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ORIGINAL ARTICLE

Obesity in Pregnancy Maternal and Fetal Outcome

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ABSTRACT

Background: The presence of excessive weight in mothers during pregnancy and childbirth can result in significant issues in different stages of pregnancy, delivery, postpartum and also newborn health. The aim of the present study was to examine the influence of maternal obesity on diverse consequences for both the mother and the developing baby. The main objective was to contrast the effects of obesity on outcomes during pregnancy and childbirth for overweight expectant mothers versus those with a healthy weight.

Material and Methods: The investigation was carried out on pregnant women who attended the antenatal clinic at Indus Medical College Tando Muhammad Khan. The investigators utilized a sequential sampling technique and handpicked 56 cases and 56 controls. The data was analyzed using IBM SPSS 22.0 software. The chi-square test was used to identify discrepancies in proportions, while the independent t-test and ANOVA were utilized to contrast the means. They also conducted Pearson's correlation to investigate the connection between maternal BMI and birth weight.

Results: There were a total of 112 patients included in the study. There were 56 cases (patients) and 56 controls (healthy individuals). Women with gestational diabetes mellitus had a significantly higher proportion of complications compared to those without gestational diabetes mellitus (32.1% vs. 7.14%, p-value=0.02). Regarding the mode of delivery, women who underwent caesarean section had a significantly higher proportion of complications compared to those who had a vaginal delivery (37.5% vs. 62.5%, p-value=0.02). For post-partum complications, the proportion of women with postpartum fever and wound infection was very low, and no statistical comparison was made.

Conclusions: The current research provided clear evidence that maternal obesity can result in negative outcomes for both the mother and fetus. In addition, the study showed that there was an increased need for induction of labor and operative interventions in women who were obese.

Keywords: Fetal outcome, Maternal outcome, obesity in pregnancy

INTRODUCTION

The prevalence of obesity during pregnancy has been associated with numerous challenges for both the mother and the unborn child. Maternal obesity is characterized by a body mass index (BMI) of 30 or higher, and it impacts roughly 20% of expectant mothers globally.[1]

Evidence has demonstrated that the presence of obesity while pregnant escalates the likelihood of experiencing gestational diabetes, high blood pressure, premature delivery, and fetal demise.[2,3] The fetal risks associated with maternal obesity include macrosomia, congenital anomalies, and neonatal hypoglycemia. Several studies have found that maternal obesity adversely impacts a mother's health and the health of her fetus. In a systematic review and meta-analysis study[1], maternal obesity was associated with 2.78 times higher risks of gestational diabetes, 2.38 times higher risks of gestational hypertension, and 2.19 times higher risks of preeclampsia. As well as the preterm birth risk, obese women are at 1.8 times higher risk for stillbirth and 1.4 times higher risk for preterm birth. Another systematic review and meta-analysis study[2] also looked at the link between a mother's weight and risk of stillbirth. Women who are obese are 30% more likely to give birth to a stillborn child than women who are not obese. The study also reported a 40% increased risk of neonatal death in babies born to obese women. According to Johansson et al, research has indicated that maternal obesity is linked to unfavorable pregnancy results.[3] The study found that maternal obesity increased the risk of preterm birth by 30%, shoulder dystocia by 60%, and macrosomia by 130%. The study also reported a 30% increased risk of congenital anomalies in babies born to obese women. Numerous studies have demonstrated that the occurrence of overweight and obesity among children of all age groups has been progressively increasing over the last few decades.[4] Pregnant women who have a higher body mass index (BMI) are more likely to face several health issues during pregnancy, childbirth, and postpartum, which can affect both the mother and the newborn. These complications can range from high blood pressure and diabetes to fetal deaths and bigger-sized babies. Caesarean sections and postdate pregnancies are also more common in overweight or obese mothers. Therefore, it is crucial to manage weight and maintain a healthy BMI during pregnancy to minimize the risk of such complications.[5–7] Women who are overweight or obese have a higher probability of being given induction to initiate labor and needing a C-section for delivery.[8,9] There seems to be a connection between the amount of maternal obesity and the likelihood of fetal macrosomia, with the risk increasing as the maternal obesity level rises.[10] Furthermore, obese pregnant women have been observed to experience still births and higher rates of infant mortality during the postnatal and perinatal periods.[11] The main goal of this research was to investigate different outcomes for both the mother and fetus, which are affected by maternal obesity. Specifically, the aim was to determine how obesity impacts the outcome for pregnant women and their babies in comparison to women who have a normal weight.

MATERIAL AND METHODS

The research was carried out in department of Indus Medical College Tando Muhammad Khan. The study was designed as a prospective, and its focus was on antenatal women who had registered during the period of six months, specifically during their first trimester. The study group consisted of 56 antenatal women who were receiving outpatient care at the hospital, while the control group was also made up of 56 antenatal women attending the same department. The eligibility requirements for the study sample encompassed individuals who were open to taking part and fulfilled the inclusion criteria.

The study only included pregnant women in their first trimester who had a body mass index (BMI) of ≥30 kg/m^2 or higher, regardless of their age and previous childbirths, as long as they were willing to participate. Women who had not received antenatal care during their first trimester, those who had experienced miscarriages or had babies with abnormalities in the past, and those with a BMI <30 kg/m^2 were not considered for the study. The

control group consisted of pregnant women in their first trimester whose BMI ranged from 25.1 kg/m^2 to 29.9 kg/m^2.

During the study period, it was possible to recruit a total of 112 women, consisting of 56 cases and 56 controls.

The collection of information during this period also included the indication for labour induction, the mode of delivery (vaginal or caesarean), as well as details regarding shoulder dystocia and instrumental delivery. The participants in the study were monitored from the time of delivery through their postpartum period until they were released from the hospital.

Before conducting the study, the Institutional Ethical Committee granted ethical permission.

Statistical Analysis: The statistical software used for data analysis was SPSS IBM version 22.0. For categorical variables, a ratio was employed, while for numerical variables, an average, a middle value, a span, and a variability measure were computed. The chi-square examination was utilized to ascertain the significance of the distinct proportions, and a p-value of 0.05 was deemed statistically noteworthy. The autonomous t-test and ANOVA were employed to determine the significant disparities in averages. The study compared two groups for antepartum, intrapartum complications, and neonatal outcomes.

RESULTS

There were 112 participants in the study. Table 1 shows the distribution of various demographic and medical characteristics of 56 cases (patients) and 56 controls (healthy individuals) in a study.

Age group: There are more than half of cases (57.1%) in people aged 26-31, followed by 37.5% in people aged 32-36, and 5.3% in people aged 21-25. No cases were reported in the age group of >36 years. In contrast, controls were more evenly distributed across age groups, with the highest proportion (64.2%) in the age group of 26-31 years.

Occupation: The majority of cases (83.9%) are housewives, whereas controls are mostly from class I and II occupations (92.8%). The proportion of skilled and unskilled workers is very low in both cases and controls.

Socio-economic status: The majority of cases and controls belong to class IV and V socio-economic status. However, a slightly higher proportion of cases (35.7%) belong to class III, whereas a slightly higher proportion of controls (46.4%) belong to class V.

Gravida and parity: Cases and controls are similar in terms of the number of gravida and parity. However, a higher proportion of cases (35.7%) are in their first pregnancy (primipara), whereas a higher proportion of controls (32.1%) have one child (parity one).

Previous abortion: Cases are more likely to have a history of previous abortion (17.85%) compared to controls (16.0%).

Childhood obesity: Cases and controls have a similar distribution of childhood obesity, with 26.7% of cases and 33.9% of controls reporting a history of childhood obesity. **Table 1**

Table 2 shows the mean height of cases was 157 ±5.3 cm, while that of controls was 158 ±5.8 cm.

The mean weight of cases was 87 ±7 kg, while that of controls was 61 ±3.7 kg.

The mean BMI of cases was 36 ±3.4 kg/m2, which is considered obese, while that of controls was 24 ±1.5 kg/m2, which is considered normal.

The mean pulse rate of cases was 85 ±7 beats per minute, while that of controls was 80 ±7.3 beats per minute.

The mean systolic blood pressure of cases was 120 ±20 mmHg, while that of controls was 106 ±12 mmHg. The mean diastolic blood pressure of cases was 80 ±10 mmHg, while that of controls was 71 ±8 mmHg. These differences in blood pressure values between cases and controls may be clinically significant and warrant further investigation**. Table 2**

Table 3 presents the outcomes, cases, controls, and P-values for different variables related to pregnancy and delivery. The P-values indicate the statistical significance of the association between the outcome and the exposure.

For antepartum complications, women with gestational diabetes mellitus had a significantly higher proportion of complications compared to those without gestational diabetes mellitus (32.1% vs. 7.14%, p-value=0.02). Similarly, women with gestational hypertension had a significantly higher proportion of complications compared to those without gestational hypertension (39.2% vs. 7.14%, p-value <0.001). Women with preeclampsia and those who required induction of labour also had significantly higher proportions of complications compared to those who did not have these conditions (p-value=0.003 and 0.013, respectively).

Regarding the mode of delivery, women who underwent caesarean section had a significantly higher proportion of complications compared to those who had a vaginal delivery (37.5% vs. 62.5%, p-value=0.02).

For post-partum complications, the proportion of women with postpartum fever and wound infection was very low, and no statistical comparison was made. **Table 3**

Based on the provided table, 4 the following information can be inferred:

The study compared cases and controls in terms of various fetal and neonatal outcomes.

Cases had a higher mean estimated fetal weight (3.44 ± 0.42) compared to controls (2.91 ± 0.21), with a mean difference of 0.425 and a 95% confidence interval (CI) of 0.257-0.704. This distinction exhibited statistical importance, showing a p-value <0.0001.

Cases also had a higher mean amniotic fluid index (12.69 ± 3.1) compared to controls (10.29 ± 2.3), with a mean difference of 2.315 and a 95% CI of 1.251-3.440. This difference was statistically significant with a p-value of <0.0001.

There was a tendency for cases to exhibit a higher average neonatal birth weight (3.22 ± 0.87) compared to controls (2.8 ± 0.29), with a mean deviation of 0.122 and a 95% confidence interval ranging from -0.031 to 0.477. However, this disparity was not statistically significant, as indicated by a p-value of 0.062.

Regarding neonatal gestational age, there was no noteworthy distinction observed between cases and controls. The mean deviation was 78.871, and the 95% confidence interval ranged from -233.66 to 75.843. The p-value associated with this comparison was 0.213. **Table 4**

Table 1: Demographic Profile of the participants (n=112).

Profile	Cases (n=56)	Control (n=56)
Age group (in years)		
21-25	3 (5.3%)	8 (14.2%)
26-31	32 (57.1%)	36 (64.2%)
32-36	21 (37.5%)	12 (21.4%)
>36	0	0
Occupation		
Housewife	47 (83.9%)	52 (92.8%)
Skilled worker	4 (7.14%)	2 (3.57%)
Unskilled worker	3 (5.35%)	1 (1.78%)
Clerk	1 (1.78%)	1 (1.78%)
Semi Professional	1 (1.78%)	0
Socio-economic status		
Class I	0	0
Class II	1 (1.78%)	0
Class III	17 (30.3%)	9 (16.0%)
Class IV	20 (35.7%)	21 (37.5%)
Class V	18 (32.1%)	26 (46.4%)
Gravida		
Primipara	20 (35.7)	26 (46.4)
Multipara (2nd Gravida)	20 (35.7)	12 (21.4)
Multipara (3rd Gravida)	11 (19.64)	15 (26.7)
Multipara (4th Gravida)	5 (8.92)	3 (5.35)
Parity		
Zero	21 (37.5%)	26 (46.4%)
One	26 (46.4%)	18 (32.1%)
Two	7 (12.5%)	11 (19.6%)
Three	2 (3.57%)	1 (1.78%)
Previous abortion		
Yes	10 (17.85%)	47 (83.9%)
No	46 (82.1%)	9 (16.0%)
Childhood obesity		
yes	15 (26.7%)	19 (33.9%)
No	41 (73.2%)	37 (66.0%)

Table 2: The study population's vital parameters (n=112).

Parameters	Cases Mean (SD) n =56	Controls Mean (SD) n =56
Height (cm)	157 ±5.3	158 ±5.8
Weight (kg)	87 ±7	61 ±3.7
BMI (kg/m2)	36 ±3.4	24 ±1.5
Pulse rate (per min)	85 ±7	80 ±7.3
Systolic blood pressure (per mmHg)	120 ±20	106 ±12
Diastolic blood pressure (per mmHg)	80 ±10	71 ±8

Table 3: Obstetric complications and neonatal mortality associated with maternal obesity. (n=112).

Outcomes	Cases	Controls	P-value
Antepartum complication			
Gestational diabetes mellitus			
Yes No	18 (32.1%) 38 (67.8%)	4 (7.14%) 52 (92.8%)	0.02*
Gestational hypertension			
Yes No	22 (39.2%) 34 (60.7%)	4 (7.14%) 52 (92.8%)	<0.001*
Preeclampsia			
Yes No	13 (23.1%) 43 (76.7%)	2 (3.57%) 54 (96.4%)	0.003*
Need for induction of labour			
Yes No	11 (19.6%) 45 (80.3%)	2 (3.57%) 54 (96.4%)	0.013*
Mode of delivery			
Vaginal Caeserean section	35 (62.5%) 21 (37.5%)	49 (87.5%) 7 (12.5%)	0.02*
Post-partum complications			
Postpartum fever			
Yes No	3 (5.35%) 53(94.6%)	0 56 (100%)	-
Wound infection			
Yes No	3 (5.35%) 53(94.6%)	0 56 (100%)	-

Table 4: Numerous factors are associated with maternal obesity (n=112).

Characteristics	Mean (SD)	Mean difference	95% CI	p value
Estimated fetal weight				
Case Control	3.44 (±0.42) 2.91 (±0.21)	0.425	0.257-0.704	<0.0001
Amniotic fluid index				
Case Control	12.69 (±3.1) 10.29 (±2.3)	2.315	1.251-3.440	<0.0001
Neonatal birth weight				
Case Control	3.22 (±0.87) 2.8 (±0.29)	0.122	-0.031-0.477	0.062
Neonatal gestational age				
Case Control	37.54 (±2.8) 38.5 (±4.3)	78.871	-233.66-75.843	0.213

DISCUSSION

Obesity during pregnancy is a growing concern, affecting a significant proportion of pregnant women worldwide. Based on a report issued by the World Health Organization (WHO), there has been a notable increase in obesity levels among women in the childbearing age group (15-49 years) who are anticipating a baby. Roughly 15% of these women are classified as overweight or obese while being pregnant. This upsurge in obesity during gestation has been associated with diverse adverse effects on the health and welfare of both the mother and the developing fetus, profoundly affecting their overall state.[12]

Excessive weight during pregnancy raises the likelihood of different maternal issues, such as gestational diabetes mellitus (GDM), pregnancy-related hypertension, preeclampsia, blood clotting incidents, and surgical delivery.[13] Research has indicated that overweight women face an increased likelihood of experiencing gestational diabetes mellitus (GDM), a form of diabetes that emerges during pregnancy and can result in difficulties for both the mother and the infant. Moreover, overweight women have a greater propensity to develop hypertensive disorders while pregnant, like preeclampsia, which can contribute to premature birth, the unfortunate demise of both the mother and the infant, and enduring cardiac complications.[14] The most recent inquiry unveiled a significant statistical correlation (p = 0.02) between maternal obesity and gestational diabetes mellitus. This finding corresponds to previous studies conducted by Uebe K et al and Abenhaim HA et al., who also observed an elevated probability of gestational diabetes mellitus in women with excess weight.[15,16]

The percentage of people who experienced gestational hypertension and pre-eclampsia exceeded that of the comparison groups (with a p-value <0.001 and 0.003, respectively). Several studies have definitively established a comparable association between maternal obesity and pregnancy-related high blood pressure.[17–19]

Some of the unfavorable fetal consequences linked to obesity during pregnancy include macrosomia, stillbirths, neonatal fatalities, congenital abnormalities, and childhood obesity.[20] Fetal macrosomia, which is more prevalent in overweight women, raises the likelihood of birth harm, shoulder dystocia, and low blood sugar in newborns. Moreover, research indicates that obesity during pregnancy augments the chances of fetal demise and neonatal mortality, despite the fact that the precise mechanisms are not completely comprehended.[21] Moreover, offspring born to overweight mothers face an elevated probability of encountering obesity and metabolic ailments in the future, underscoring the significance of tackling obesity during pregnancy as a matter of public health importance.[22]

The current research has found that there was a higher demand for inducing labor among the participants, with a percentage of 20%. This outcome has been previously documented.[23] The proportion of instances leading to a cesarean delivery was markedly greater in comparison to the reference group, with 37.5% of instances necessitating the operation compared to merely 12.5% in the reference group. Numerous other investigations have also documented an increased prevalence of cesarean deliveries among mothers who are overweight.[16,24,25] According to the report, caesarean section was performed due to failed induction (4%), macrosomia (18%), and prolonged labour (6%). This aligns with the results of previous studies which also found prolonged labour to be a common reason for caesarean section.[19,23,26]

The admission of the infants to the neonatal intensive care unit (NICU) was primarily caused by fetal distress, which accounted for most of the admissions (12% out of 22%). It was evident that the mother's obesity had caused fetal distress, which consequently resulted in the baby being admitted to the Neonatal Intensive Care Unit (NICU). Similar research has also indicated analogous findings, indicating that infants born to overweight mothers had a higher likelihood of NICU admission.[27,28]

CONCLUSION

Based on the current research, both the unborn child and the mother may experience adverse consequences as a result of the mother's excessive weight. Maternal obesity was discovered to have a significant correlation with prenatal problems, including gestational diabetes mellitus, gestational hypertension, and preeclampsia. Furthermore, maternal obesity was linked to a higher probability of requiring labor induction and increased medical interventions during childbirth. Another connection between maternal obesity and larger-than-average infants, as well as postpartum issues like wound infection and fever, is that it leads to a notable increase in the levels of amniotic fluid. Obese women exhibited higher rates of neonatal intensive care unit (NICU) admissions for their babies due to fetal distress. To fully comprehend the complete clinical implications of maternal obesity on both pregnancy and the offspring, further examination is necessary, particularly in areas such as neurodevelopmental outcomes and the likelihood of future offspring developing obesity.

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