Original Article

Pregnancy outcome in overweight and obese mothers at a tertiary care Hospital

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Abstract

Introduction: Maternal obesity has been associated with increased risk of adverse pregnancy outcomes. The aim of this study was to determine the impact of increased body mass index on pregnancy outcome in women delivering at Tribhuvan University Teaching Hospital.

Methods: This was a retrospective comparative study carried out in the Department of Obstetrics and Gynecology of TU Teaching Hospital. The study was carried from 1st April 2016 to 31st July 2016. Women were categorized according to booking BMI into three groups: normal (18.5–24.9kg/m^2), overweight (25.0-29.9 kg/m^2) and obese (≥30 kg/m^2). Obstetrical and neonatal outcomes were evaluated using normal group as reference. The outcome variables were maternal hypertensive disorders, type of labor and delivery, blood loss, hospital stay, birth weight, preterm delivery and NICU admission.

Results: During the study period, there were 228 mothers of whom 114 were normal weight, 85 overweight and 29 obese. The mean age and multipara were significantly higher in over weight and obese as compared to normal weight women. The overweight and obese mothers were at an increased risk of hypertensive disorders (OR3.3, 95%CI 1.4-8.1 and OR10.8, 95%CI 3.9-30.0), cesarean section (OR 2.2 95%CI 1.2-3.8 and OR 4.2, 95%CI 1.7-10.2), post partum hemorrhage (OR 3.8 95%CI 1.0-14.9), longer mean hospital stay and adverse neonatal outcome like macrosomia, preterm birth and NICU admission.

Conclusions: Overweight and obese mothers appear to be at an increased risk of hypertensive disorders, cesarean section, postpartum hemorrhage and neonatal problems like macrosomia, preterm birth and NICU admission in comparison to normal weight mothers.

Key words: obesity, overweight, pregnancy outcome.

Introduction

The prevalence of obesity has increased substantially over the past few decades throughout the world. In USA, more than half of pregnant women are overweight or obese, and around 8% are morbidly obese.[1] In Nepal according to NDHS 2011, about 11.2% of women were overweight and 2.2% were obese. The prevalence of overweight and obesity has increased by 5% since 2006.[2] Due to this fact; increasing women are overweight or obese at the time of starting pregnancy.

Maternal obesity has been associated with increased risk of adverse pregnancy outcomes for both the mother and the baby. It has been associated with increased maternal risk of hypertensive complications, gestational diabetes, induction of labor, cesarean delivery, increased blood loss.[4,5,6] Adverse fetal outcome includes decreased apgar score, still birth, macrosomia, neonatal death etc.[7,8,9] The aim of this study was to determine the impact of increased body mass index on pregnancy outcome in women delivering at Tribhuvan University Teaching Hospital.

Methods

This was a retrospective comparative study carried out in the Department of Obstetrics and Gynecology of Tribhuvan University Teaching Hospital. The

study was carried out from 1st April 2016 to 31st July 2016. The inclusion criteria was booked patient at TU teaching hospital with first antenatal visit within 14 weeks of pregnancy, singleton and delivered ≥ 28 weeks of gestation. Still birth and babies with congenital anomaly were excluded. Women were categorized by booking BMI, which was the BMI taken within the first fourteen weeks of pregnancy. BMI was categorized according to World Health Organization (WHO) into three groups: normal (18.5–24.9kg/m2), overweight (25.0-29.9 kg/m2) and obese (≥30 kg/m2).[10] Overweight or obese mothers who delivered meeting the inclusion and exclusion criteria were taken as the study group and woman with normal BMI who had delivered immediately after them were taken as the reference. Data on baseline maternal characteristics like age, parity, ethnicity, educational status, residence were obtained. The height and weight of the mother was recorded from antenatal card. Obstetrical and neonatal outcomes were evaluated. The obstetric outcomes were hypertensive disorders of pregnancy, type of labor and delivery, blood loss and hospital stay. Neonatal outcomes were birth weight, preterm delivery and NICU admission. Mother and babies were followed till discharge.

After the data collection, it was entered in computer. Computer software SPSS 15 was used for processing and analysis of the data. Descriptive analysis of the result was done through frequency analysis and cross-tabulation to determine the percentage. Quantitative data was compared by using t-test. To determine the relationship between the BMI categories and outcome variables chi-square test was applied. The odds ratio (OR) and corresponding 95% confidence intervals (CIs) of the outcome variable was estimated using a uni-variate analysis. P value <0.05 was regarded as statistically significant. Permission to conduct the study was taken from the department head. Confidentiality of the collected information was maintained.

Results

During the study period, there were 114 mothers delivered who were overweight or obese in their first ANC visit. Among these, 85 were overweight and 29 were obese. 114 normal weight mothers were taken as reference group during the same period.

The mean BMI in the overweight and obese group was 28.6 kg/m^2, while it was 21.8 kg/m^2 in normal weight group. The mean age was significantly more (27.3±4.1 vs 24.9±3.8 years) and there were more multipara (56; 49.1% vs 29; 25.4%) in the overweight and obese group than in the normal weight. Most of the mothers were of Indo-Aryan ethnicity, had studied grade 10 or more and from Kathmandu valley but there was no significant difference between the different BMI groups on these parameters (Table 1).

Table 1. Maternal characteristics of normal and overweight, obese BMI categories

characteristics		Normal BMI n=114 (%)	Over wt and obese BMI n=114 (%)	P value
Age(years), mean±SD		24.9±3.8	27.3±4.1	0.000*
Weight (kg), mean±SD		52.3±14.7	66.3±9.3	0.000*
Height (mt), mean±SD		1.51±0.14	1.52±0.05	0.329
BMI (kg/mt^2), mean±SD		21.8±2.0	28.6±3.4	0.000*
Gest age at 1st ANC visit (wk), mean±SD		10.4±2.6	11.4±2.4	0.003*
Parity	Primi	85 (74.6)	58(49.1)	0.000*
	Multi	29(25.4)	56(50.9)	
Ethnicity	Tibeto-Burmans	41(36.0)	43(37.7)	0.784
	Indo-aryans	73(64.0)	71(62.3)	
Education status	<10 class	14 (12.3)	25(21.9)	0.053
	≥ 10 class	100(87.7)	89(78.1)	
Residence	Kathmandu	94 (82.5)	90(78.9)	0.502
	Outside Kathmandu	20(17.5)	24(21.1)	

*p value <0.05

Medical disorders was more as the BMI of the mother increased with 14 (12.3%) in normal weight group, 22 (25.9%) in overweight and 18(62.1%) in obese group. The most common medical disorder was hypertensive disorders followed by heart disease, gestational diabetes and hypothyroidism. There was one case of postpartum pulmonary embolism in an obese mother who survived with timely diagnosis and treatment. (Not shown in table)

Comparison of obstetrical outcome based on booking BMI is presented in Table 2.

Table 2. Obstetrical outcome across BMI categories.

	Normal weight n=114(%)	Overweight n=85(%)	OR(95%CI)	P value	Obese n=29(%)	OR(95%CI)	P value
Hypertensive disorders of preg	8(7.0)	17(20.0)	3.3(1.4-8.1)	0.006*	13(44.8)	10.8(3.9-30.0)	0.000*
Induced labor	25(21.9)	16(18.8)	0.8(0.4-1.7)	0.592	4(13.8)	0.6(0.2-1.8)	0.947
Cesarean section	44(38.6)	49(57.6)	2.2(1.2-3.8)	0.008*	21(72.4)	4.2(1.7-10.2)	0.001*
Fetal distress	22(19.3)	24(28.2)	1.6(0.8-3.2)	0.139	5(17.2)	0.9(0.3-2.5)	0.800
Labor dystocia	11(9.6)	9(10.6)	1.1(0.4-2.8)	0.827	2(6.9)	0.7(0.1-3.3)	0.645
Mec stain liquor	15(13.2)	20(23.5)	2.0(0.97-4.2)	0.057	2(6.9)	0.5(0.1-2.3)	0.352
PPH (blood loss≥500ml)	3(2.6)	8(9.4)	3.8(1.0-14.9)	0.038*	1(3.4)	1.3(0.1-13.2)	0.812
Blood loss(ml),mean±SD	162±127	228±259		0.019*	187±84		0.311
Hospital stay (Day),mean±SD	2.9±2.0	5.7±7.4		0.000*	8.4±11.9		0.000*
Postnatal stay (day), mean±SD	2.3±1.6	4.1(5.4)		0.001*	4.4±4.5		0.000*

Note: *p < 0.05 as compared to normal weight group (reference category).

The values are presented as n (%) with Odds Ratio or mean±SD

Hypertensive disorder was three times more in the overweight (OR3.3, 95%CI 1.4-8.1) and ten times more in the obese group (OR10.8, 95%CI 3.9-30.0) as compared to the normal weight group. There were five cases of gestational diabetes, one in overweight and four in obese group (not shown in table). The likelihood of Cesarean Section increased with increasing BMI, with highest risk in the obese women (OR 4.2, 95%CI 1.7-10.2). The risk of postpartum hemorrhage was 3.8 times higher in the overweight group and the mean blood loss was significantly more as well (162±127ml vs 228±259ml, p=0.019). Regarding the duration of hospital stay, both total hospital stay and postnatal stay was significantly more in the increased BMI group (p=0.000).

Table 3 shows the data on neonatal outcome.

Table 3. Neonatal outcome across BMI categories.

	Normal weight n=114(%)	Overweight n=85(%)	OR(95%CI)	P value	Obese n=29(%)	OR(95%CI)	P value
Birth weight(gm), mean±SD	2977±362	3171±598		0.005*	3196±853		0.037*
BW ≥3500	12(10.5)	28(32.9)	4.2(2.0-8.8)	0.000*	9(31.0)	3.8(1.4-10.3)	0.005*
BW ≥4000	1(0.9)	7(8.2)	10.1(1.2-84.1)	0.009*	4(13.8)	18.1(1.9-168.8)	0.001*
Pre term (<37 wks)	10(8.8)	11(12.9)	1.5(0.6-3.8)	0.334	8(27.6)	3.9(1.4-11.2)	0.006*
NICU admission	1(0.9)	6(7.1)	8.6(1.0-72.7)	0.019*	2(6.9)	8.4(0.7-95.7)	0.043*

Note: *p < 0.05 as compared to normal weight group (reference category).

The values are presented as n(%) with Odds Ratio or mean±SD

The mean birth weight increased as the maternal BMI increased. Overweight and obese mothers were more likely to have babies ≥3500gm than normal weight mothers (OR 4.2, 95%CI 2.0-8.8 and OR 3.8 95%CI 1.4-10.3 respectively). Taking macrosomia as babies ≥4000gm, overweight and obese mothers were 10 and 18 times more likely to have macrosomic babies. There were significantly more preterm (<37 weeks) babies born by obese mothers (OR 3.9, 95%CI 1.4-10.3). Babies born to overweight and obese mothers were eight times more likely to be admitted for NICU care (OR 8.6 and 8.4 respectively) in comparison to normal weight mothers. One baby born to obese diabetic mother with birth weight of 5200gm was diagnosed with hypertrophic obstructive cardiomyopathy and died on 5th day of life.

Discussion

Overweight and obesity during pregnancy and delivery is a growing problem in developing and more so in the developed countries. It has not been studied much in Nepal and this hospital based study may provide data on the maternal characteristics and the pregnancy outcome of mothers entering pregnancy with increased BMI. Mother with booking BMI up to 14 weeks have been taken in the present study, as it has been shown that maternal weight does not usually increase much in the first trimester and the baseline BMI during pregnancy can be calculated accurately up to 18-20 weeks gestation.[11]

In the older studies, from 1992 to 1994 the prevalence of overweight and obese women ranged from 11-19% in South Asian countries.[12,13,14] In a study carried out among 2989 pregnant Vietnamese women in 2007-2008, the proportion of women with high pre pregnant BMI (≥23kg/m^2) was 8.5%.[15] In a study of body mass index of Nepalese women attending gynecology clinic, the prevalence of overweight and obesity was 37.3% and 10.1% respectively.[16] Study done by Sebire et al (2001) showed that among 287,213 singleton pregnancies in London, 27.5% were overweight and 10.9% were obese.[17] A population based study done in Canada on the perinatal outcome of maternal overweight and obese in term infants also showed among 1996 participants 23.6% to be overweight and 10.6% to be obesity.[18] Studies have shown that, women with higher parity and increasing age were more likely to be overweight and obese.[2,5,9,15,19]

This study has shown that maternal overweight and obesity in early pregnancy is associated with increased risk of hypertensive disorders of pregnancy, cesarean section, increased blood loss and hospital stay as well as adverse neonatal outcome.

In the present study there was significant association of hypertensive disorder in the overweight and obese women (OR 3.3 95%CI 1.4-8.1 and OR 10.8 95%CI 3.9-30.0 respectively). A retrospective analysis of maternity database in London has shown pre-eclampsia to be significantly associated with maternal overweight and obesity (OR 1.4 95%CI 1.28-1.6 and OR 2.1 95%CI 1.85-2.5 respectively).[17] Similar findings were noted in other studies as well.[9,20,21,22]

Obese women are at higher risk of developing GDM has yet to be fully delineated, but it is likely related to an increase in insulin resistance. As a result of continued

production of counter regulatory (anti-insulin) hormones by the growing placenta, insulin resistance increases progressively throughout pregnancy.[23] In the present study there were five cases of GDM of which one in overweight, four in obese and none in normal weight group. A study has shown GDM was diagnosed in 5.5% of women with mild obesity and 11.5% of women with moderate to severe obesity compared with 2.3% in women with normal BMI.[24] These findings highlight the need of performing selective screening for GDM at 24 to 28 weeks of gestation.[25]

In one study, the likelihood of spontaneous onset of labor decreased with increasing BMI, with obese women having the highest risk of labor induction (OR 2.5 95%CI 1.8-3.3); in addition these women were more likely to deliver by cesarean section (OR 2.2 95%CI 1.6-3.8) compared to normal weight women.[18] Obese women are more likely to require elective delivery for medical complications such as hypertension and GDM.[26] However, the present study did not show such increase; it could be due to smaller sample size.

This study has shown increased risk of PPH and increased mean blood loss during delivery in overweight and obese mothers. In a population based study in UK, the risk of PPH was significantly greater in the group of women with increased BMI (OR1.5 95%CI 1.2-1.8).[3] Significant more blood loss was in obese (BMI 30.1-40kg/m^2) and morbidly obese (BMI >40kg/m^2) group with mean difference of 135.42 and 207.94 ml compared with normal weight(BMI 19.1-25kg/m^2) group.[4] It could be due to higher need for inductions and operative interventions like cesarean sections and macrosomic babies in these mothers.

In the present study, overweight and obese mothers had longer duration of hospital stay with mean differences of 2.8 and 5.5 days respectively. The mean duration of postnatal hospital stay was also significantly longer (p=0.000). Similar findings has been reported by other studies as well.[4,18] The longer hospital stay may be due to maternal complications like hypertensive disorders pregnancy, postpartum hemorrhage and/or neonatal problems requiring NICU admission.

In this study, the mean birth weight increased with increasing BMI as well as the risk of having babies more than 3500 gm and 4000gm. Sewell et al found the average fat mass of infants born to mother with normal BMI (<25kg/m^2) was 334 g, giving the body fat composition of 9.7%. The offspring of women with a BMI >25kg/ m^2, on the other hand, had a mean fat mass of 416g, or a body fat composition of 11.6%.[27] Vinturache et al showed that the adjusted odds ratio for delivering macrosomic infant increased by one and half in overweight (OR 1.4 95%CI 1.1-2.1) and by two fold in obese women (OR 2.0 95%CI 1.2-3.1).[18]

In a systemic review and meta-analysis including 84 studies and nearly 1.1 million women the risk of induced preterm birth was increased in overweight and obese women (RR 1.30 95%CI 1.23-1.37).[28] Similarly in the present study, there were more preterm births in obese but not in overweight mothers. NICU admission was found to be significantly more in the overweight and obese group in the present study, with 1(0.9%) in normal weight where as it was 6 (7.1%) in the overweight and 2(6.9%) obese group. Previous studies have also shown increased risk of admission to neonatal care for the babies of obese mothers.[3,29] However, other large studies have found no difference in NICU admission rate of the infants of overweight and obese women in comparison to normal weight women.[5,18] These differences could be due to difference in the criteria for admission to NICU and indications for admission to NICU.

In the present study to overcome the recall bias, instead of pre-pregnancy BMI first trimester booking BMI has been taken. The findings from the study, point out to the need for counseling for weight reduction in the pre-pregnant state during medical checkup. Women in the higher BMI especially obese group should be classified as high risk and appropriate screening should be done.

A larger study needs to be carried out, especially at the community level to get the real picture in the context of Nepalese population. Confounder has not been ruled out in the present study which may provide bias in the results.

Conclusions

Over weight and obesity is an important risk factor for maternal complication and neonatal morbidity and mortality. Overweight and obese mothers appear to be at an increased risk of hypertensive disorders, cesarean section, postpartum hemorrhage and neonatal problems like macrosomia, preterm birth and NICU admission in comparison to normal weight mothers. They should be provided appropriate counseling to enter pregnancy with optimal BMI. During pregnancy they may require treatment in higher centers for pregnancy management and delivery, so timely referral should be done when needed.

Conflict of interest: None Declared

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