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ORIGINAL ARTICLE

Comparison of Maternal and Fetal Outcome in Pregnant Women with BMI ≤ 25 KG/M2 and > 25 KG/M2 at Tertiary Care Hospital, Karachi

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ABSTRACT
Objective: To compare the frequency of maternal and fetal outcome in pregnant women with BMI ≤ 25 kg/m2 and > 25 kg/m2 at Tertiary Care Hospital, Karachi.
Study Design: Descriptive study.
Place and Duration: Study was conducted at Department of Gynaecology and Obstetrics, Aga Khan University Hospital. Duration was six months after approval from 7th November, 2019 till 7th May 2020.
Subjects and Methods: Data was prospectively collected from patients after taking a verbal consent. 201 patients who met the diagnostic criteria were included. Brief history was taken and demographic information was entered in the performa. Quantitative data was presented as simple descriptive statistics giving mean and standard deviation and qualitative variables was presented as frequency and percentages. Effect modifiers were controlled through stratification. Post stratification chi square test and t test was applied taking p-value of ≤0.05 as significant.
Results: A total of 201 patients were included in this study. Mean age in < 25 kg/m2 and > 25 kg/m2 BMI groups in our study was 27.21±6.24 years and 26.48±8.41 years. Out of 90 patients with BMI < 25kg/m2, 12.2%, 1.1%, 1.1%, 8.9%, 16.7%, 16.7%, 1.1%, 1.1% and 1.1% had gestational diabetes postpartum hemorrhage, pregnancy induced hypertension, anemia, birth weight < 2500 gm, perinatal mortality, still birth and early neonatal death. Whereas out of 111 patients with BMI > 25kg/m2, 26.1%, 7.2%, 18%, 15.3%, 18.9%, 1.8%, 2.7% and 1.8% had gestational diabetes postpartum hemorrhage, pregnancy induced hypertension, anemia, birth weight < 2500 gm, perinatal mortality, still birth and early neonatal death.
Conclusion: Obesity is a risk factor for maternal and fetal is evident from our study. Pre-pregnancy dietary counseling, regular physical activity, and a healthy lifestyle could help to reduce the incidence of gestational obesity and the incidence of perinatal complications as well.
Keywords: Body Mass Index, Maternal Outcomes and Fetal Outcomes.

INTRODUCTION
Inadequate healthcare and a high rate of maternal and infant mortality make Pakistan a poor developing nation [1]. Seventy percent of Pakistani women, primarily those living in rural areas, do not obtain antenatal care, which is strongly linked to poor maternal and perinatal outcomes [2]. Women of childbearing age have the highest obesity rates of any demographic [3]. At 38.4%, Pakistan's overweight female reproductive-age population is nearly double that of India's [4]. There is a correlation between obesity and both established and new medical issues. An increasing number of overweight mothers provide a significant challenge to obstetrics [5].

Thirty percent of pregnancy weight increase is due to maternal fat accumulation, and insulin resistance worsens throughout the second half of a normal pregnancy [6]. Trimester differences in weight gain composition are also seen. The early pregnancy weight gain in mothers is predominantly fat, which may have an effect on their long-term insulin resistance [7]. Diabetes mellitus (GM) is more common in patients who are overweight or have insulin resistance. Pregnancy and long-term health consequences of both mothers and their infants can be reliably predicted by abnormal or excessive GWG [8]. The nutritional health of a pregnant woman can be predicted in part by the mother's body mass index (BMI) [9]. Pregnancy outcomes can be affected by controllable factors such as maternal weight and dietary intake [10]. It has also been shown that babies born to obese mothers are more likely to have a low Apgar score and to die during pregnancy and childbirth [11]. Preterm birth is more common among underweight women, who tend to be of lower socioeconomic class, have lower levels of education, perform more manual labour, and have less health awareness [12]. Due in part to their inactivity, obese women tend to have their babies later than normal [13]. Verma et al. compared women with a body mass index (BMI) of less than 25 and those with a BMI of more than 25, finding that those with a BMI of less than 25 were less likely to experience adverse maternal outcomes like gestational diabetes mellitus (0.19%), postpartum haemorrhage (2.1%), pregnancy-induced hypertension (7.6%) and anaemia (41.1%) [14]. Birth weight 2500 gm (19.1% vs 14.8%), perinatal mortality (5.7 % vs 7.1 %), stillbirth (3.4 % vs 4.4 %), and early neonatal death (2.1 % vs 2.7 %) were also identified in the study by Short et al [15].

Since there is a dearth of local data due to the fact that data differs widely due to demographic, socioeconomic, and practise differences, the study's goal is to evaluate the frequency of maternal and foetal outcome in pregnant women with BMI 25 kg/m2 and > 25 kg/m2. This gives a compelling argument for expanding the obstetrician-gynecologists' expertise by studying these outcomes and comparing both groups with varying BMI at the same time. Patients from all around the country seek treatment at Aga Khan University Hospital because it is a Tertiary Care Hospital. Therefore, this study's findings would serve as a standard against which other hospitals might measure their own performance, facilitating the creation of management guidelines to cut down on these unwanted effects.

MATERIALS AND METHODS
This descriptive study was conducted at Department of Gynecology and Obstetrics, Aga Khan University Hospital. Duration was six months after approval 7th November, 2019 till 7th May 2020. The required sample size came out to be 201 patients. By taking the prevalence of postpartum hemorrhage (2.6%), [14] margin of error = 2.2% and confidence level 'C.I'=95%. This sample size was calculated using the WHO software. Patients with ages 20-45 years with singleton pregnancy assessed on ultrasound scan were included. Gestational age of patients was >12 weeks. Non-consenting, women with preexisting medical disorders such as type II diabetes mellitus, thyroid disease, essential hypertension, thrombophilia, chronic liver disease and cardiac disease, intrauterine growth restricted fetus, and un-booked cases were excluded.

The BMI of patients who were 12 weeks pregnant when they presented to the antenatal clinic was calculated. The researcher assessed the subjects' height and weight on a measuring tape and a weighing machine, respectively, and then used those values to make the calculation. Patients were then classified into two groups, those with a body mass index (BMI) below or above 25 kg/m^2. Patients' age, height, weight, body mass index, parity, gravida, monthly family income, and educational status will be noted. Antenatally, we check for complications like gestational diabetes, pregnancy-induced hypertension, and anaemia; at delivery, we will check for things like postpartum haemorrhage, low birth weight, perinatal mortality, and still birth; and for early neonatal death, we will keep an eye on the mother and baby until the seventh day after giving birth. There is a performa annexure with all the data entered.

Data was analyzed on SPSS Version 16. Mean and standard deviations for the quantitative variables like maternal age, height, weight and BMI was calculated. Frequencies and percentages for the qualitative variables like parity, gravida, family monthly income, educational status and adverse maternal outcome (gestational diabetes mellitus, postpartum hemorrhage, pregnancy induced hypertension and anemia) and adverse perinatal outcome (birth weight <2500 gm, perinatal mortality, stillbirth and early neonatal death) will be calculated. Chi-square was used to compare maternal and fetal outcomes between BMI ≤ 25 kg/m2 and >25 kg/m2.

RESULTS

Out of 90 patients in the < 25 kg/m2 BMI group minimum age of the patient was 20 while maximum age of the patients was 45 years. Mean age in our study was 27.21 years with the standard deviation of ±6.24. Whereas, height, weight and BMI in our study were 137±4.21 cm, 71.7±7.25 kg and 23.14±1.78 kg/m^2 respectively. Similarly, out of 111 patients in the > 25 kg/m2 BMI group minimum age of the patient was 20 while maximum age of the patients was 45 years. Mean age in our study was 26.48 years with the standard deviation of ±8.41. Whereas, height, weight and BMI in our study was 148±5.28 cm, 78.7±9.87 kg and 31.74±4.51 kg/m2. As shown in Table 1.

Table 1: Descriptive Statistics In Bmi < 25 Kg/M2 (90) And BMI > 25 KG/M2 (111)

Variable	Mean ± sd	Standard deviation	Min-max
AGE IN < 25KG/M2 GROUP(YEARS)	27.21	±6.24	20-45
AGE IN > 25KG/M2 GROUP (YEARS)	26.48	±8.41	20-45
HEIGHT IN < 25KG/M2 GROUP (CM)	137	±4.21	138-172
HEIGHT IN > 25KG/M2 GROUP (CM)	148	±5.28	138-172
WEIGHT IN < 25KG/M2 GROUP (KG)	71.7	±7.25	68-115
WEIGHT IN > 25KG/M2 GROUP (KG)	78.7	±9.87	68-115
BMI IN < 25KG/M2 GROUP (CM)	23.14	±1.78	22-25
BMI IN > 25KG/M2 GROUP (KG)	31.74	±4.51	26-33

Frequency distribution of age showed that out of 90 patients in the < 25 kg/m2 group, 64 (71.1%) and 26 (28.9%) were in age group 20-30 years and 31-45 years respectively. Whereas out of 111 patients in the > 25 kg/m2 group, 61 (55%) and 50 (45%) were in age group 20-30 years and 31-45 years respectively. Frequency distribution of parity showed that out of 90 patients in the <25 kg/m2 group, 61 (67.8%) and 29 (32.2%) were in < 2 and > 2 parity respectively. Whereas out of 111 patients in the >25 kg/m2 group, 73 (65.8%) and 38 (34.2%) were in < 2 and > 2 parity respectively. Frequency distribution of gravid showed that out of 90 patients in the < 25 kg/m2 group, 25 (27.8%) and 65 (72.2%) were in < 38 and > 38 week respectively. Whereas out of 111 patients in the > 25 kg/m2 group, 50 (45%) and 61 (55%) were in < 38 and > 38 week respectively. Frequency distribution of educational status showed that out of 90 patients in the < 25 kg/m2 group, 01 (1.1%), 02 (2.2%), 20 (22.2%) and 67 (74.4%) were in illiterate, primary, secondary and higher educational group respectively. Whereas out of 111 patients in the > 25 kg/m2 group, 03 (2.7%), 05 (4.5%), 29 (26.1%) and 74 (66.7%) were in illiterate, primary, secondary and higher educational group respectively. Frequency distribution of family income status showed that out of 90 patients in the < 25 kg/m2 group, 03 (3.3%), 26 (28.9%) and 61 (67.8%) were in lower, middle and upper income group respectively. Whereas out of 111 patients in the > 25 kg/m2 group, 01 (0.9%), 28 (25.2%) and 82 (73.9%) were in lower, middle and upper income group respectively. (Table 2)

Table 2: Baseline Details Of Included Patients

Variables	<25 kg/m2 group	>25 kg/m2 group
Age (years)		
20 to 30	64 (71.1%)	61 (55%)
31 to 45	26 (28.9%)	50 (45%)
Parity		
<2	61 (67.8%)	73 (65.8%)
>2	29 (32.2%)	38 (34.2%)
Gravid (weeks)		
<38	25 (27.8%)	50 (45%)
>38	65 (72.2%)	61 (55%)
Educational Status		
Illiterate	01 (1.1%)	03 (2.7%)
Primary	02 (2.2%)	05 (4.5%)
Secondary	20 (22.2%)	29 (26.1%)
Higher	67 (74.4%)	74 (66.7%)
Family Income status		
Lower	03 (3.3%)	01 (0.9%)
Middle	26 (28.9%)	28 (25.2%)
Upper	61 (67.8%)	82 (73.9%)

Stratification for gestational diabetes with respect to BMI showed that patients who had BMI < 25kg/m2, 11 (12.2%) and 79 (87.8%) had and did not have gestational diabetes respectively. Whereas, patients who had BMI > 25kg/m2, 29 (26.1%) and 82 (73.9%) had and did not have gestational diabetes respectively. P-value was 0.01. As presented in Table 3.

Table-3: Gestational Diabetes Mellitus In BMI < 25 KG/M2 (90) and BMI > 25 KG/M2 (111) n=201

Groups	Gestational diabetes mellitus		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	11 (12.2%)	79 (87.8%)	0.01

Stratification for postpartum hemorrhage with respect to BMI showed that patients who had BMI < 25kg/m2, 01 (1.1%) and 89 (98.9%) had and did not have postpartum hemorrhage respectively. Whereas, patients who had BMI > 25kg/m2, 08 (7.2%) and 103 (92.8%) had and did not have postpartum hemorrhage respectively. P-value was 0.01. As presented in Table 4.

Table-4: Postpartum Hemorhage In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Postpartum hemorhage		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	01 (1.1%)	89 (98.9%)	0.03
BMI > 25 KG/M2 GROUP	08 (7.2%)	103 (92.8%)	

Stratification for pregnancy induced hypertension with respect to BMI showed that patients who had BMI < 25kg/m2, 01 (1.1%) and 89 (98.9%) had and did not have pregnancy induced hypertension respectively. Whereas, patients who had BMI > 25kg/m2, 20 (18%) and 91 (82%) had and did not have pregnancy induced hypertension respectively. P-value was 0.01. As presented in Table 5.

Table-5: Pregnancy Induced Hypertension In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Pregnancy induced hypertension		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	01 (1.1%)	89 (98.9%)	0.01
BMI > 25 KG/M2 GROUP	20 (18%)	91 (82%)	

Stratification for anemia with respect to BMI showed that patients who had BMI < 25kg/m2, 08 (8.9%) and 82 (91.1%) had and did not have anemia respectively. Whereas, patients who had BMI > 25kg/m2, 17 (15.3%) and 94 (84.7%) had and did not have anemia respectively. P-value was 0.16. As presented in Table 6.

Table-6: Anemia In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Anemia		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	08 (8.9%)	82 (91.1%)	0.16
BMI > 25 KG/M2 GROUP	17 (15.3%)	94 (84.7%)	

Stratification for birth weight < 2500 gm with respect to BMI showed that patients who had BMI < 25kg/m2, 15 (16.7%) and 75 (83.3%) had and did not have birth weight < 2500 gm respectively. Whereas, patients who had BMI > 25kg/m2, 21 (18.9%) and 90 (81.1%) had and did not have birth weight < 2500 gm respectively. P-value was 0.67. As presented in Table 7.

Table-7: Birth Weight < 2500 GM IN BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Birth weight < 2500 gm		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	15 (16.7%)	75 (83.3%)	0.67
BMI > 25 KG/M2 GROUP	21 (18.9%)	90 (81.1%)	

Stratification for perinatal mortality with respect to BMI showed that patients who had BMI < 25kg/m2, 01 (1.1%) and 89 (98.9%) had and did not have perinatal mortality respectively. Whereas, patients who had BMI > 25kg/m2, 02 (1.8%) and 109 (98.2%) had and did not have perinatal mortality respectively. P-value was 0.68. As presented in Table 8.

Table-8: Perinatal Mortality In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Perinatal mortality		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	01 (1.1%)	89 (98.9%)	0.68
BMI > 25 KG/M2 GROUP	02 (1.8%)	109 (98.2%)	

Stratification for still birth hypertension with respect to BMI showed that patients who had BMI < 25kg/m2, 01 (1.1%) and 89 (98.9%) had and did not have still birth respectively. Whereas, patients who had BMI > 25kg/m2, 03 (2.7%) and 108 (97.3%) had and did not have still birth respectively. P-value was 0.67. As presented in Table 9.

Table-9: Still Birth In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Still birth		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	01 (1.1%)	89 (98.9%)	0.67
BMI > 25 KG/M2 GROUP	03 (2.7%)	108 (97.3%)	

Table-10: Early Neonatal Death In BMI < 25 KG/M2 (90) AND BMI > 25 KG/M2 (111) n=201

Groups	Early neonatal death		P-value
	Yes	No	
BMI < 25 KG/M2 GROUP	01 (1.1%)	89 (98.9%)	0.68
BMI > 25 KG/M2 GROUP	02 (1.8%)	109 (98.2%)	

Stratification for early neonatal death with respect to BMI showed that patients who had BMI < 25kg/m2, 01 (1.1%) and 89 (98.9%) had and did not have early neonatal death respectively. Whereas, patients who had BMI > 25kg/m2, 02 (1.8%) and 109 (98.2%) had and did not have early neonatal death respectively. P-value was 0.68. As presented in Table 10.

DISCUSSION

The obesity epidemic has become a global phenomenon from both a medical and social perspective. Obesity is currently considered the most prevalent metabolic disorder and a global epidemic. Obesity is described as excessive body fat that is extremely likely to result in health decline, increased morbidity, and death. Women of reproductive age have been impacted by the rapid increase in the incidence of obesity. Obesity during pregnancy is defined as a BMI greater than 30 kg/m2 during the initial prenatal counselling appointment. The Institute of Medicine (IOM) recommends a range of healthy weight increase during pregnancy for underweight (12.5–18.0 kg), normal weight (11.5–16.0 kg), overweight (7.0–11.5 kg), and obese (5.0–9.0 kg) pregnant mothers [16-20].

Obesity during pregnancy is associated with an increased risk of pregnancy complications, including miscarriage, foetal and congenital anomalies, thromboembolism, preeclampsia and gestational hypertension, foetal macrosomia, gestational diabetes mellitus, intrauterine growth restriction (IUGR), and stillbirth, as well as intrapartum, postpartum, and neonatal mortality. Compared to women with a normal BMI, women who are obese had a higher incidence of caesarean sections and a lower incidence of breastfeeding. Obesity may be a maternal mortality risk factor [21-24].

In addition to being a significant predictor of adverse maternal and neonatal health outcomes, gestational weight growth is also a significant predictor of adverse maternal and neonatal health outcomes. Inadequate weight gain is related with elevated risks of preterm birth and delivery of a low-birth-weight infant, whereas excessive weight gain is associated with elevated risks of gestational hypertension, preterm birth, delivery of a high-birth-weight infant, and caesarean delivery [25-28].

Our study covered 201 patients in total. In our study, the mean age in the 25 kg/m2 and > 25 kg/m2 BMI groups was 27.216.24 years and 26.488.41 years, respectively. 12.2%, 1.1%, 1.1%, 8.9%, 16.7%, 16.7%, 1.1%, 1.1%, 1.1%, and 1.1% of 90 patients with BMI 25kg/m2 suffered gestational diabetes, postpartum haemorrhage, pregnancy-induced hypertension, anaemia, birth weight 2500 g, perinatal mortality, stillbirth, and early neonatal death, respectively. In contrast, 26.1%, 7.2%, 18%, 15.3%, 18.9%, 1.8%, 2.7%, and 1.8% of 111 individuals with BMI > 25kg/m2 suffered gestational diabetes, postpartum haemorrhage, pregnancy-induced hypertension, anaemia, birth weight 2500 g, perinatal mortality, stillbirth, and early neonatal death, respectively.

Stubert et al. discovered that maternal obesity is linked to adverse clinical outcomes for both mother and child. Numerous dangers have been discovered to be linearly proportional to body mass index (BMI). Starting at a BMI of 29 kg/m2, the probability of conception decreases linearly by 4% for each additional 1 kg/m2 of BMI (hazard ratio 0.96, 95% confidence interval: [0.90; 0.99]). A 10% increase in pre-pregnancy BMI raises the risk of gestational diabetes and preeclampsia by roughly 10% each. Increasing the BMI by 5 kg/m2 increases the relative risk of intrauterine death to 1.24 [1.18; 1.30]. 11% of all newborn fatalities are thought to be attributable to the effects of maternal overweight and obesity. Nonetheless, in the majority of randomised controlled studies, nutritional and lifestyle treatments did not reduce the prevalence of gestational diabetes and foetal macrosomia to a clinically significant degree [29].

In another retrospective study, 7122 women participated. Our findings indicate a statistically significant association between overweight and obesity and gestational hypertension (adjusted odds ratio (AOR) = 15.3; 95% confidence interval [CI]: 9.025.8 for obesity), preeclampsia (AOR = 3.4; 95% CI: 1.96.0 for overweight and AOR = 13.2; 95% CI: 7.722.5 for obesity), and gestational diabetes mellitus (AOR = 1.9; In the group of obese women, the incidence of pregnancies terminated by caesarean section was greater. Gestational weight gain in excess of IOM (Institute of Medicine) standards was related with an increased risk of C-section delivery (AOR = 1.2; 95% CI 1.01.3), gestational hypertension (AOR = 1.7; 95% CI 1.02.7), and baby macrosomia (AOR = 1.7; 95% CI 1.32.1) [30].

Another study compared 932 pregnant women with a BMI more than 50 to 1232 pregnant women with a BMI less than 50. Women with a BMI more than 50 were slightly older, more likely to be multiparous, and had pre-existing comorbidities. There were no maternal deaths, but highly obese women had a nine-fold increased risk of thrombotic events compared to those with a BMI50 (uOR: 9.39 (95% CI: 1.15–76.0%)). A BMI>50 during pregnancy was associated with significantly increased risks of preeclampsia/eclampsia (aOR:4.88(95%CI: 3.11–7.65)), caesarean delivery (aOR:2.77(95%CI:2.31–3.32)), induction of labour (aOR:2.45(95% CI:2.00–2.99)), post-caesarean wound infection (aOR:7.25(95%CI:3. Twelve of the infants born to women in the cohort of severely obese mothers died in the early neonatal period or were stillborn [31]; these infants were stillborn or died during the neonatal period.

CONCLUSIONS

There is strong evidence from research that maternal and foetal morbidity increase with obesity in pregnancy. Comorbidities like diabetes are not required for the risk factor of obesity to be present. The same holds true for unnaturally large weight gains. The placenta is increasingly becoming recognised as a key player in foetal growth regulation. Treatment strategies appear to be promising, provided the following conditions are met:

- High-level adherence and monitoring of intervention by supervision of the training program
- Start of intervention prior to or concomitant with placental development to prevent irreversible negative metabolic conditioning.

The prevalence of prenatal obesity and associated perinatal problems may be mitigated through preconception counselling on nutrition, physical activity, and healthy lifestyle habits. The major objective should be making concerted attempts to minimise weight before pregnancy and excessive GWG. In general, it's good to get to a healthy weight before trying to conceive. Changes in diet and lifestyle that are maintained after pregnancy are the only way to reduce maternal and foetal morbidity in the long run.

The social and economic consequences associated with obesity-related pregnancy problems are substantial. In order to offer adequate care for women who are considered to be "at-risk," it is essential to first determine the incidence of maternal obesity on a national and regional scale. To reduce and control the dangers of maternal obesity, national clinical care guidelines for medical practitioners are required. Although more study is needed, there is already adequate data for maternity care to implement efforts to reduce hazards associated with pregnancies in obese women. Guidelines for clinical management based on a national agreement of experts are now in the works.

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