Original Article

A Comparative Study of Maternal and Fetal Outcome in Obese and Non-Obese Pregnant Women

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Abstract

Objective: To compare maternal and fetal outcomes between obese and non-obese pregnant women.

Methodology: The case control study was conducted at Department of Obstetrics and Gynecology, Azad Jammu and Kashmir Medical College, Muzaffarabad from November 2018 to October 2019. Pregnant women visiting to the department for antenatal visit in the first trimester were enrolled for the study. The women who had BMI > 30 were included in the cases group and women with BMI 18.5-25 were included in the control healthy group. All the enrolled women were followed at least four times during the pregnancy period for assessment of antenatal and maternal complications till delivery.

Results: The mean age of obese cases was 28.67±3.30 years similar to 28.84±1.316 years of healthy controls. The rate of preeclampsia (30.9% vs. 14.5%), eclampsia (21.8% vs. 7.3%) and gestational diabetes (27.3% vs. 9.1%) were significantly (p-value < 0.05) higher in obese cases as compared to normal healthy women. Significantly (p-value < 0.05) higher rates of IUGR (14.5% vs. 3.6%), preterm delivery (29.1% vs. 12.7%) and cesarean section (43.6% vs. 16.4%) were observed in obese cases. The mean birth weight (2.691 ± 0.52 vs. 2.424 ± 0.212 kg, p-value < 0.05) was noted significantly greater in obese group.

Conclusion: Maternal outcome was significantly better in women who had a healthy weight as compared to obese women. Maternal obesity is significantly associated with poor pregnancy outcomes resulting in major complications for mother and fetus. A proper management plan can reduce the feto-maternal morbidity and mortality associated with maternal obesity.

Keywords: Obesity, Maternal outcome, Fetal outcome, BMI.

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Introduction

Obesity has become a public health problem worldwide with psychological, physical, and social consequences. The problem of obesity has been known from centuries as a major risk factor for many chronic fatal diseases.

The world health organization (WHO) defines it as excess and abnormal accumulation of fat in the body causing many risks for health. Smoking is the most common health problem followed by obesity being at the second number. Obesity is becoming an epidemic in most of the industrial countries with day by day increasing prevalence of overweight and obesity. The prevalence of obesity is higher in females as compared to male population. The reasons might be weight gain during pregnancy, use of oral contraceptives and increase in weight due to estrogen etc. The limited social life and physical activity is also a common reason for increasing weight among females.[1] Obesity

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is an important non-communicable disease, WHO has declared it as major risk factor for maternal and child health. Other obesity related risk factors include infertility, maternal morbidity and issues related to newborn health.[2]

Maternal obesity and overweight at start of pregnancy and during the pregnancy significantly increases the chance of complications for antenatal, intrapartum, postpartum and neonate. The maternal complications in antenatal period, associated with obesity include recurrent miscarriage, congenital malformations, pregnancy induced hypertension, preeclampsia, gestational diabetes and venous thrombolismetc.[3]

Overweight and obesity also considerably increases the chance and prevalence of caesarean sections[4] Infants born to these overweight or obese mothers usually requires prolonged hospital admissions due to different complications.[5]

Improvements of maternal, fetal, neonatal and child health are key public health goals. Weight management in women could represent a strategic resource to reach this objective. In recent years the prevalence of obesity has increased significantly and has become most common comorbidity of pregnancy throughout the world. A high clinical care is required during the pregnancy to the mothers and developing baby because many studies have proved these pregnancies as high risk for different complications. Obesity can dysregulate the maternal physiology and metabolism, which may cause adverse outcomes during the pregnancy.[6,7]

The rate of obesity in pregnant women is rising rapidly, increasing the risk for maternal and child health. This problem is spreading widely and have got a significant importance due to its high impact on feto-maternal health outcome. Most of the problems due to maternal obesity during pregnancy are related to woman's health but it also has significant effect on fetus, neonate and older child. The comparison of pregnancy related complications showed that obese mothers have significantly higher chance as compared to normal weight pregnant women. In a study conducted by Awan S et al, it was noted that maternal complications including PIH (24% vs. 8%), preeclampsia (27% vs. 9%), gestational diabetes mellitus (22% vs. 5%) and postpartum hemorrhage (5% vs. 2%) were significantly higher in obese mothers as compared to normal weight mothers. The rate of caesarean section (44% vs. 16%) and wound infection (3% vs. 2%) were also significantly higher in obese mothers' group.[8,9]

The pre-gravid maternal obesity has more worse outcomes as compared to excessive weight gain during pregnancy. The main causes of obesity especially in females include sedentary lifestyle, fat and carbohydrates rich diet and irregular eating habits. Few studies have been done on prevalence of obesity and over weight in general population and pregnant women in our local population and have reported a high incidence rate both in males and females.[10]

The data on feto-maternal morbidity related to maternal obesity is lacking in Pakistan. Due to sharply increasing prevalence of obesity, this issue has become crucial. Therefore, this study was planned to determine the association of obesity with feto-maternal outcomes in our setup.

Methodology

This case control study was conducted in Obstetrics and Gynecology department Azad Jammu And Kashmir Medical College, Muzaffarabad. Pregnant women visiting to the department for antenatal visit in the first trimester were enrolled for the study. The women who had BMI >30 were included in the cases group and women with BMI 18.5-25 were included in the control healthy group. Approval of study was taken from Institution Review Board (hospital ethics review board). All the females in the study were briefly described about the study and informed written consent was taken. The women were selected by non-probability consecutive sampling technique.

A total of 55 cases and 55 controls were selected for the study. The sample size was calculated by using WHO sample size calculator on the basis of 5% level of significance, 90% power of test, population proportion (rate of cesarean section)4 4% in obese and 16% in normal controls.[9] All the women with singleton pregnancy presented in first trimester were selected for the study. The women presented with medical disorder like chronic hypertension, anemia, pre-pregnant diabetes, Scarred uterus, Placenta praevia, Cardiovascular disease, multiple pregnancy and miscarriage were excluded from the study. All the enrolled women were followed at least four times during the pregnancy period for assessment of antenatal and maternal complications during the pregnancy period till delivery. In maternal complication gestational diabetes, PIH, preeclampsia, eclampsia,

PPH, preterm delivery and mode of delivery were noted, and for fetal outcome, congenital anomalies based on anomaly scan, birth weight, APGAR score, NICU admission were recorded on a predesigned performa.

All the collected data was entered and analyzed with SPSS v. 21. Descriptive statistics including mean and standard deviation for numerical data and frequency and percentages for categorical data were calculated. Chi-square test was applied to compare different feto-maternal outcomes between obese and normal weight women. P-value < 0.05 was considered significant.

Results

In this case control study, the mean age of obese cases was noted, 28.67 ± 3.30 years similar to healthy controls with a mean age of 28.84 ± 1.316 years. The mean value of parity and body mass index were significantly (p-value < 0.05) different in both groups. The mean parity (1.05 ± 0.951 vs. 2.80 ± 0.869) was higher in healthy controls and mean BMI (32.89 ± 1.917 vs. 23.98 ± 1.080) was higher in the obese cases group.

There was no significant (p-value > 0.05) difference in gestational age (37.11 ± 1.641 vs. 36.87 ± 0.546) of cases and control groups. Quite a high number of cases (63.6 %) and controls (67.3%) were booked with the hospital with no statistically significant (p-value > 0.05) difference between both groups. Similarly, the education level of both cases and controls was comparable as elaborated in table I.

The results showed that the maternal outcome was significantly better in women who had a healthy weight as compared to obese women. The rate of preeclampsia was significantly (30.9% vs. 14.5%, p-value < 0.05) higher in obese cases in comparison to healthy controls. The rate of eclampsia (21.8% vs. 7.3%) and gestational diabetes (27.3% vs. 9.1%) was significantly (p-value < 0.05) associated with obesity as compared to a normal healthy weight. No statistically significant (p-value > 0.05) difference was noted in the frequency of hypertension among obese cases and healthy controls. A significantly (p-value < 0.05) higher rate of IUGR (14.5% vs. 3.6%), preterm delivery (29.1% vs. 12.7%), and cesarean section (43.6% vs. 16.4%) was observed in obese cases as compared to normal healthy controls who had normal weight as shown in table II.

The mean birth weight (2.691 ± 0.52 kg) of babies born to obese women was significantly (p-value < 0.01) higher as compared to healthy controls with mean value of (2.424 ± 0.212) kg. Three (5.5%) babies born to obese women were macrosomia and no baby had higher weight than normal in the healthy control group. There was a significant (p-value < 0.05) association of birth weight with BMI status of the women. There was a significantly (p-value < 0.05) higher rate of low APGAR score (<7) at 1 minute in the obese group (36.4% vs. 12.7%) as compared to the normal control group. Which remained significantly (p-value < 0.05) higher in the obese group (21.8% vs. 9.1%) as compared to babies born to women having normal weight after 5 minutes. The requirement of admission to NICU was significantly (p-

Table I: Description of Demographic characteristics of participants

Characteristics	Obese Cases (n=55)		Healthy Control (n=55)		P-value
	Frequency	Percentage	Frequency	Percentage	
Age of participants					
Mean ± SD	28.67 ± 3.300		28.84 ± 1.316		0.733
Parity distribution					
Mean ± SD	1.05 ± 0.951		2.80 ± 0.869		0.000
Body Mass Index					
Mean ± SD	32.89 ± 1.917		23.98 ± 1.080		0.000
Gestational age					
Mean ± SD	37.11 ± 1.641		36.87 ± 0.546		0.313
Booking status					
Booked	35	63.6	37	67.3	0.688
Non-booked	20	36.4	18	32.7	
Educational Level					
Illiterate	12	21.8	15	27.3	0.604
Under matric	17	30.9	11	20.0	
Intermediate	8	14.5	8	14.5	
Graduate	18	32.7	21	38.2	

Table II: Distribution of maternal outcome of both groups.

Characteristics	Obese Cases (n=55)		Healthy Control (n=55)		P-value
	Frequency	Percentage	Frequency	Percentage	
Preeclampsia					
Yes	17	30.9	8	14.5	0.041 *
No	38	69.1	47	85.5	
Eclampsia					
Yes	12	21.8	4	7.3	0.031 *
No	43	78.2	51	92.7	
Gestational Diabetes Mellitus					
Yes	15	27.3	5	9.1	0.013 *
No	40	72.7	50	90.9	
Hypertension					
Yes	12	21.8	6	10.9	0.122 *
No	43	78.2	49	89.1	
IUGR					
Yes	8	14.5	2	3.6	0.047 *
No	47	85.5	53	96.4	
Preterm delivery					
Preterm	16	29.1	7	12.7	0.035 *
Term	39	70.9	48	87.3	
Mode of delivery					
SVD	31	56.4	46	83.6	0.002 *
Cesarean Section	24	43.6	9	16.4	

** Difference is significant at 5% level of significance*

Table III: Distribution of fetal outcome of both groups.

Characteristics	Obese Cases (n=55)		Healthy Control (n=55)		P-value
	Frequency	Percentage	Frequency	Percentage	
Mean birth weight					
Mean ± SD	2.691 ± 0.52		2.424 ± 0.212		0.001 *
Birth weight					
Low Birth Weight	17	30.9	27	49.1	0.049 *
Normal Birth Weight	35	63.6	28	50.9	
Macrosomia	3	5.5	0	0	
APGAR score at 1 minute					
< 7	20	36.4	7	12.7	0.004 *
≥ 7	35	63.6	48	87.3	
APGAR score at 5 minutes					
< 7	13	21.8	5	9.1	0.039 *
≥ 7	42	78.2	50	90.9	
NICU admission					
Yes	31	56.4	15	27.3	0.002 *
No	24	43.6	40	72.7	

** Difference is significant at 5% level of significance*

value <0.05) greater (56.4% vs. 27.3%) in obese women group as compared to normal weight controls as elaborated in table III.

Discussion

In this case control study, the effect of maternal obesity on perinatal and maternal health were studied in our population. Literature shows that obesity is a major risk factor for poor maternal and fetal outcomes. The results of a meta-analysis showed that women who were obese before or during the pregnancy had a significantly higher risk of poor maternal outcomes like pregnancy-induced hypertension, preeclampsia, gestational diabetes, caesarian section delivery and postpartum hemorrhage. It shows that a higher BMI of mothers contributes 10% to 35% adverse maternal health outcomes.[10]

An increase in maternal and fetal morbidity due to maternal obesity during pregnancy is well supported by

results from different studies. Maternal obesity or excessive weight gain during pregnancy is itself a risk factor for poor outcome independent of comorbidities like diabetes. There is growing evidence that the placenta plays an important role in the regulation of fetal growth. The normalization of weight before getting pregnant has many advantages and improves the feto-maternal outcome. It is very important to maintain the dietary and lifestyle changes beyond pregnancy for long term reduction of maternal and fetal morbidity.[11,12]

The results of this present study showed that the maternal outcome was significantly better in women who had a healthy weight as compared to obese women. The rate of preeclampsia was significantly (30.9% vs. 14.5%), eclampsia (21.8% vs. 7.3%), and associated with obesity as compared to a normal healthy weight. These results are supported by many studies like in study Robert JM et al, found that the risk of preeclampsia increases 3 times among obese mothers as compared to normal weight mothers. Maternal obesity is the leading cause of preeclampsia in developed countries.[13]

In our study there was no statistically significant (p-value > 0.05) difference in frequency of hypertension among obese cases and healthy controls but these results are not in accordance to previous studies like in a study, Takai et al found that hypertensive disorders in pregnancy were significantly higher in the obese (42.0% vs. 24.7%) in contrast to pregnant women of normal weight. Our present study showed a significant association of gestational diabetes (27.3% vs. 9.1%) with obesity similar to results of Takai et al and Bloomgarden et al studies, who found a very higher rate of gestational diabetes mellitus in the obese (41.3% vs. 26.1%) women in comparison to normal weight pregnant women.[14,15] A significantly (p-value < 0.05) higher rate of IUGR (14.5% vs. 3.6%), preterm delivery (29.1% vs. 12.7%) was recorded in this present study. Similar results have been reported by other studies like in a study it was observed that 28.8% of babies had IUGR in a sample of obese pregnant women.[16]

According to the results of this present study, the c-section rate was significantly associated with overweight and obesity. The cesarean section rate was very high among obese women (43.6% vs. 16.4%) as compared to normal healthy controls. This high rate of c-section among obese women is also supported by other studies in the literature like in a study conducted in the USA it was observed that the rate of c-section increases as the weight of the mother increases. It was noted that 40.8% of obese and 56.6% of morbidly obese women required cesarean delivery.[17,18]

In the present study, the rate of preterm deliveries was considerably (29.1% vs. 12.7%) higher in obese women as compared to normal controls. Results were parallel to the study of Driul et al.[19] who also found that the preterm birth rate was significantly higher in the obese group.

According to the results of this present study, there was a significantly (p-value < 0.05) higher rate of low APGAR score (<7) at 1 minute (36.4% vs. 12.7%) and (21.8% vs. 9.1%) at 5 minutes in the obese group as compared to the normal control group. The requirement of admission to NICU was significantly (p-value < 0.05) greater (56.4% vs. 27.3%) in the obese women group as compared to normal weight controls. These results are in agreement with other studies like the study conducted by Callaway et al, who reported that newborn ICU requirement was markedly higher in the obese group in comparison to normal controls, due to a high rate of pregnancy-related complications were present in babies born to obese mothers.[20]

The genomes of many chronic diseases begin to develop during the embryonic phases because of interactions between genotypic variations and maternal health status. A healthy status of the mother prevents many variations in the genome. So, the healthy weight of the mother is very important before and at beginning of pregnancy to prevent offspring from future illnesses.

Inadequate weight in the form of “too little” gain or “too much” gain throughout the pregnancy indicates a risk for both mother and baby because both situations have a significant association with poor feto-maternal outcomes of any pregnancy. Since the prevalence of obesity and overweight is rising sharply throughout the world, the women of child bearing age are also in the first line of victims of this disease. Both the conditions, inadequate BMI, and over than normal BMI are significantly associated with negative maternal and neonatal outcomes.[21]

Conclusion

Poor pregnancy outcomes including major maternal and fetal complications are associated with maternal obesity. Pregnant women with higher than normal BMI should be treated as high risk pregnancy with a proper management plan, to reduce the maternal and perinatal

morbidity and mortality associated with maternal obesity. Proper weight should be maintained before planning for pregnancy. The reduction of excess weight before pregnancy and controlling it to normal limits during pregnancy can help in preventing the majority of the adverse effects related to maternal obesity.

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