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Original Research Article

Adverse Pregnancy Outcomes in Overweight and Obese Pregnant Women Visiting a Tertiary Care Center in Western Nepal: A Prospective Cohort Study

Deepak Shrestha[a,d] Kritina Singh[b,d] Shreyashi Aryal[c,d]

ABSTRACT:

Introduction: Maternal obesity is an established risk factor for various adverse pregnancy outcomes. For instance, increased chances of labour induction, prolonged labour, instrumental and cesarean deliveries, medical disorders of pregnancy, post partum haemorrhage, preterm deliveries, macrosomia, and low Apgar score are well recognised risks of maternal obesity. This study aimed to evaluate these maternal and fetal outcomes in relation to the maternal body mass index (BMI). **Methods:** A prospective cohort study involving 115 overweight and obese women was conducted. Various maternal and fetal outcomes were studied and compared with those of 115 postpartum women with normal BMI. Statistical analysis was done using student's t-test and Chi square test. Binomial logistic regression analysis was carried out to examine the magnitude and significance of the independent effect of BMI. **Results:** The three groups were comparable in terms of maternal age and gestational age at delivery. The total blood loss was significantly higher in the obese group as compared to the normal BMI (p=0.001) or overweight groups (p=0.005). Vaginal delivery was 69% less common in the obese group in comparison to the normal BMI group. The prevalence of meconium-stained liquor, labour induction, preterm labour, and neonatal intensive care unit admission were not significantly different across the three groups. **Conclusion:** This study highlighted the increased risk of total blood loss and birth weight >3500 grams with increasing BMI of pregnant women. A multicentric prospective study with larger sample size would shed further light on the strength of association between maternal BMI and various outcomes.

Keywords: Body mass index, Obesity, Overweight, Pregnancy outcomes

INTRODUCTION:

The prevalence of obesity in pregnancy has been on a constant rise worldwide. The global burden of overweight and obesity in women reportedly were 40% and 15% respectively in 2016.[1] This prevalence of overweight and obesity is climbing up even more alarmingly in low- and middle- income countries (LMICs).[2] The National Demographic and Health Survey (NDHS) 2016 reported that among reproductive women aged 15-49 years, 22% were overweight and 5% were obese.[3]

Maternal obesity is an established risk factor for adverse pregnancy outcomes, both maternal and neonatal. It is associated with an increased maternal risk of hypertensive disorder of pregnancy (HDP), gestational diabetes mellitus (GDM), post-datism, induction of labor (IOL), prolonged duration of labour, instrumental and cesarean deliveries, and postpartum hemorrhage (PPH).[4,5,6] Adverse fetal outcomes include still birth, low Apgar score, neonatal intensive care unit (NICU) admission, macrosomia, and neonatal death.[7,8,9] However, there is very little published literature available from western Nepal examining these findings. This

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a - Assistant Professor
b - Lecturer
c - Associate professor
d - Department of Obstetrics and Gynaecology, Lumbini Medical College, Pravas, Palpa.

Corresponding Author:
Deepak Shrestha
Department of Obstetrics and Gynaecology,
Lumbini Medical College
Pravas, Palpa, Nepal
e-mail: @yahoo.com
ORCID: https://orcid.org/0000-0002-9006-3640

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study aimed to evaluate the increasing prevalence of obesity in our region and compare its adverse impacts on pregnancy outcomes in women with normal body mass index (BMI) with overweight/ obese women.

METHODS:

This was a prospective cohort study conducted in the department of Obstetrics and Gynecology, Lumbini Medical College and Teaching Hospital (LMCTH) for a period of three months from 15th May 2021 to 16th August 2021.

Inclusion and exclusion criteria:

All singleton pregnancies with/without booking visit in our hospital, with documented weight taken pre-pregnancy or in the first trimester <14 weeks and delivering at our facility after 28 weeks were included in the study. Those with multiple pregnancies, mal-presentations, still births or major congenital anomalies were excluded.

Sample size calculation:

The sample size was calculated using the following formula:

$n = [Z_{1-\alpha/2} \sqrt{\{ (r+1) * p(1-p) \}} + Z_{1-\beta} \sqrt{\{ r p1 (1-p1) + p2(1-p2) \}}]2 / r(p2-p1)2$

and n (exposure) $>n/4[1+\sqrt{\{1+2(r+1)/nr|p2-p1|\}}]2$

where,

$\alpha=0.05$, $\beta=0.2$,

r=sample size ratio (non exposure to exposure),

p1=prevalence of outcome in non-exposure group,

p2=p1*OR/[1+p1(OR-1)], and

p= (p1+rp2)/(1+r).

Taking OR=2.2 and p=38.6%, from the study of Ojha N,[10]

the minimum sample size calculated in each group was 113.

Data collection:

The weight of the women was documented at their first antenatal visit to the hospital. For those without booking visit before 14 weeks in our center, the weight was recorded from the antenatal care (ANC) card of the nearby government health facility (health post, primary health care center or district hospital) where they had their first antenatal visit. It has been shown that the maternal weight does not increase much in the first trimester and hence the baseline body mass index during pregnancy can be calculated accurately up to 18-20 weeks gestation. [12] So, in this study BMI up to 14 weeks was taken. In case of undocumented weight, self-reported pre-pregnancy weight was taken to calculate BMI.

On their first visit to this center, the height was measured in the standard fashion in our out-patient department (OPD). The participants were categorized based on their BMI (calculated as weight in kilograms divided by square of height in meters) into exposure (study) and non-exposure (reference) groups. Based on BMI, participants were categorized according to WHO into three groups: normal (18.5–24.9 kg/m^2), overweight (25.0-29.9 kg/m^2) and obese (>30 kg/m^2).[11] Women delivering immediately before or after the index case with normal BMI and matched to age (± 5 years) and gestational age (± 2 weeks) were included for the reference group.

The information on maternal characteristics as age, residence, ethnicity, parity, and gestational age at delivery were obtained from case sheet. Maternal complications like HDP, GDM, hypothyroidism, meconium stained liquor (MSL), and shoulder dystocia were recorded. The obstetrical parameters as IOL, mode of delivery, and total blood loss were noted. Visual estimation method was used for the evaluation of the amount of total blood loss. The neonatal outcomes of interest were birth weight, preterm delivery, APGAR scores at 1 and 5 minutes, and NICU admission. Obstetrical and neonatal outcomes were then evaluated taking the normal BMI group as reference.

A low APGAR score was defined as a score less than seven at 5 minute after birth. Stillbirth was defined as intrauterine death occurring after 22 completed weeks of gestation. Birth weight was measured and recorded at birth by the attending nurse or pediatrician using a calibrated digital weighing machine.

All the data were collected by one of the investigators and recorded in a preformed proforma.

The data thus collected were entered in Statistical Package for Social Sciences (SPSS) software version 16. The frequencies with percentages of the various outcomes of pregnancy were calculated within the maternal BMI groups. Quantitative data

Table 1: Socio-demographic and clinical characteristics of the normal BMI, overweight and obese groups

Characteristics		Normal BMI (n=115)	Overweight (n=99)	Obese (n=16)	p-value *
Maternal age (years)		26.69±5.82	26.78±5.86	28.31±5.82	0.575
Height (cm)		150.40±3.12	150.02±2.84	150.25±3.87	0.664
Weight (kg)		52.89±3.70	59.93±3.76	75.44±10.61	<0.001
BMI (kg/m2)		23.32±1.15	26.61±1.18	33.54±3.66	
Parity	Primipara	53 (46.09%)	45 (45.45%)	5 (31.25%)	
	Multipara	62 (53.91%)	54 (54.54%)	11 (68.75%)	
Ethnicity	Brahmin	30 (26.01%)	28 (28.28)	3(18.75%)	
	Chhetri	12 (10.43%)	8 (8.08)	4 (25%)	
	Janajati	32 (27.83%)	27 (27.27%)	5 (31.25%)	
	Dalit	41(35.65%)	36 (36.36%)	4 (25%)	
Gestational age (weeks)		39.15±2.46	39.27±2.12	38.08±2.91	0.170
Hospital stay (days)		2.46±1.27	2.51±1.17	3.06±1.53	0.194
Total blood loss (ml)		149.78±91.90	159.24±95.68	248.13±200.31	0.002
Birth weight (grams)		2929.80±524.04	2964.16±444.21	3150.00±697.47	0.884
Pre-term labour		8 (7.96%)	7 (7.07%)	3 (18.75)	
NICU admission		14 (12.17%)	10 (10.10%)	1 (6.25)	
Low Apgar at 1 min		14 (12.17%)	10 (10.10%)	1 (6.25)	
Birth weight >3500 grams		12 (10.43%)	9 (9.09%)	2 (12.50%)	

were presented in means with standard deviation. Qualitative data were expressed in frequency and percentages. Statistical analysis was done using student's t-test, ANOVA and Chi square test. Binomial logistic regression analysis was carried out to examine the magnitude and significance of the independent effect of BMI. Risks are presented as crude odds ratios (ORs) with 95% confidence intervals (CI). A p value <0.05 was taken for statistical significance.

Ethical approval: The ethical clearance for the study was taken from the Institutional Review Committee of the institute prior to commencement of data collection (IRC-LMC 02-G/020). Informed consents were taken from all the participants after explaining the study objectives and procedure. Confidentiality of the participants were maintained.

RESULTS:

During the study period, there were 345 mothers who delivered in the facility. A total of 115 overweight and obese mothers were enrolled in the study and an equal number of normal BMI mothers. Therefore, the prevalence of overweight and obese women was 28.69% and 4.63% respectively in this study.

Table 1 compares the comparison of socio-demographic and clinical characteristics among the normal BMI, overweight and obese groups.

All the three groups were comparable in age (p=0.575) and height (0.664). Statistical analysis showed that only weight and total blood loss were statistically significant across the three groups. On post hoc analysis, it was found that difference in mean weight was significant across all the three groups (p<0.001). Whereas in total blood loss, the mean difference was statistically significant for obese group against normal BMI (p=0.001) or overweight groups (p=0.005) only. The difference in blood loss was not statistically significant between the normal BMI and overweight groups (p=0.785).

Table 2 shows that IOL and prevalence of MSL were less in overweight and obese women than the normal BMI group but they were not statistically significant. However, the occurrence of vaginal delivery in the

Table 2: Comparison of obstetrical outcomes among study and reference groups

Maternal BMI	Induction of labour		Meconium stained liquor		Mode of delivery	
	n (%)	OR (95% CI)	n (%)	OR (95% CI)	n (%) (vaginal)	OR 95% CI
Normal	33 (28.70)	1	15 (13.04)	1	88 (76.52)	1
Overweight	24 (24.24)	0.80 (0.43-1.47)	8 (8.08)	1.71 (0.70-4.21)	71 (71.71)	0.78 (0.42-1.44)
Obese	1 (6.25)	0.17 (0.02-1.3)	1 (6.25)	2.25 (0.28-18.30)	8 (50)	0.31 (0.11-0.90)

obese group was 69% less than the reference group.

No cases of shoulder dystocia were encountered. However, there were four cases of HDP in obese group, and one each in normal BMI and overweight groups. Similarly, there was one case of hypothyroidism in normal BMI and overweight groups.

As seen in table 3, the chances of low APGAR score at 5 min., preterm labour, and NICU admission were not statistically significant across the groups. However, birth weight >3500 grams was 1.86 times more in the overweight group and 2.23 times more in the obese group than the normal BMI group.

DISCUSSION:

Maternal obesity is a growing epidemic and its adverse effects on the outcomes of pregnancy and delivery are widely studied, both nationally and globally. Therefore, this study aimed to report the impact of maternal obesity on pregnancy complications in this part of the country.

The present study showed that the likelihood of vaginal delivery in the obese group was 69% less as compared to the reference group, which was statistically significant. This is probably because most obese women are likely to undergo cesarean sections, either elective or emergency, due to

Table 3: Comparison of neonatal outcomes among the study and reference groups

Maternal BMI	Low Apgar at 5 min		Preterm labour		Birth weight >3500 grams		NICU admission	
	n (%)	OR 95% CI	n (%)	OR 95% CI	n (%)	OR 95% CI	n (%)	OR 95% CI
Normal	14 (12.17)	1	8 (6.96)	1	4 (3.48)	1	14 (12.17)	1
Overweight	10 (10.10)	1.23 (0.52-2.92)	7 (7.07)	0.98 (0.34-2.81)	15 (15.15)	1.86 (1.35-3.13)	10 (10.10)	0.81 (0.34-1.92)
Obese	1 (6.25)	2.08 (0.26-16.98)	3 (18.75)	0.32 (0.08-1.38)	7 (43.75)	2.23 (1.25-6.06)	1 (6.25)	0.48 (0.06-3.93)

various indications as failed inductions, non-progress of labour, fetal macrosomia, cephalo-pelvic disproportion etc. Similar findings were reported by other studies too. [4,10]

Overweight and obese women are more likely to require elective termination of pregnancy for various medical and fetal complications as HDP, GDM, macrosomia etc.[12] These women undergo

induction of labour (IOL) more and the chances of cesarean deliveries also increase.[13] However, this study showed no statistically significant difference in IOL among the three groups. This might be attributed to our study's lower prevalence of medical and fetal complications and smaller sample size. Our findings were similar to those in the study by Ojha N.[10]

The occurrence of preterm labour was similar between normal BMI and overweight groups but it was relatively high in the obese group. However this difference was not statistically significant. The chances of pregnancies being complicated with meconium-stained liquor were also not significant in our study, which agrees with another study.[10]

The mean total blood loss was significantly higher in the obese group than the overweight or normal BMI group however, it was not significantly different between the overweight and normal BMI groups. This could be attributed to the higher rate of IOL, operative interventions and macrosomia encountered in the obese groups which are themselves independent risk factors for higher blood loss. These findings are congruent with other studies as well.[4,5,10].

The total hospital stay in our study was not significantly different across the three groups. However, a study by Ojha N reported that the total hospital stay was significantly higher in the overweight and obese groups.[10] In our center, most of the patients after cesarean are discharged on the third post-operative day with the instruction of wound dressing and suture removal to be done at nearby health facilities. Also, medical complications like HDP and GDM and delivery complications as PPH were less in our study which might have been responsible for longer hospital stay in other studies.

In this study, the mean birth weight of the babies increased with increasing BMI. However, the mean birth weights' difference were not significant statistically across the three groups. But the odds of having babies >3500 grams were almost 1.9 times higher in the overweight group and 2.2 times higher in the obese group in comparison to the normal BMI group. This finding was consistent with other published works too.[4,10]

The occurrence of low APGAR score at 5 min. was higher in the overweight and obese groups as compared to the reference group in our study but this was not statistically significant. This might be due to a smaller sample size. Also, comparisons were made between individual groups instead of another study where both the overweight and obese categories were combined as a single group and compared with the normal BMI group instead of individual comparison.[10]

Our study found no significant difference in NICU admission among the normal BMI (12.17%), overweight (10.10%) and obese (6.25%) groups. These findings are following some other large studies too.[6,13] The study by Ojha N reported increased admission to NICU in overweight and obese groups. Increased risk of admission to neonatal care has also been found in other studies.[4,9] This difference could be due to the difference in criteria and indications for NICU admission in different centers.

In this study the prevalence of medical disorders in pregnancy was not much compared to other studies,[1,10] which have reported a higher prevalence of hypertensive disorders and GDM in overweight and obese mothers. This can probably be explained on the basis of geographical variation of prevalence of obesity and non-communicable diseases. People in this region are generally more physically active and have a healthier diet which might be the reasons for low prevalence of medical disorders.

There are some notable limitations of this study. The duration of labour was not examined as a possible complication of maternal obesity. The occurrence of third or fourth degree perineal tears and venous thrombosis were also not studied.

CONCLUSION:

This study showed that increasing obesity in pregnant women impacts several maternal and fetal outcomes. The total blood loss was significantly higher in the obese group as was the birth weight of more than 3500 grams. Vaginal delivery was less common in the obese group. The occurrence of meconium stained liquor, induction of labour, preterm labour, low APGAR score and NICU admission were comparable across the three groups. A multicentric prospective study with larger sample size would shed further light on the strength of association between maternal BMI and various outcomes.

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The authors declare that the principal author was not involved in the editorial workflow of the article.

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