European Journal of Clinical Pharmacy

Print ISSN: 2385-409X **Online ISSN**: 3105-0409
Website: https://farmclin.com/

Original Research Article

Adverse Fetomaternal Outcomes of High BMI in Pregnant Females Attending a Tertiary Care Hospital

Article History:

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Received: 04-09-2025
Revised: 18-11-2025
Accepted: 24-11-2025
Published: 30-11-2025

Abstract:
Objective: To determine the frequency of adverse fetomaternal outcomes in pregnant women with high body mass index presenting at a tertiary care hospital.
Study Design: cross-sectional study
Place and Duration of Study: Jinnah Postgraduate Medical Centre, Department of Obstetrics and Gynecology, Karachi from 30th May 2025 to 29th August 2025.**Methodology:** Non-probability consecutive sampling was used to enroll 116 pregnant women with gestational age of 24 weeks and aged between 18 and 45 years old and BMI 25kg/m 2. Women who were multiple pregnant, or had a history of diabetes or a history of high blood pressure or gestational complications were ruled out. Baseline measures (and negative outcome) were documented. Analysis of data was done in SPSS version 22.**Results:** The mean age was 29.4 ± 5.8 years, mean gestational age was 31.6 ± 4.2 weeks, and mean BMI was 32.7 ± 5.1 kg/m^2. The most prevalent maternal outcome was the cesarean section of 76 women (65.5%), the next most frequent outcome was gestational diabetes mellitus of 42 (36.2%), then gestational hypertension of 34 (29.3) and preeclampsia of 19 (16.4) women. Macrosomia among fetal outcomes was seen in 31 (26.7) adults and weathering was seen in 24 (20.7), shoulder dystocia in 13 (11.2), and fetal death in 8 (6.9) adults. Gestational hypertension, preeclampsia, gestational diabetes mellitus, cesarean section, macrosomia, and shoulder dystocia were significantly related to increasing the BMI class.**Conclusion:** Pregnancy BMI was found to have a positive correlation with negative fetomaternal outcomes. The early BMI evaluation, prenatal care, nutritional advocacy, and timely obstetric care can help avoid maternal and fetal problems.

Keywords: High BMI, pregnancy, obesity, fetomaternal outcome, gestational diabetes, cesarean section.

INTRODUCTION

Increased body mass index (BMI) in pregnancy has become a significant societal issue and obstetric concern due to its rising trend and the incidence of avoidable maternal and fetal complications. Mother overweight and obesity can no longer be associated to high-income countries; the latest evidence in the global context demonstrates that the socioeconomic burden of maternal overweight, and obesity is on the increase among various populations which adds a further strain on the antenatal and delivery-care providers (1). Pregnancy is a major physiological, metabolic, vascular and inflammatory

adaptation and excessive maternal adiposity can interfere with this adaptation to predispose pregnancy to adverse pregnancy outcomes (2).

Pre and perinatal increased BMI has been continuously predominantly connected with high blood pressure disorders of expectancy, preeclampsia, gestational diabetes mellitus, venous thromboembolism, parturition, postpartum vagina, anesthetic complication and extended hospitalization (3,4). A systematic review and meta-analysis revealed that BMI measures of maternal adiposity were significantly linked with a variety of adverse maternal outcomes, which in turn underscores the importance of BMI measurement as an effective but easy screening test during antenatal employment (5). Likewise, recent reports reveal that there is a dose-response association, with increasing categories of BMI that are directly related to increased risks of gestational hypertension, preeclampsia, gestational diabetes, cesarean section and postpartum hemorrhage (6).

Mother high BMI also affects the fetus and neonate. Fetal and neonatal complications were reported including macrosomia, large-for-gestational-age birth, shoulder dystocia, birth trauma, neonatal hypoglycemia, congenital anomalies, at least one hospital admission to a neonatal intensive care unit or stillbirth (7). Obesity in mothers can also affect future child health to have long term health problems as a result of fetal programming which puts children at risk of developing obesity, metabolic syndrome and neurodevelopment problems in the future (8). Such associations cause maternal BMI not only to be a short term obstetric problem but also is a determinant of intergenerational health.

Gestational weight gain also alters the risk profile of women that go into pregnancy being overweight or obese. Being overweight in pregnancy was linked to an increased frequency of cesarean delivery and unstable fetal and post-delivery weight gain, but organized antenatal education, nutritional advice and exercise regimens could aid in decreasing the risks (9). Recent systematic evidence stresses that identification of early pregnancy, multidisciplinary antenatal management, and individual assessment of risks are the key elements of care of pregnant women with obesity (10).

In developing nations, like Pakistan, where maternal and perinatal morbidity is still a significant healthcare issue, local evidence about the high BMI and fetomaternal outcomes particularly comes in handy. Knowledge of the prevalence of adverse outcomes in pregnant women with high BMI would enable clinicians to appreciate high-risk pregnant women earlier, enhance antenatal observation and design beneficial interventions to mitigate maternal and neonatal morbidity.

METHODOLOGY

This was a cross-sectional research undertaken in the Jinnah Postgraduate Medical Centre in the Department of Obstetrics and Gynecology, Karachi. The study was carried out from 30th May 2025 to 29th August 2025 after approval from the institutional ethical review committee. The WHO sample size calculator was used to compute the sample size. Sample size was estimated using a confidence level of 95 per cent, absolute precision of 5 per cent and expectancy rate of a stillbirth of 8.2 per cent. The sample size was computed to be 116 pregnant women. The participants were chosen using a non-probability consecutive method. Enrolment was done on all pregnant women meeting the selection criteria and who presented themselves to the outpatient department of Obstetrics and Gynecology within the study period.

Pregnant women aged 18 to 45 years, having gestational age of 24 weeks or more and body mass index of 25 kg/m² or above, were included in the study. The measure of gestational age was based on an obstetric dating scan performed by a consultant obstetrician. The study excluded women with multiple pregnancy, a history of preexisting diabetes mellitus, history preexisting hypertension or previous gestational complications. These exclusion criteria were evaluated by checking past records of medical and obstetric histories.

Witten informed consent was taken out of all the eligible participants after explaining the objectives, procedure, benefits and confidentiality of the study. Participants were provided with pro forma of the study and the baseline demographic and clinical data were noted. Recorded variables were the variables such as the age, week of gestation at the time of presentation, weight, height, body mass index, BMI class, parity and gravida. The weighing scale was used to measure weight in kilograms whereas height was measured in meters. Body mass index was calculated as body weight out of kilograms divided by the square of the height in meters. High BMI was defined as a BMI of 25 kg/m 2 and more. The participants were further divided into: overweight (BMI 25-29.9 kg/m²), class I obese (BMI 30-34.9 kg/m²), class II obese (BMI 35-39.9 kg/m 2), and class III obese (BMI 40 kg/m 2 and above) groups.

Follow ups of all the registered patients were administered in the antinatal period to delivery and up to six weeks following child birth. In the case of follow-up, maternal and fetal adverse outcomes were measured based on operational definitions. These were maternal outcomes of gestational hypertension, preeclampsia, gestational diabetes mellitus and cesarean section delivery. The diagnosis of gestational hypertension was performed one week with blood pressure above or equal to 140/90 mmHg without proteinuria after the 20th week of gestation. Preeclampsia was determined by the presence of blood pressure of 140/90 mmHg or higher after 20 weeks of gestation in addition to proteinuria of more than 0.3 grams in 24-hour urine sample. The researcher determined the blood pressure through the use of the stethoscope and manual mercury sphygmomanometer.

Fasting blood glucose and 75-gram oral glucose tolerance test were used to determine gestational diabetes mellitus during the final trimester between 24 and 28 weeks of gestation. A diagnosis was considered when at minimum one of the set glucose levels were equal to the set level, which included fasting glucose of 92 mg/dL,

one-hour glucose level of 180mg/dL or 2-hour glucose level of 153mg/dl. Mode of delivery was noted and when the participant delivered by the use of an operative abdominal delivery, the cesarean section was recorded.

The outcomes of fetal quality were low birth weight, macrosomia, stillbirth and shoulder dystocia. Low birth weight was classified as having a birth weight whose weight is less than 2500 grams whereas macrosomia was classified as having a weight of birth which was more than 4000 grams. The presence of stillbirth was reported upon the delivery of a still born fetus. Shoulder dystocia was reported when during delivery, there was obstruction of the anterior shoulder at the maternal pubic bone. The researcher recorded all the findings on a predesigned proforma.

The gathered data were typed into SPSS 22 and assessed. The shapiro-wilk test was used to determine the normality of quantitative variables (such as age, gestational week at presentation and BMI). Quantitative variables that are normally distributed has been shown as the mean and standard deviation, and those that are non-normally distributed have been shown as the median and the interquartile range. Categorical variables such as parity, gestational hypertension, Stillbirth, Preeclampsia, gestational diabetes mellitus, cesarian section, low birth weight, macrosomia, Stillbirth, and shoulder dystocia were given as frequencies and percentages.

The adverse fetal outcomes were stratified on the basis of age, parity, gravida and BMI category in order to control the effect modifiers. The Chi-square test or Fisher exact test was used after stratification to determine the level of significance. A p-value below 0.05 was taken as being statistically significant.

RESULTS

A total of 116 pregnant women with high body mass index were included in the study. The average age of the participants in the study was 29.4 + 5.8 years, with the age of 18-45 years. The average gestational age at presentation was 31.6 [3.2] weeks and the average body mass index was 32.7 [5.1] kg/m 2. The average weight of newborn babies was 3140.5 and 625.8 grams (Table 1).

Table 1. Descriptive statistics of quantitative variables among study participants

Variable	Mean ± SD	Minimum	Maximum
Age, years	29.4 ± 5.8	18	45
Gestational age at presentation, weeks	31.6 ± 4.2	24	40
BMI, kg/m²	32.7 ± 5.1	25.1	43.8
Birth weight, grams	3140.5 ± 625.8	1800	4600

The age group 26 years and below (66 cases), 18 years age group (30 cases) and age group 36 years and above (20 cases) constituted most of the participants (56.9, 25.9, 17.2) respectively. In terms of BMI classification, 38 females (32.82) were overweight, 41 females (35.28) were having obesity, class I, 24 females (20.67) were having class II, 13 females (11.18) were having class III. Parity wise, 31 participants (26.7) were nulliparous, 39 participants (33.6) were primiparous and 46 participants (39.7) were multiparous. On gravida status, 42 (36.2) and 74 (63.8) women were primigravida and multigravida, respectively (Table 2).

Table 2. Baseline demographic and clinical characteristics of study participants

Variable	Frequency	Percentage
Age group		
18–25 years	30	25.9%
26–35 years	66	56.9%
36–45 years	20	17.2%
BMI class		
Overweight, 25–29.9 kg/m²	38	32.8%
Obese class I, 30–34.9 kg/m²	41	35.3%
Obese class II, 35–39.9 kg/m²	24	20.7%
Obese class III, ≥40 kg/m²	13	11.2%
Parity		
Nulliparous	31	26.7%
Primiparous	39	33.6%
Multiparous	46	39.7%
Gravida		
Primigravida	42	36.2%
Multigravida	74	63.8%

Cesarean section was the most common adverse outcome of the maternal outcomes at 76 (65.5), and it was done by 76 women. Fourty-two women, gestational diabetes mellitus, 34 women, gestational hypertension, and 19 women, preeclampsia, were reported. Agency outcomes were convincingly recorded with 31 neonates having macrosomia (26.7%), 24 neonates with a low birth weight (20.7%), 13 deliveries with shoulder dystocia (11.2%), and 8 incidences of stillbirth (6.9%). There were 20 participants where no adverse fetomaternal outcome was reported (17.2%) (Table 3).

Table 3. Frequency of adverse fetomaternal outcomes among pregnant women with high BMI

Adverse fetomaternal outcome	Frequency	Percentage
Gestational hypertension	34	29.3%
Preeclampsia	19	16.4%
Gestational diabetes mellitus	42	36.2%
Delivery by cesarean section	76	65.5%
Low birth weight	24	20.7%
Macrosomia	31	26.7%
Stillbirth	8	6.9%
Shoulder dystocia	13	11.2%

No adverse outcome observed	20	17.2%

As the adverse maternal outcomes were categorized as per class of the BMI, the prevalence rate of gestational hypertension was 15.8 percent in the overweight women, and 61.5 percent in women belonging to category III of obesity. This correlation with a p-value of 0.004 was statistically significant. Likewise, preeclampsia rose with the rise in BMI class and was found in 7.9% of women with overweight compared to 38.5% with BMI class III and showed statistically significant BMI class association (p=0.021). Gestational diabetes mellitus did not show a significant difference between the BMI class with a percentage that rose to 23.7% among overweight women and 69.2% among the women with class III obesity (p=0.006). There was a statistically significant positive relationship between the increasing BMI class with cesarean section having been done in overweight, 63.4, 75 and 100 with classes I, II and III respectively (Table 4).

Table 4. Stratification of maternal outcomes according to BMI class

Maternal outcome	Overweight n=38	Obese I n=41	Obese II n=24	Obese III n=13	p-value
Gestational hypertension	6(15.8 %)	10(24.4%)	10(41.7%)	8 (61.5 %)	0.004
Preeclampsia	3 (7.9%)	5(12.2 %)	6(25.0 %)	5 (38.5 %)	0.021
Gestational diabetes mellitus	9(23.7 %)	13(31.7%)	11(45.8%)	9 (69.2 %)	0.006
Cesarean section	19(50.0 %)	26(63.4%)	18(75.0%)	13 (100.0%)	0.003

Chi-square test or Fisher's exact test was applied as appropriate. A p-value ≤0.05 was considered statistically significant.

The higher BMI levels also tended towards an increasing pattern in fetuses. BMI class was found to be significantly class related with macrosomia in 13.2 percent of overweight, 24.4 percent, 37.5 percent and 53.8 percent of class I, II and III obese women respectively. The incidence of shoulder dystocia was found to be 2.6, 9.8, 16.7 and 30.8 percent among the overweight, class I, class II and class III obese women and the difference was statistically significant (p=.027). There were more cases of low birth weight and stillbirth in higher BMI groups, although their correlation with BMI group was not statistically significant with p-values of 0.187 and 0.168 respectively.

In general, the results indicated that poor maternal and infant outcomes were commonly witnessed in high BMI pregnant women. There was a significant association of increasing BMI class with gestational hypertension, preeclampsia, gestational diabetes mellitus, cesarean section, macrosomia and shoulder dystocia (Table 5).

Table 5. Stratification of fetal outcomes according to BMI class

Fetal outcome	Overweight n=38	Obese I n=41	Obese II n=24	Obese III n=13	p-value
Low birth weight	5 (13.2%)	8 (19.5 %)	7 (29.2 %)	4 (30.8 %)	0.187
Macrosomia	5 (13.2%)	10 (24.4 %)	9 (37.5 %)	7 (53.8 %)	0.013
Stillbirth	1 (2.6%)	2 (4.9 %)	3 (12.5 %)	2 (15.4 %)	0.168
Shoulder dystocia	1 (2.6%)	4 (9.8 %)	4 (16.7 %)	4 (30.8 %)	0.027

Chi-square test or Fisher's exact test was applied as appropriate. A p-value ≤0.05 was considered statistically significant.

DISCUSSION

The current study assessed the adverse fetomaternal outcomes in 116 pregnant women who had a high BMI attending a tertiary care hospital. The age of the participants in this research was 29.44 + 5.7 years, the gestational age at presentation was 31.6 + 4.2 weeks and the body-mass index (BMI) was 32.7 + 5.1 kg/m². The majority of the women were either overweight or class I obese with 31.9% in the class II or III obese. This burden of obesity in this obstetric population is aligned with the new evidences around the world which indicate that maternal overweight and obesity are causing significant potential pregnancy outcomes. Shirvanifar et al. have found out that obesity and overweight constituted a high percentage of complications such as diabetes during gestational stage, large-for-gestational-age birth and preeclampsia, which indicate the significance of BMI based antenatal risk assessment in the clinical context (1).

In the current research, 29.3 percent of the women developed gestational hypertension and there was a significant rising pattern with regard to the classes of BMI. It occurred in 15.8 percent of females with overweight, 24.4 percent of females with class I obesity and 41.7 percent with class II obesity and 61.5 percent with class III obesity. This dose-response is consistent with that of Abdi et al., who found that prepregnancy is overweight and obesity correlated with increased likelihood of adverse pregnancy outcomes, and hypertensive complications (2). Correspondingly, Siddiqui and colleagues discovered a relation between maternal obesity and severe preeclampsia, implying that overadiposity might be a contributor to endothelial dysfunction, systemic inflammation and abnormal placental vascular adaptation (3). Such processes could be the reason why the incidence of hypertensive disorders increased proportionally to the increase of the BMI class in the current study.

Preeclampsia was identified among 16.4 percent of the participants and also strongly related with the BMI class. The prevalence rose to 7.9 percent amongst overweight women to 38.5 percent among women who were having class III obesity. The result is similar to that of Nikolova et al., who established a very strong correlation between maternal obesity, especially severe obesity, with preeclampsia in women who had a cesarean section (4). Stogianni et al. also found that obesity in association with metabolic disorders, enhanced risks of preeclampsia and operative birth (5). The current observation thus concurs with the idea that obesity is not a case of uniform risk condition, but the level of obesity must be taken into account when making arrangements in regards to antenatal surveillance.In the current study, 36.2% of the women had developed gestational diabetes mellitus. Its prevalence increased to 69.2 in the class III obese women as compared to 23 7 in overweight women. This is biologically plausible since insulin resistance is a close fit to obesity and heightened by metabolic alterations occurring during pregnancy. According to Sgayer et al. late-onset gestational diabetes had been identified to have a higher adverse perinatal outcome such as the cesarean section and neonatal morbidity (6). It was also highlighted that maternal hyperglycemia has both short-term (macrosomia, neonatal hypoglycemia) and long-term (metabolic risks in the offspring) detrimental effects on the child (Al Bekai et al. 7). Li et al. also found that gestational diabetes predisposes cesarean delivery, shoulder dystocia and birth trauma with the predisposition being attributable to its relation to fetal overgrowth (8). The greater number of GDM in the study could be a contributing factor of the greater cesarean section, macrosomia and shoulder dystocia.

The adverse maternal outcomes in the current study included cesarean section (65.5 percent of those studied). There was a marked increase in the BMI category, with 50.0 percent overweight women up to 100.0 percent in the class III obese women. This finding is consistent with Brunner et al., who outlined the effects of overweight and obesity on the pregnancy as being multifactorial with physiological effects, high obstetric risk and difficulties in the prenatal and intrapartum care (9). Kurnaz and Karaçam confirmed that maternal obesity interventions can mitigate some of the negative outcomes, but prenatal weight is more crucial, and indirectly addresses the high burden of operative delivery in obese women (10). The elevated cesarean birth rate in the current study could be associated with macrosomia, unsuccessful induction, labor dystocia, fetal distress, hypertensive disorders and anxieties by the clinicians about complex vaginally birth delivery among the obese women.

In terms of fetal outcomes, 26.7% of newborns had a macrosomia. It rose sharply by 13.2 in the overweight females up to 53.8 in the women with a class III obesity. This observation agrees with Another study by Wu et al. that prepregnancy BMI was linked with the risk of macrosomia and that the relationship was modified by glycemic status (11). Another study by Song et al. has also reported that macrosomia or large-for-gestational-age birth was mediated by gestational diabetes between prepregnancy BMI and gestational diabetes (12). Salameh et al. mentioned the interconnection between maternal obesity and gestational diabetes and fetal macrosomia, pointing to the fact that maternal adiposity and hyperglycemia often go hand in hand and enhance the overgrowth of children (13). In the study under question, the association between high prevalence of GDM and macrosomia can be explained by simultaneous high prevalence of both disorders.

Shoulder dystocia was reported in 11.2% of the births and was significantly associated with higher BMI categories. It was also found in such small consideration of 2.6% among the overweight women, but this rose to 30.8% among the class III obese women. This observation conforms to Abdelwahab et al., who stated that the impact of diabetes during pregnancy was that it exposed the mothers to risks of shoulder dystocia even with lower birth-weight points (14). Pena et al. have also found factors relating to preventing the disappearance of macrosomia and shoulder dystocia in women with GDM who had received postpartum care glycemic management and fetal weight-among other factors (15). Marginal effects of obesity, GDM and macrosomia together possibly explain the correlation between the growing BMI and shoulder dystocia, in this study.One out of five neonates were found to have low birth weight, but the relationship between birth weight and BMI class was not found to be significant. Though the problem of obesity is generally related to fetal overgrowth, it can also be associated with placental dysfunction, hypertensive disease and medically-induced early birth, which can also lead to low birth weight. Weir et al. also found maternal obesity to elevate serious adverse risk of the neonates specifically in the case of GDM (16). The comorbidity of both low birth weight and macrosomia in the current report indicates that the high BMI could be a factor creating heterogeneous trends of fetal growth based on their related morbidity like high blood pressure, diabetes and placental activity. In 6.9 percent of cases stillbirth was witnessed and was more common in the higher BMI classes but the relationship was not statistically significant. This is possible because the sample size and the number of stillbirths are small making the lack of statistical significance. However, it is clinically important that this trend is observed. Population based evidence in recent years has revealed that maternal overweight and obesity are contributive to various more serious adverse pregnancy outcomes and in many cases, severe maternal obesity is also related to increased absolute risk (1,2). In resource constrained environments, late reservations, insufficient glucose monitoring, extraversion, and subpar blood pressure management and fetal monitoring can also augment the threat.

In general, the current research confirmed that high BMI during pregnancy was linked to high percentage of maternal and fetal morbidity. Increasing BMI class was significantly associated with gestational hypertension, preeclampsia, gestational diabetes mellitus, cesarean

section, macrosomia and shoulder dystocia. These results align with the recent literature that has been indexed in PubMed and proves the necessity of early BMI reporting, nutritional education, glucose testing, blood pressure management and a specific plan of delivering it. Other key points mentioned in the study include preconception weight optimization and structured antenatal follow-up of women with overweight and obesity.

CONCLUSION

BMI was found to be high during pregnancy and this was accompanied by poor fetomaternal outcomes. The most frequent maternal outcome was Cesarean section and the most frequent fetal outcome was Macrosomia. The frequency among the complications was highest in high BMI class, particularly the gestational hypertension, preeclampsia, gestational diabetes mellitus, cesarean section, macrosomia, and shoulder dystocia. Early assessment of the BMI, frequent antenatal check-ups, nutritional counseling and prompt obstetric care are advised to minimise the maternal and fetal complications.

Funding Source / Author Funding: none

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