



Maternal Complications in Obese Women During Pregnancy

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ABSTRACT

Background: Obesity during pregnancy has emerged as a major public health issue, contributing to multiple maternal complications that jeopardize both maternal and neonatal outcomes. Metabolic, hypertensive, and infectious disorders occur more frequently in obese expectant women, yet their burden in Pakistan remains underexplored. **Objective:** To determine the frequency of maternal complications in obese women during pregnancy. **Study Design:** Descriptive study. **Duration and Place of Study:** The study was carried out from February 2025 to May 2025 at the Department of Obstetrics and Gynaecology, Rawal Institute of Health Sciences, Islamabad. **Methodology:** A total of 369 obese pregnant women, aged 18–40 years with singleton pregnancies beyond 12 weeks of gestation, were included through non-probability consecutive sampling. Women with pre-existing diabetes, thyroid disorders, or congenital fetal anomalies were excluded. Obesity was defined as body mass index $>30 \text{ kg/m}^2$. Standard diagnostic criteria were used to identify maternal complications. **Results:** The mean age of participants was 29.75 ± 4.76 years, mean BMI $34.34 \pm 2.40 \text{ kg/m}^2$, and mean gestational age 27.37 ± 5.37 weeks. Impaired glucose tolerance was observed in 15.2%, gestational diabetes in 19.8%, pregnancy-induced hypertension in 20.1%, urinary tract infection in 17.6%, and vaginal candidiasis in 24.9% of women. Stratified analysis revealed significant associations of urinary tract infection with higher parity ($p < 0.001$) and impaired glucose tolerance with socioeconomic class ($p = 0.034$). **Conclusion:** Obesity in pregnancy is linked to considerable maternal complications, with gestational diabetes, pregnancy-induced hypertension, and infections being the most frequent.

INTRODUCTION

Pregnancy obesity is a public health concern because it is accompanied by negative outcomes for mothers and infant newborn babies.¹ Obese pregnant women are at increased risk for later pregnancy complications.¹ Excessive weight gain makes it hard to tolerate usual variations and can affect hormonal and metabolic balance.² This can lead to greater pain during delivery and labour and often necessitate surgery procedures.³ Besides short-term danger, pregnancy obesity can also have long-term consequences for mothers' health and increase odds for children to acquire obesity and metabolic syndromes later in life.^{2,3}

Reduced glucose tolerance is one of the most common complications among pregnant obese women and can further develop to gestational diabetes mellitus.⁴ The sensibility to insulin is already reduced among obese patients; pregnancy adds an extra stress by normal hormonal changes and creates extra insulin resistibility.⁵ Gestational diabetes complicates management during pregnancy and significantly enhances risk to create a large infant at birth (macrosomia), birth traumata and metabolic perturbations by birth among neonatal ones.⁶

For its mother itself, it significantly augments risk to delivery by cesarean section and at long term develops risk for type 2 diabetes mellitus significantly.⁷

Pregnancy-induced hypertension is yet another life-threatening condition ranging from mild elevation of blood pressure to severe preeclampsia.⁸ These can damage and affect organs, reduce placental blood supply and precipitate life-threatening complications like eclampsia.⁹ Because of these dangers, accurate blood pressure measurement is imperative for obese expectant women to prevent undesirable outcomes for fetus and mother equally.⁹

Other than metabolic and hypertensive diseases, obesity has also been implicated with raised incidence of infection during pregnancy amongst women.¹⁰ Urine tract infection is common due to physiological accommodation to urinary system as well as immune system disturbances, and urine glucose predisposes to bacterial multiplication.¹¹ Vaginal candidiasis is similarly raised amongst obese expectant women and has similarly been implicated with raised glucose and hormonal change disturbing vaginal flora.¹¹ These are usually considered insignificant but can cause much distress to out-patients and carry some risk of

precipitating preterm labour and/or other antepartum complications if left to oneself. Raised incidence amongst obese expectant women only makes it all the more imperative to have complete antenatal care with dietary advice and infection screens and close follow-ups to prevent complications and achieve satisfactory outcomes for mother and child.¹²

In a study conducted by Riffat J. et al., the reported prevalence of maternal complications among obese pregnant women included impaired glucose tolerance in 10.1%, gestational diabetes in 4%, pregnancy-induced hypertension in 10.1%, urinary tract infection in 20.2%, and vaginal candidiasis in 36.4% of cases.¹³

There is a growing obesity burden among reproductive-age women in Pakistan but little local information about its contribution during pregnancy. Pregnancy complications like gestational diabetes, hypertensive diseases, and infection are increasingly being recorded but their true prevalence among our population has yet to be fully explored. Conducting studies like this one will assist in generating evidence relevant to Pakistani women and to inform optimal antenatal care and risk stratification and preventive interventions to reduce maternal and neonatal morbidity.

METHODOLOGY

This descriptive study was carried out in the Department of Obstetrics and Gynaecology at *Rawal Institute of Health Sciences*, Islamabad, over a period from February 2025 to May 2025. A total of 369 participants were included. The sample size was estimated using the WHO software, based on a 95% confidence interval, a 2% margin of error, and an expected frequency of gestational diabetes of 4% among obese pregnant women.¹³ Sampling was done through a non-probability consecutive technique.

Approval for the study was obtained from the institutional ethics review board and from the College of Physicians and Surgeons Pakistan before recruitment began. Women between 18 and 40 years of age, carrying a singleton pregnancy confirmed by ultrasound, and with gestational age beyond 12 weeks according to the last menstrual period were eligible. Obesity was defined as a body mass index greater than 30 kg/m², calculated by dividing weight in kilograms by height in meters squared. Excluded were women with previously diagnosed type 1 or type 2 diabetes mellitus, known thyroid disease, history of bariatric surgery, major congenital anomalies on ultrasound, or substance use such as alcohol or illicit drugs during pregnancy.

Written informed consent was obtained from all participants, and confidentiality of data was ensured. Each woman's baseline information was documented. All women were followed until delivery, and assessments were conducted by the attending obstetrician. Maternal complications were evaluated during pregnancy. Impaired glucose tolerance was considered present when the 2-hour plasma glucose ranged between 140 and 199 mg/dL following a 75-gram oral glucose tolerance test. Gestational diabetes was diagnosed if any of the following criteria were met during the same test: fasting plasma glucose ≥ 92 mg/dL but < 126 mg/dL, 1-hour plasma glucose ≥ 180 mg/dL, or 2-hour plasma glucose ≥ 153

mg/dL. Pregnancy-induced hypertension was recorded when systolic blood pressure was ≥ 140 mmHg on two separate readings, taken 24 hours apart, after 20 weeks of gestation, in the absence of protein in the urine. Urinary tract infection was identified when pyuria (≥ 10 white cells/mm³ or ≥ 5 white cells per high-power field) was found along with a positive urine culture showing $\geq 5 \times 10^4$ colony-forming units per milliliter of a single bacterial species. Vaginal candidiasis was diagnosed in the presence of vulvovaginal itching, burning, curd-like discharge, and mucosal erythema, supported by a vaginal pH of 4.0–4.5 and microscopic detection of budding yeast or pseudohyphae on potassium hydroxide preparation. Data were processed using IBM SPSS version 26. Quantitative data were presented as mean \pm standard deviation or as median with interquartile range, depending on distribution tested by the Shapiro–Wilk method. Categorical variables were reported as frequencies and percentages. Maternal complications were stratified according to age, gestational age, parity, body mass index and socioeconomic class. Associations were tested using chi-square or Fisher's exact test, with a p-value ≤ 0.05 considered statistically significant.

RESULTS

The study analyzed 369 obese pregnant women with a mean age of 29.75 \pm 4.76 years, mean gestational age of 27.37 \pm 5.37 weeks, mean parity of 2.44 \pm 1.56, and mean BMI of 34.34 \pm 2.40 kg/m². The socioeconomic distribution showed 75 (20.3%) women from poor backgrounds, 235 (63.7%) from middle-class families, and 59 (16.0%) from affluent families (as shown in Table 1).

Table 1
Patient Demographics

Demographics	Mean \pm SD	
Age (years)	29.75 \pm 4.76	
Gestational Age (weeks)	27.37 \pm 5.37	
Parity	2.44 \pm 1.56	
BMI (Kg/m ²)	34.34 \pm 2.40	
Socioeconomic Status	Poor n (%)	75 (20.3%)
	Middle n (%)	235 (63.7%)
	Rich n (%)	59 (16.0%)

Regarding maternal complications, impaired glucose tolerance occurred in 56 (15.20%) women, gestational diabetes in 73 (19.80%) women, pregnancy-induced hypertension in 74 (20.10%) women, urinary tract infections in 65 (17.60%) women, and vaginal candidiasis was the most prevalent complication affecting 92 (24.90%) women (as shown in Table 2).

Table 2
Frequency of Maternal Complications Among Obese Women During Pregnancy

Maternal Complications	Frequency	% age	
Impaired Glucose Tolerance	Yes	56	15.20%
	No	313	84.80%
	Total	369	100%
Gestational Diabetes	Yes	73	19.80%
	No	296	80.20%
	Total	369	100%
Pregnancy Induced Hypertension	Yes	74	20.10%
	No	295	79.90%
	Total	369	100%

Urinary Tract Infection	Yes	65	17.60%
	No	304	82.40%
	Total	369	100%
Vaginal Candidiasis	Yes	92	24.90%
	No	277	75.10%
	Total	369	100%

The stratified analysis revealed detailed demographic associations across all complications. Age stratification showed that among women ≤ 30 years (n=201), impaired glucose tolerance occurred in 26 (12.9%) versus 175 (87.1%) without, gestational diabetes in 39 (19.4%) versus 162 (80.6%) without, pregnancy-induced hypertension in 37 (18.4%) versus 164 (81.6%) without, urinary tract infections in 33 (16.4%) versus 168 (83.6%) without, and vaginal candidiasis in 52 (25.9%) versus 149 (74.1%) without. Among women >30 years (n=168), the respective distributions were 30 (17.9%) versus 138 (82.1%) for impaired glucose tolerance, 34 (20.2%) versus 134 (79.8%) for gestational diabetes, 37 (22.0%) versus 131 (78.0%) for pregnancy-induced hypertension, 32 (19.0%) versus 136 (81.0%) for urinary tract infections, and 40 (23.8%) versus 128 (76.2%) for vaginal candidiasis, with no significant associations (p-values: 0.189, 0.841, 0.388, 0.509, and 0.649 respectively). Parity analysis showed that among women with ≤ 3 pregnancies (n=250), complications occurred as follows: impaired glucose tolerance in 34 (13.6%) versus 216 (86.4%) without, gestational diabetes in 47 (18.8%) versus 203 (81.2%) without, pregnancy-induced hypertension in 52 (20.8%) versus 198 (79.2%) without, urinary tract infections in 30 (12.0%) versus 220 (88.0%) without, and vaginal candidiasis in 60 (24.0%) versus 190 (76.0%) without. Among women with >3 pregnancies (n=119), the distributions were 22 (18.5%) versus 97 (81.5%) for impaired glucose tolerance, 26 (21.8%) versus 93 (78.2%) for gestational diabetes, 22 (18.5%) versus 97 (81.5%) for pregnancy-induced hypertension, 35 (29.4%) versus 84 (70.6%) for urinary tract infections, and 32 (26.9%) versus 87 (73.1%) for vaginal candidiasis, with urinary tract infections showing significant association (p<0.001). BMI stratification revealed that among women with BMI

≤ 35 kg/m² (n=227), complications occurred as: impaired glucose tolerance in 30 (13.2%) versus 197 (86.8%) without, gestational diabetes in 47 (20.7%) versus 180 (79.3%) without, pregnancy-induced hypertension in 44 (19.4%) versus 183 (80.6%) without, urinary tract infections in 46 (20.3%) versus 181 (79.7%) without, and vaginal candidiasis in 63 (27.8%) versus 164 (72.2%) without. Among women with BMI >35 kg/m² (n=142), the respective distributions were 26 (18.3%) versus 116 (81.7%) for impaired glucose tolerance, 26 (18.3%) versus 116 (81.7%) for gestational diabetes, 30 (21.1%) versus 112 (78.9%) for pregnancy-induced hypertension, 19 (13.4%) versus 123 (86.6%) for urinary tract infections, and 29 (20.4%) versus 113 (79.6%) for vaginal candidiasis, with no significant associations across all complications (p-values: 0.185, 0.574, 0.684, 0.091, and 0.113 respectively). Socioeconomic analysis showed that among poor women (n=75), complications were distributed as: impaired glucose tolerance in 8 (10.7%) versus 67 (89.3%) without, gestational diabetes in 12 (16.0%) versus 63 (84.0%) without, pregnancy-induced hypertension in 12 (16.0%) versus 63 (84.0%) without, urinary tract infections in 11 (14.7%) versus 64 (85.3%) without, and vaginal candidiasis in 22 (29.3%) versus 53 (70.7%) without. Among middle-class women (n=235), the distributions were 44 (18.7%) versus 191 (81.3%) for impaired glucose tolerance, 53 (22.6%) versus 182 (77.4%) for gestational diabetes, 50 (21.3%) versus 185 (78.7%) for pregnancy-induced hypertension, 43 (18.3%) versus 192 (81.7%) for urinary tract infections, and 59 (25.1%) versus 176 (74.9%) for vaginal candidiasis. Among affluent women (n=59), the respective distributions were 4 (6.8%) versus 55 (93.2%) for impaired glucose tolerance, 8 (13.6%) versus 51 (86.4%) for gestational diabetes, 12 (20.3%) versus 47 (79.7%) for pregnancy-induced hypertension, 11 (18.6%) versus 48 (81.4%) for urinary tract infections, and 11 (18.6%) versus 48 (81.4%) for vaginal candidiasis, with only impaired glucose tolerance showing significant association (p=0.034 using Fischer Exact Test) (as shown in Table 3)

Table 3
Association of Maternal Complications with Demographic Factors

Demographic Factors	Impaired Glucose Tolerance		Gestational Diabetes		Pregnancy Induced Hypertension		Urinary Tract Infection		Vaginal Candidiasis		
	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	Yes n(%)	No n(%)	
Age (years)	≤ 30	26 (12.9%)	175 (87.1%)	39 (19.4%)	162 (80.6%)	37 (18.4%)	164 (81.6%)	33 (16.4%)	168 (83.6%)	52 (25.9%)	149 (74.1%)
	>30	30 (17.9%)	138 (82.1%)	34 (20.2%)	134 (79.8%)	37 (22.0%)	131 (78.0%)	32 (19.0%)	136 (81.0%)	40 (23.8%)	128 (76.2%)
	p-value	0.189		0.841		0.388		0.509		0.649	
Parity	≤ 3	34 (13.6%)	216 (86.4%)	47 (18.8%)	203 (81.2%)	52 (20.8%)	198 (79.2%)	30 (12.0%)	220 (88.0%)	60 (24.0%)	190 (76.0%)
	>3	22 (18.5%)	97 (81.5%)	26 (21.8%)	93 (78.2%)	22 (18.5%)	97 (81.5%)	35 (29.4%)	84 (70.6%)	32 (26.9%)	87 (73.1%)
	p-value	0.221		0.492		0.604		<0.001		0.549	
BMI (Kg/m ²)	≤ 35	30 (13.2%)	197 (86.8%)	47 (20.7%)	180 (79.3%)	44 (19.4%)	183 (80.6%)	46 (20.3%)	181 (79.7%)	63 (27.8%)	164 (72.2%)
	>35	26 (18.3%)	116 (81.7%)	26 (18.3%)	116 (81.7%)	30 (21.1%)	112 (78.9%)	19 (13.4%)	123 (86.6%)	29 (20.4%)	113 (79.6%)
	p-value	0.185		0.574		0.684		0.091		0.113	
Socioeconomic Status	Poor	8 (10.7%)	67 (89.3%)	12 (16.0%)	63 (84.0%)	12 (16.0%)	63 (84.0%)	11 (14.7%)	64 (85.3%)	22 (29.3%)	53 (70.7%)
	Middle	44 (18.7%)	191 (81.3%)	53 (22.6%)	182 (77.4%)	50 (21.3%)	185 (78.7%)	43 (18.3%)	192 (81.7%)	59 (25.1%)	176 (74.9%)
	Rich	4 (6.8%)	55 (93.2%)	8 (13.6%)	51 (86.4%)	12 (20.3%)	47 (79.7%)	11 (18.6%)	48 (81.4%)	11 (18.6%)	48 (81.4%)
	p-value	0.034*		0.197		0.609		0.753		0.363	

DISCUSSION

The present study demonstrates that obesity during pregnancy is associated with substantial maternal morbidity, with vaginal candidiasis being the most

prevalent complication (24.9%), followed by pregnancy-induced hypertension (20.1%) and gestational diabetes (19.8%). The high prevalence of vaginal candidiasis in obese pregnant women can be attributed to the altered

immune function and increased insulin resistance associated with excess adiposity, which creates a favorable environment for *Candida* proliferation through elevated glucose levels in vaginal secretions and compromised local immunity. The significant occurrence of pregnancy-induced hypertension reflects the chronic inflammatory state induced by adipose tissue, which releases pro-inflammatory cytokines and adipokines that promote endothelial dysfunction, increased peripheral vascular resistance, and activation of the renin-angiotensin-aldosterone system. Gestational diabetes mellitus in nearly one-fifth of obese women occurs due to pre-existing insulin resistance exacerbated by pregnancy hormones, particularly human placental lactogen and cortisol, combined with the inability of pancreatic beta cells to compensate for increased insulin demands in the setting of obesity-related metabolic dysfunction.

The demographic analysis revealed intriguing patterns, with higher parity (>3) showing a significant association with urinary tract infections ($p<0.001$), which can be explained by the cumulative effects of multiple pregnancies on pelvic floor anatomy, bladder emptying efficiency, and urinary stasis. Interestingly, the significant association between socioeconomic status and impaired glucose tolerance, with middle-class women showing the highest prevalence (18.7%), may reflect dietary transition patterns where middle-income families often adopt processed, high-calorie Western dietary patterns while lacking the nutritional awareness or resources for optimal dietary choices that characterize higher socioeconomic groups. The absence of significant associations between BMI categories and most complications suggests that once obesity is established ($\text{BMI} >30 \text{ kg/m}^2$), the absolute degree of obesity may be less predictive of complications than the presence of obesity itself, indicating a threshold effect rather than a linear dose-response relationship.

The findings of the present study align substantially with previous research conducted in South Asian populations, demonstrating consistent patterns of maternal morbidity associated with obesity during pregnancy. Our observed prevalence of gestational diabetes (19.8%) closely matches the findings of Iqbal N et al.¹⁴ and Qadir A et al.¹⁸ who reported gestational diabetes rates of 22.33% and 32% respectively in obese pregnant women, while being considerably higher than the rates reported by Jahan E et al.¹⁹ at 31.7% and Jaleel R¹³ at 10.1% using the lower Asian BMI cut-off of $>23 \text{ kg/m}^2$. This variation likely reflects differences in diagnostic criteria, population characteristics, and the BMI thresholds used across studies, with our study employing the WHO standard $\text{BMI} \geq 30 \text{ kg/m}^2$ criterion similar to most recent investigations. The prevalence of pregnancy-induced hypertension in our cohort (20.1%) demonstrates remarkable consistency with Rahman S et al.¹⁵ who reported 67.3% PIH in obese women, though this higher rate may be attributed to their stricter case-control methodology and different population characteristics. Our findings align more closely with Qadir A et al.¹⁸ who observed 28% PIH prevalence and Jahan E et al.¹⁹ who reported 34.14% preeclampsia rates in obese primigravidae. The dose-response relationship observed by Inam I et al.¹⁶ where PIH rates increased from 15.6% in Class I obesity to 48.7% in Class

III obesity, supports our finding that obesity severity influences maternal complications, though our study did not stratify by obesity grades.

Our finding of high urinary tract infection rates (17.6%) corroborates the consistent pattern reported across multiple Pakistani studies, with Iqbal N et al.¹⁴ documenting 22.33% UTI prevalence (RR 2.09) and Jaleel R¹³ reporting 20.2% rates in overweight/obese women compared to 8.1% in normal-weight controls. The significant association between higher parity (>3) and UTI risk in our study ($p<0.001$) provides novel insights into the cumulative effects of multiparity on urogenital complications in obese women, a relationship not specifically examined in previous studies. The high prevalence of vaginal candidiasis (24.9%) in our cohort finds strong support in Jaleel R's¹³ findings of 36.4% candidiasis rates in overweight/obese women versus 5.1% in controls ($p<0.001$), reinforcing the role of obesity-induced metabolic alterations in predisposing to fungal infections.

The socioeconomic association with impaired glucose tolerance observed in our study, where middle-class women showed the highest prevalence (18.7%), contrasts with typical assumptions about poverty and health outcomes. This finding may reflect the nutrition transition phenomenon observed in developing countries, where middle-income families often adopt calorie-dense, processed diets while lacking the nutritional awareness or healthcare access available to higher socioeconomic groups. Jaleel R¹³ noted higher family history of diabetes (75.8% vs 47.5%) in overweight/obese women, suggesting genetic predisposition combined with lifestyle factors may explain our socioeconomic patterns. The absence of significant BMI-stratified differences in our study aligns with the concept that once obesity is established, the threshold effect predominates over linear dose-response relationships, though this contrasts with Inam I et al.'s¹⁶ clear demonstration of grade-specific increases in complications.

Our demographic profile showing mean BMI of $34.34 \pm 2.40 \text{ kg/m}^2$ closely parallels Bajaj G & Davu G's¹⁷ pooled analysis reporting mean BMI of 34.2 kg/m^2 in obese women, while our mean age of 29.75 ± 4.76 years aligns with the 25-30 year age range commonly reported in South Asian obstetric populations. The consistent pattern of maternal morbidity across these studies, despite varying methodologies and settings, underscores the robust association between maternal obesity and adverse pregnancy outcomes in South Asian women, supporting the need for standardized obesity management protocols in regional obstetric care.

Several limitations should be acknowledged in interpreting these findings. First, this was a single-center study conducted at one healthcare facility, which may limit the generalizability of results to other populations or healthcare settings with different patient demographics, care protocols, or resource availability. The cross-sectional design precludes establishment of causal relationships between obesity and maternal complications, as temporal associations cannot be definitively determined. Additionally, the study did not include a control group of non-obese pregnant women,

which would have strengthened the comparative analysis and allowed for calculation of relative risks for each complication. The absence of stratification by obesity grades (Class I, II, and III) represents another limitation, as previous studies have demonstrated dose-response relationships between increasing BMI categories and maternal morbidity.

CONCLUSION

Our study has concluded that maternal obesity during pregnancy is associated with significant maternal complications, with vaginal candidiasis being the most

prevalent complication, followed by pregnancy-induced hypertension and gestational diabetes. The demographic analysis revealed that higher parity significantly increases the risk of urinary tract infections in obese pregnant women, while socioeconomic status demonstrates a notable association with impaired glucose tolerance, with middle-class women showing the highest prevalence.

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