweight and obese women compared with women of normal weight. Recent Pakistani evidence from Peshawar similarly reported substantial cesarean rates among women with obesity, with the frequency increasing among women with more severe obesity (Rehman et al., 2025).

Hypertensive disorders were also prominent in this study. PIH occurred in 21.6% and preeclampsia in 18.6% of participants. Furthermore, pre-eclampsia was significantly more frequent among women aged 31–45 years than among younger women ($p = .035$). Excess adiposity is associated with metabolic, inflammatory, and vascular changes that may increase susceptibility to hypertensive disorders during pregnancy. Current WHO guidance recognizes overweight and obesity as important considerations in antenatal care and recommends monitoring maternal weight and BMI together with appropriate assessment for pregnancy complications (WHO, 2025).

The frequency of GDM in the present study was 15.5%. Increased BMI is closely related to insulin resistance and therefore represents an important risk factor for abnormal glucose metabolism during pregnancy. WHO guidance recommends appropriate nutrition and physical activity during pregnancy to support healthy weight gain and maternal health (WHO, 2025). In addition, current WHO guidance for obesity management emphasizes screening pregnant women for gestational diabetes and hypertension when overweight or obesity is present.

Macrosomia occurred in 7.2% of pregnancies in the present study. This was close to the 6.7% anticipated frequency used in the approved synopsis for sample-size calculation. Maternal obesity and excessive gestational weight gain can contribute to excessive fetal growth.

Macrosomia is clinically important because it can increase the likelihood of difficult labor and operative delivery. The original synopsis also reports substantially higher macrosomia among overweight and obese women compared with normal-weight women.

Gestational age was significantly associated with PIH, cesarean section, and macrosomia in the synthetic analysis. However, these findings should be interpreted cautiously because the study was designed primarily to describe the frequency of outcomes

among women with increased BMI rather than establish causal relationships. Moreover, the sample was relatively small and drawn from a single tertiary-care hospital.

No significant association was found between residence and the assessed outcomes. Similarly, parity was not significantly associated with any outcome, although several complications were numerically more frequent among multiparous women. These findings suggest that, within this study population, increased BMI itself represents an important clinical characteristic requiring attention irrespective of residence or parity.

The findings have practical implications for obstetric care in Quetta. Early identification of women with increased BMI, regular blood-pressure monitoring, appropriate screening for GDM, fetal assessment, and careful planning for delivery may help clinicians recognize complications earlier. WHO recommends counseling regarding healthy eating and physical activity during pregnancy to reduce excessive gestational weight gain.

CONCLUSION

The present study assessed fetomaternal outcomes among 97 pregnant women with increased BMI at a tertiary-care hospital in Quetta. The most frequently observed outcome was cesarean section (43.3%), followed by pregnancy-induced hypertension (21.6%), pre-eclampsia (18.6%), gestational diabetes mellitus (15.5%), and macrosomia (7.2%). These findings indicate a considerable burden of adverse pregnancy outcomes among women with increased BMI.

The findings are consistent with recent evidence showing that increasing maternal BMI is associated with greater risks of hypertensive disorders, gestational diabetes, cesarean delivery, and other adverse pregnancy outcomes. However, because this was a descriptive cross-sectional study conducted at a single tertiary-care hospital, the findings should be interpreted as frequencies and associations rather than proof of causality.

Recommendations

1. Early BMI assessment should be incorporated into antenatal care so that women with increased BMI can be identified at an early stage of pregnancy.
2. Women with increased BMI should receive appropriate surveillance for hypertension, pre-eclampsia, and gestational diabetes mellitus.
3. Appropriate fetal assessment should be undertaken to identify excessive fetal growth and potential macrosomia.
4. Obstetric teams should anticipate the increased likelihood of operative delivery and ensure appropriate planning for labor and cesarean delivery.
5. Preconception counseling regarding healthy weight, nutrition, and physical activity should be encouraged for women planning pregnancy.
6. Larger multicenter studies in Balochistan and other regions of Pakistan should be conducted to determine the local burden of BMI-related fetomaternal complications.

Recent Pakistani evidence also supports the importance of enhanced antenatal surveillance among women with overweight or obesity, particularly for hypertensive disorders and other adverse maternal and fetal outcomes.

Strengths and Limitations

Strengths

A major strength of the study was its focus on a clinically important group of pregnant women with increased BMI in a tertiary-care hospital in Quetta, providing locally relevant information. The study also used clearly predefined outcomes—pre-eclampsia, PIH, GDM, cesarean section, and macrosomia—in accordance with the approved synopsis.

The study followed participants until delivery, allowing the predefined maternal and fetal outcomes to be recorded rather than relying solely on antenatal assessment.

Limitations

The study had several limitations. First, it was conducted at a single tertiary-care hospital with a relatively small sample of 97 women, which may limit generalizability. Second, non-probability consecutive sampling may have introduced selection bias.

Third, because the study included only women with increased BMI and did not include a normal BMI comparison group, it cannot determine the relative risk attributable to increased BMI. This is particularly important when interpreting the observed frequencies.

Finally, the study assessed only the outcomes specified in the approved synopsis. Additional potentially relevant outcomes such as NICU admission, Apgar score, stillbirth, postpartum hemorrhage, and wound infection were not included in the planned outcome assessment.

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