

Maternal and Fetal Outcomes in Obesity Complicated Pregnancies

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ABSTRACT

Background and Aim: Obesity in reproductive age women is growing to epidemic proportions causing adverse perinatal outcomes and various pregnancy complications. Pregnant women with obesity pose risks for child and maternal health in terms of intrapartum, antenatal, postpartum and neonatal complications. The current study aim was to find the maternal and fetal outcomes in complicated pregnancies of obese women.

Methodology: This cross-sectional study was conducted on 164 pregnant women in the Department of Obstetrics and Gynecology, Lahore General Hospital, from April 2021 to March 2022. Prior to study conduction, ethical approval was granted from the institution research and ethical committee. Informed consent was taken from each individual. Based on BMI index for pre-pregnancy, participants were categorized as normal weight (19-25 kg/m²), overweight (25-30 kg/m²), and obese (≥ 30 kg/m²). All the pregnant women with gestational age of 20 weeks who were willing to participate were enrolled. Underweight women with previous anomaly babies and miscarriage were excluded. Maternal and fetal outcomes were recorded. SPSS version 25 was used for data analysis.

Results: The overall mean age of the participants was 26.4 \pm 3.61 years. Based on BMI (kg/m²), the participants were distributed as follows: 26.8% (n=44) of normal weight (19-25 kg/m²), 28.1% (n=46) of overweight (25.0 - 30 Kg/m²), and 45.1% (n=74) of obese (≥ 30 kg/m²). Majority of overweight and obese women were ≥ 30 years old. Diabetes before pregnancy was strongly related to obesity (16.3%, $p < 0.0001$). Lower weight gain (10.3 \pm 6.9 Kg) were seen in obese pregnant women. Comparing to the normal weight women, overweight and obese women physical exercise more often ($p = 0.01$). Obese women were more susceptible to the risk of developing hyperglycemic disturbance (OR= 6.2; 3-10.5), hypertension (OR=6.8, 3.0-15.5), and HbA1c ≥ 6.5 % (OR=3.5; 1.1-10.8). Longer hospitalization (4.1 \pm 2.9 days) was seen in infants born to obese mother ($p = 0.005$). The gestational age babies born from obese mother had a proportion of (14.6%) ($p = 0.022$) with higher abdominal and thoracic circumference (30.7 \pm 2.1 cm) and (32.8 \pm 1.9 cm) respectively.

Conclusion: Our study concluded that adverse perinatal outcomes and pregnancy complications could be caused by obesity in pregnant women. Obese women were more susceptible to increase risk of developing gestational diabetes mellitus, postpartum complications, pregnancy related hypertensive disorders, pre-eclampsia, preterm birth, cesarean section, and longer hospital stay. The importance of weight status before and during pregnancy should be identified to have adequate treatment.

Keywords: Pregnancy, Maternal outcomes, Fetal outcomes, Obesity

INTRODUCTION

The excessive accumulation of adipose tissue in the body referred to overweight and obesity. Genetic, socioeconomic, behavioral, cultural, metabolic, and environmental factors are the reasons for these conditions. Obesity is a pandemic issue worldwide causing potential adverse effects on the fetus and mother due to the increasing prevalence among reproductive age group women. It contributes to certain preventable mortality per annum [1, 2]. Special care should be taken of pregnant women with obesity due to high-risk conditions in the obstetric system. With the growing rate of obesity, it is predicted that about 21% of women throughout the world will suffer from obesity by 2025 [3]. The prevalence of overweight and obesity in UK adults are 36% and 28% respectively [4]. Various research showed that the incidence of overweight and obesity is rising among children of all age's children in the past two decades [5, 6]. During pregnancy, the overweight or obese mother as determined by BMI are at higher risk if intrapartum, neonatal complications, postpartum complications. The escalating rise in obesity and under nutrition status among children is the dual burden, Pakistan is facing nowadays. Millions of people has alarmingly increased weight turned into obese group [7, 8].

Obese women are highly susceptible to gestational hypertension, postpartum hemorrhage, preeclampsia, cesarean delivery, gestational diabetes mellitus, and maternal death [9, 10]. Another study revealed the adverse effect of obesity on neonates and found that congenital abnormalities, stillbirth, miscarriage, preterm birth, and neonatal death could be the various risks developed [11]. The obesity associated risk increases in the postpartum phase in terms of depression, wound infection, and lower rate of breastfeeding compared to the general population. Maternal obesity is directly related to obesity in children and adults

[12]. Obese pregnant women are more susceptible to induction and cesarean delivery. Fetal macrosomia and maternal obesity has a dose-dependent association. Additionally, in most cases of stillbirths, mortality of babies in perinatal and postnatal periods are due to obesity among pregnant women [13]. The aim of the current study was to find out the different maternal and fetal outcomes in obesity complicated pregnancies.

METHODOLOGY

This cross-sectional study was conducted on 164 pregnant women in the Department of Obstetrics and Gynecology, Lahore General Hospital, from April 2021 to March 2022. Prior to study conduction, ethical approval was granted from the institution research and ethical committee. Informed consent was taken from each individual. Based on BMI index for pre-pregnancy, participants were categorized as normal weight (19-25 kg/m²), overweight (25-30 kg/m²), and obese (≥ 30 kg/m²). All the pregnant women with gestational age of 20 weeks who were willing to participate were enrolled. Underweight women with previous anomaly babies and miscarriage were excluded. Maternal and fetal outcomes were recorded. Demographic details and maternal characteristics such as age, smoking history, family history of hypertension and diabetes, current pregnancy, history of diabetes and hypertension, cardiovascular disease, previous cesarean section, and hypercholesterolemia were assessed and recorded. Maternal pregnancy outcomes after 37th gestational week were evaluated based on gestational weight gain, BMI, final weight gain, physical exercise during pregnancy, and other diseases such as genital infection, preeclampsia, urinary infection and hyperglycemic disorders. Glycated hemoglobin (HbA1c) levels were measured. During childbirth, other data such as mode of delivery,

birth weight, circumference of abdomen and thoracic, placental weight, and APGAR scores at 1, 5, and 10 minutes were collected. Hemoglobin, white blood cells, glucose levels, bilirubin, red blood cells, and hematocrit were assessed in the cord blood. Infant hospital duration, hypoglycemic episodes information, and malformations were recorded during neonatal period.

Data analysis was carried out through SPSS version 25. Numerical variables were expressed as mean and standard deviation. Qualitative variables were described as frequency and percentage. Post-stratification chi-square test was used for the comparison of different outcomes. Maternal, fetal, and delivery outcomes were evaluated using logistic regression model in order to measure odds ratios of their outcomes with confidence interval (95% CI) and 5% level of significance.

RESULTS

The overall mean age of the participants was 26.4±3.61 years. Based on BMI (kg/m²), the participants were distributed as follows; 26.8% (n=44) of normal weight (19-25 kg/m²), 28.1% (n=46) of overweight (25.0 - 30 Kg/m²), and 45.1% (n=74) of obese (≥30 kg/m²). Majority of overweight and obese women were ≥ 30 years old. Diabetes before pregnancy was strongly related to obesity (16.3%, p<0.0001). Lower weight gain (10.3 ± 6.9 Kg) was seen in obese pregnant women. Comparing to the normal weight women, overweight and obese women physical exercise more often (p=0.01). Obese women were more susceptible to the risk of developing hyperglycemic disturbance (OR= 6.2; 3-10.5), hypertension (OR=6.8, 3.0-15.5), and HbA1c ≥ 6. 5 % (OR=3.5; 1.1-10.8). Longer hospitalization (4.1 ± 2.9 days) was seen in infants born to obese mother (p=0.005). The gestational age babies born from obese mother had a proportion of (14.6%) (p=0.022) with higher abdominal and thoracic circumference (30.7 ± 2.1 cm) and (32.8 ± 1.9 cm) respectively. BMI-based distribution of all the participants is illustrated in Figure-1. Incidences of different disease history in participant women are shown in Figure-2. Table-I shows the baseline characteristics of participant pregnant women. Maternal and neonatal outcomes are shown in Table-II and Table-III respectively. Logistic regression is used for the association of maternal and fetal outcomes with body mass index as shown in Table-IV.

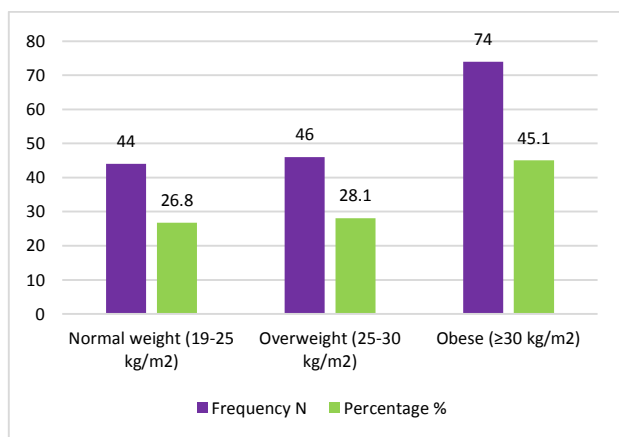


Figure-1: Distribution of the participants based on body mass index (n=164)

Table-1: Baseline characteristics (n=164).

Parameters	Normal weight N (%)	Overweight N (%)	Obese N (%)	P-value
Age (years)				<0.001
≤20	9 (20.5)	1 (2.2)	2 (2.7)	
21-30	30 (68.2)	34 (73.9)	54 (73)	
≥30	5 (11.3)	11 (23.9)	18 (24.3)	
Previous Pregnancies	10 (22.7)	8 (17.4)	11 (14.9)	0.246

1	11 (25)	13 (28.3)	19 (25.7)	
2	23 (52.3)	25 (54.3)	44 (59.4)	
≥3				
History of C/section	29 (66)	26 (56.5)	40 (54.1)	0.415
Nil	10 (22.7)	14 (30.4)	20 (27)	
1	5 (11.3)	6 (13.1)	14 (18.9)	
≥2				

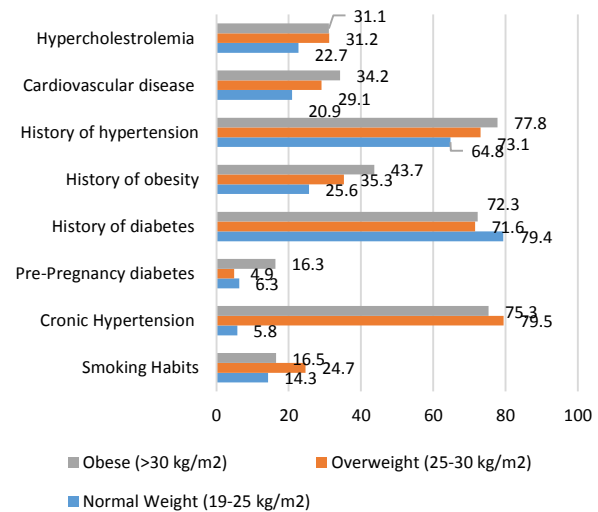


Figure-2: Different risk factors and diseases associated with obesity (%)

Table-2: Participant's women maternal outcomes

Variables	Normal Weight N (%)	Overweight N (%)	Obese N (%)	P-value
Weight gain (kg)	13.6±3.8	11.8±4.5	10.3 ± 6.9 Kg	<0.001
Pregnancy BMI (Kg/m ²)	22.6 ±1.3	28.2 ± 1.6	35.9±3.6	<0.001
Gestational BMI (kg/m ²)	29.3±1.7	33.2±2.1	39.6±4.9	<0.001
Physical activity (done)	19 (43.2)	38 (82.6)	59 (79.7)	0.010
Urinary infection	9 (20.5)	10 (21.7)	19 (25.7)	0.518
Genital infection	8 (18.2)	8 (17.4)	10 (13.5)	0.526
GDM	5 (11.4)	15 (32.6)	18 (24.3)	<0.001
MGH	8 (18.2)	11 (23.9)	17 (23)	0.005
HbA1c (%)				0.081
<6.5	41 (93.2)	37 (80.4)	59 (79.7)	
6.5-8	2 (4.5)	7 (15.2)	14 (18.9)	
>8	1 (2.3)	2 (4.4)	1 (1.4)	

Table-3: details of neonatal outcomes

Variables	Normal Weight N (%)	Overweight t N (%)	Obese N (%)	P-value
Delivery Mode				0.291
Cesarean	29 (65.9)	31 (67.4)	58 (78.4)	
Vaginal	15 (34.1)	15 (32.6)	18 (21.6)	
Gestational age (weeks)				0.526
<37	5 (11.4)	6 (13)	64 (86.5)	
>37	39 (88.6)	40 (87)	12 (13.5)	
Birth Weight (g)				0.294
<2500	3 (6.8)	4 (8.7)	3 (4.1)	
2500-4000	37 (84.1)	37 (80.4)	62 (83.8)	
>4000	4 (9.1)	5 (10.9)	9 (12.2)	
1 minute APGAR score	7.9 ± 1.8	7.8 ± 1.5	7.4 ± 1.7	0.137
5-minutes APGAR score	8.6 ± 0.9	8.7 ± 1.0	8.8 ± 0.9	0.139
10-minutes APGAR score	9.3 ± 0.7	9.2 ± 0.8	9.4 ± 0.7	0.128

Table-4: Association of maternal and fetal outcomes with obese

Variables	Obese versus normal weight OR (CI 95%)
Maternal outcomes	
Hypertension	6.8 (3.0-15.5)
Weight gain (kg)	0.3 (0.1-0.5)
Hyperglycemia	6.2 (3-10.5)
HbA1c \geq 6.5 %	3.5 (1.1-10.8).
Neonatal outcomes	
Newborn weight	2.1 (0.6 – 6.8)
1 minute APGAR score	0.5 (0.1 – 1.2)
5 minutes APGAR score	1.9 (0.1-30.9)
10 minutes APGAR score	3.6 (0.1-32)

DISCUSSION

The present study investigate the maternal and fetal outcomes in obesity complicated pregnant women and found that increasing body mass index from normal to obese condition significantly affect maternal and neonatal health. These adverse perinatal outcomes and pregnancy complications could be caused by obesity in pregnant women. Obese women were more susceptible to increase risk of developing gestational diabetes mellitus, postpartum complications, pregnancy related hypertensive disorders, pre-eclampsia, preterm birth, cesarean section, and longer hospital stay. Previous studies conducted by S. Ornaghi et al [14] and H. Berger et al [15] reported similar findings while studied increasing maternal body mass index and risk of pregnancy associated disorders such as pre-eclampsia, hypertension, cesarean section, GDM, labour induction, and postpartum complications.

The higher prevalence of MGH and GDM, increased gestational BMI and maternal weight were significantly related to obesity as reported in the current study. The obese group participants had longer hospital stay. During late pregnancy, risk of hyperglycemia, hypertension, and HbA1c was higher in obese group compared to normal weight group. Previous studies on association of obesity and risk of developing hyperglycemia and hypertension observed similar findings [16, 17].

Logistic regression performed in the present study showed that the risk of developing hyperglycemia and hypertension increased five-fold for the probability of their occurrence in obese women. However, the risk of increasing HbA1c \geq 6.5 % increased four-fold time as a determining factor for maternal outcomes. Central obesity is significantly associated with hyperglycemia and hypertension as a clinical standard for diagnosis of metabolic syndrome whose physiopathology varies between insulin resistance and obesity [18].

Another study by Poston et al. reported that pre-eclampsia and gestational hypertension could be developed mostly in obese patients than in control or normal weight [19]. Pregnancy induced hypertension had a strong association with maternal obesity reported by many researchers [20]. He et al [21] found that average age of pregnant obese women was similar and their prevalence in was as follows; 49.3% in 20-34 years, 42% >34 years, and 0.4% <20 years. In the present study, the overall mean age was 26.4 \pm 3.61 years which show the resemblance in characteristics of similar study.

Majority of the pregnant obese women in the current study delivered babies through cesarean section compared to a fraction of vaginal delivery. Tang et al [22] carried out their investigation on 8438 births among which 14% pregnancies were obesity complicated indicating the increased risk of obese women delivering their babies through cesarean section compared to normal BMI women. Hypertension and diabetes like cofounding factors were eliminated, yet, higher risk was found in obese women underwent cesarean section than control women.

Ram et al [23] advanced a theory that poor clinical outcomes (maternal) comes from inflammatory conditions that exist in normal pregnancy but exacerbated due to excessive weight gain and increased BMI. These poor maternal outcomes might lead to increased risk of gestational diabetes, preterm labour, preeclampsia, and cesarean section. In obese women, maternal

morbidity was substantially higher and was severe in cases where obesity and gestation diabetes existed at the same time. According to Ding et al [24] the poor pregnancy outcomes result from increased obesity during the pregnancy. These outcomes could be thromboembolism, gestational diabetes, delivery complications such as cesarean section, preterm labour, and preeclampsia. All the obese pregnant women were advised for dietary advice and to perform physical exercise irrespective of hyperglycemia and diabetes diagnosis. A proportion of these obese women adhered to physical exercise but still suffered from GDM and MGH due to shortage of time between admission and diagnostic tests. More than 60% obese pregnant women had reduced the risk of gaining excessive weight contributing to lower weight gain and lower BMI.

The present study identified obesity as one of the defensive parameters for avoiding excessive gain of weight without risking the babies. Consequently, maternal hypoglycemia causes poor neonatal outcomes. Another study by Wei et al. reported that fetal macrosomia is substantially related to various factors such as hyperglycemic levels, diabetes, pre-pregnancy body mass index, and macrosomia history during complicated pregnancies [25]. Another cohort study conducted by Liu et al. on 6125 deliveries using logistic regression analysis found that there was a significant relationship between meconium aspiration syndrome and neonatal macrosomia with maternal obesity irrespective of the exclusion of confounding variables [26]. Excessive fetal growth is normally connected with a BMI of 25 kg/m² and hyperglycemia, both of which are interdependent. As a result, determining the magnitude of such effects is nearly impossible. The majority of these admissions (12% of 22%) were caused by fetal distress. It was clear that maternal obesity had caused foetal distress and subsequent NICU admission.

CONCLUSION

Our study concluded that adverse perinatal outcomes and pregnancy complications could be caused by obesity in pregnant women. Obese women were more susceptible to increase risk of developing gestational diabetes mellitus, postpartum complications, pregnancy related hypertensive disorders, pre-eclampsia, preterm birth, cesarean section, and longer hospital stay. The importance of weight status before and during pregnancy should be identified to have adequate treatment.

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