

THE IMPACT OF OVERWEIGHT AND OBESITY IN EARLY PREGNANCY ON MATERNAL AND FETAL OUTCOME

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ABSTRACT

The recent increase in prevalence of overweight and obesity in pregnancy has become a major public health problem as it is associated with increased risk of obstetric and neonatal complications. A hospital based observational comparative study was done on women attending obstetrics and gynecology outpatient department of a tertiary care hospital in Kathmandu from September 2021 to January 2022 after taking ethical clearance from Institutional Review Committee. A total of 113 overweight/obese women in first trimester of singleton pregnancies and similar number of women with normal BMI were recruited for the study and followed throughout pregnancy for the development of maternal complications like gestational hypertension, gestational diabetes mellitus, antepartum hemorrhage, preterm labor and postpartum hemorrhage. The neonatal outcome compared were birth weight, low Apgar score at birth and NICU admission. Maternal overweight/obesity as compared to normal BMI was associated with increased risk of gestational diabetes mellitus (RR 2.06, 95% CI: 1.2 to 3.52; P value = 0.006), gestational hypertension (RR 2.2, 95% CI: 1.09 to 4.43; P value = 0.02) and caesarean delivery (RR 1.81, 95% CI: 1.28 to 2.55; P value = 0.004). The risk of primary postpartum hemorrhage was also increased in overweight/obese women than in normal weight women (RR 2.8, 95% CI: 1.04 to 7.51; P value=0.03). In neonatal outcomes, the mean birth weight (3.18 + 0.54 kg vs 2.9 + 0.33kg, P value < 0.001) and admission to NICU (28.3% vs 10.61%, P value = 0.008) were significantly higher in overweight/obese women. Maternal overweight/obesity in early pregnancy is associated with higher risk of adverse pregnancy and neonatal outcome.

KEYWORDS

Maternal overweight/obesity, BMI, adverse pregnancy outcome

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INTRODUCTION

The rapid increase in the prevalence of overweight and obesity worldwide has led the WHO to classify obesity as one of the most significant global health issues of 21st century.¹ Obesity is defined as accumulation of excessive body fat which is likely to impair health of individual and increase morbidity and mortality.² Though a problem predominantly of middle and old aged people, in recent years this has also affected young women of reproductive age.³

Maternal obesity has emerged globally as one of the main obstetrical challenges as it increases the risk of many pregnancy complications like miscarriage, pregnancy induced hypertension, preeclampsia, gestational diabetes mellitus, venous thromboembolism, preterm delivery, unexplained still birth, need for caesarean section and postpartum hemorrhage when compared to women with normal BMI.⁴⁻⁶ The most common and simple indicator used to define obesity according to WHO is BMI which is calculated by dividing weight in kg by square of height in meters.⁷ The pre pregnancy BMI is used as standard to define obesity in pregnancy but when it is not available, first trimester BMI can be used as weight gain in first trimester of pregnancy is negligible.⁸ As obesity is considered to be a modifiable risk factor, preconception counseling and creating awareness regarding health risks associated with overweight and obesity should be encouraged. Patient should reduce weight before attempting pregnancy with proper dietary counselling, regular physical activity and a healthy lifestyle thus reducing the risk of adverse pregnancy outcome.

The aim of this study was to evaluate the impact of overweight and obesity on maternal and neonatal outcome in our population.

MATERIALS AND METHODS

A hospital based observational comparative study was carried out in Department of Obstetrics and Gynecology at Nepal Medical College Teaching Hospital from September 2021 to January 2022 after taking ethical clearance from Institutional Review Committee. All the patients in first trimester (i.e. up to 13 weeks) of singleton pregnancy who came for antenatal checkup in our outpatient department during the study period were screened. The gestational age of the patient was calculated from first day of last menses and confirmed with ultrasonography. The height and the

weight of the patient were taken and BMI was calculated using the formula weight in kg / height in m². There were two exposure groups: Group one with BMI ≥ 25 kg/m² and group two with BMI < 25 kg/m² matched for maternal age group and parity and 113 subjects in each group. Women with multiple pregnancy, age ≤ 19 years and ≥ 40 years, preexisting medical diseases as chronic hypertension, overt diabetes mellitus, cardiac and renal disease were excluded from the study. These patients were then followed up throughout pregnancy, during delivery and in postpartum period till discharge for development of any maternal and fetal complications.

The maternal complications assessed were hypertensive disorders of pregnancy, gestational diabetes mellitus, preterm labor and antepartum hemorrhage. The mode of delivery and incidence of postpartum hemorrhage were also noted. Regarding neonatal outcome, birth weight, Apgar score < 7 in 5 minutes and NICU admission and its indication were assessed. Data was entered and analyzed in Statistical Package for Social Sciences version 21. The results were expressed in terms of number, percentage and tables. The results were analyzed using Chi-square test and 'p' value ≤ 0.05 was considered significant in the study and relative risk was calculated where the difference of incidence was found to be significant.

RESULTS

Table 1: Number of cases according to BMI

Group	BMI	n
Group 1 (Overweight/Obese)	≥ 25	113
Group 2 (Normal BMI)	18.5–24.9	113

A total of 226 patients were enrolled for the study and based on their BMI, they were divided into two groups as shown in Table 1.

The demographic profile of these patients is shown in Table 2. These two groups of patients were comparable in term of age and parity. There was no difference in age distribution of both the groups, mean maternal age in obese group was 28.69 years (SD 1.64) and in non-obese group 28.57 years (SD 2.58) with P value 0.87. Nearly 60% of patients were primigravida and 40% were multigravida in both the groups (P value = 0.49)

The antenatal complications between these two groups of patients are shown in Table 3.

Table 2: Demographic profile of patients

	Group 1 (n=113) Overweight/Obese	Group 2 (n=113) Normal weight	Independent t test P value
Maternal age			
20 - 29 years	73 (64.6%)	82 (72.6%)	0.87
30 - 39 years	40 (35.4%)	31 (27.4%)	
Mean age	28.69 ± 1.64	28.57 ± 2.58	
Gravida			
Primi	63 (55.7%)	68 (60.2%)	0.49
G 2	38 (33.6%)	35 (31.0%)	
G 3	12 (10.6%)	10 (8.8%)	
Mean gestational age at delivery	38.62 ± 1.64	38.67 ± 1.36	0.8

Table 3: Antepartum complications and BMI

Complications	Group 1 (n=113) Overweight/Obese BMI ≥ 25	Group 2 (n=113) Normal weight BMI= 18.5-24.9	Chi-square P value	RR (95% CI)
Gestational hypertension / pre-eclampsia	22 (19.5%)	10 (8.8%)	0.02	2.2 (1.09 to 4.43)
Gestational diabetes mellites	33 (29.2%)	16 (14.1%)	0.006	2.06 (1.2 to 3.52)
Antepartum hemorrhage	3 (2.6%)	1 (0.9%)	0.15	
Preterm labor	12 (10.6%)	4 (3.4%)	0.06	

CI= Confidence Interval, RR=Relative Risk

Table 4: Mode of delivery, PPH and BMI status

Mode of delivery	Group 1 (n=113)	Group 2 (n=113)	Chi square P value	RR (95% CI)
Caesarean section	58 (51.3%)	32 (28.3%)	0.004	1.81 (CI 1.28 to 2.55)
Preterm delivery	12 (10.6%)	4 (3.4%)	0.06	
Postpartum Hemorrhage	14 (12.4%)	5 (4.4%)	0.03	2.8 (95% CI 1.04 to 7.51)

CI= Confidence Interval, RR=Relative Risk

Table 5: Neonatal outcome and BMI

Birth weight	Group 1 (n=113)	Group 2 (n=113)	P value	RR (95% CI)
< 2.5 kg	12 (10.6%)	4 (3.5%)	0.06	
2.5-3.5 kg	68 (60.2%)	100 (88.5%)		
3.5-3.9 kg	24 (21.2%)	8 (7%)		
≥ 4 kg	9 (8.0%)	1 (0.9%)	0.02	9 (1.15 to 69.87)
Mean birth weight	3.18 ± 0.54	2.9 ± 0.33	0.001	
Apgar score < 7 in 5 minutes	4 (3.4%)	2 (1.7%)	0.68	
NICU admission	32 (28.3%)	12 (10.6%)	0.008	2.6 (1.42 to 4.81)

CI= Confidence Interval, RR=Relative Risk

The incidence of gestational diabetes mellites (29.2% vs 14.15% P value= 0.006) and gestational hypertension/ pre-eclampsia (19.46% vs 8.84%, P value= 0.02) were seen significantly higher in overweight/obese women than in women with normal BMI. There was a significant increase

in risk among overweight/obese mothers compared to non-obese mothers for maternal complications like gestational hypertension/ pre-eclampsia {RR 2.2, (95% CI 1.09 to 4.43)} and gestational diabetes mellitus {RR 2.06, (95% CI 1.2 to 3.52)}. The risks for maternal

Table 6: Indications for NICU admission

Indications of NICU admission	Group 1 (n=32)	Group 2 (n=12)
Transient tachypnea of newborn	7	2
Grunting	4	1
Neonatal sepsis	4	2
Meconium aspiration syndrome	3	1
Low birth baby	3	1
Perinatal depression	3	1
Neonatal jaundice	3	2
Preterm baby	2	0
Congenital pneumonia	1	1
Hypoglycemia	2	1

complications like antepartum hemorrhage and preterm labor did not increase significantly with obesity.

The mode of delivery and incidence of post-partum hemorrhage between these two groups are shown in table no 4. Obese/overweight women had significantly higher rate of caesarean section than women with normal BMI (51.3% vs 28.3%, P value = 0.004). Upon analyzing the indications for caesarean section, abnormal progression of labor, cephalopelvic disproportion and failed induction of labor were the common cause in obese/overweight women whereas fetal distress was the most common indication in normal weight women. Post-partum hemorrhage was also seen to be significantly higher in overweight/obese women than in normal weight women (P value=0.03). There was a significant increase in risk among overweight/obese mothers compared to non-obese mothers for rate of caesarean section {RR 1.81, (95% CI 1.28 to 2.55)} and postpartum hemorrhage {RR 2.8, (95% CI 1.04 to 7.51)}

The neonatal outcome of these two groups of women is shown in Table 5. The average birth weight of overweight/ obese women was 3.18 ± 0.54 kg and that of normal weight women was 2.9 ± 0.33 kg. The birth weight was significantly higher in group 1 than in group 2 women (P value = <0.001). Similarly, the incidence of macrosomia (birth weight ≥ 4 kg) was also higher in overweight/obese women (8.0% vs 0.9%, P value= 0.02). Though the admission rate to NICU was significantly higher in overweight/obese women (28.3% vs 10.6%, P value= 0.008), babies born with low Apgar score (3.4% vs 1.7%, P value= 0.68) were similar in both the groups. The indications to NICU admission are shown in Table 6. Thus, there was a significant increase

in risk among obese mothers compared to non-obese mothers for perinatal complications like macrosomia {9 (95% CI 1.15 to 69.87)} and NICU admission {(2.6 (95% CI 1.42 to 4.81))} but there was no increased risk for low birth weight and birth asphyxia with obesity.

DISCUSSION

Maternal overweight/obesity has become a growing health problem worldwide and has emerged as one of the major obstetric challenges both in developed and in developing world. Many observational studies have shown a direct correlation between maternal BMI and risk of gestational hypertension and gestational diabetes mellites.

In our study, the prevalence of gestational diabetes mellites was 29.2% and that of gestational hypertension and preeclampsia was 19.5% in obese/overweight women which was significantly higher than in women with normal BMI. The prevalence of antepartum hemorrhage and preterm labor were similar in both the groups. In our study, there was a 106% to 120% higher risk of developing gestational diabetes mellitus (RR=2.06) and gestational hypertension/preeclampsia (RR=2.2) in over weight/obese group. Previous research have found a strong association between increasing BMI and pregnancy induced hypertension. A meta-analysis of the risk of pre-eclampsia associated with maternal BMI done by O'Brien *et al*⁹ showed that the risk of pre-eclampsia doubled with each 5 to 7 Kg/m² increase in pre pregnancy BMI and also found a 3 times higher risk of pre-eclampsia in obese women. Similar to our study, Yazdani *et al*¹⁰ in their study also reported the increased risk of hypertension in obese women (12.2%) than in normal weight women (4.6%).

Inmaculada *et al*¹¹ in their study observed that overweight and obese women have greater risks of gestational diabetes mellitus (RR=2.13 and RR=2.85 respectively) and gestational hypertension (RR=2.01 and RR=4.79, respectively) when compared to normal weight women. The risk of preterm delivery in overweight/obesity was not increased in this study.

In agreement to our study, Yang *et al*¹² also found an increased incidence of the adverse pregnancy outcome like gestational hypertension and gestational diabetes mellites in overweight/ obese women than in women with normal weight. The risk of developing pre-eclampsia increased by a factor of 1.8 in

overweight and 3.5 in obese women, and the risk of developing GDM increased by a factor of 1.6 in overweight and 2.7 in obese women in their study.

Senbanjo *et al*¹³ also observed that overweight/obesity in early pregnancy was significantly related to increased risk of hypertensive disorder in pregnancy (AOR 2.2; 95% CI, 1.08-4.32, $p = 0.030$) and gestational diabetes mellitus (AOR 14.4; 95% CI, 4.85-42.6, $p = < 0.001$). Melchor *et al*¹⁴ reported the higher risk of preeclampsia (OR 2.19) in overweight/obese women in their study but they did not find any significant difference in rate of antepartum hemorrhage and preterm delivery in obese and normal weight women.

In this study, the rate of caesarean section was 51.3% in overweight/obese women which was significantly higher than that in normal weight women (28.3%). The risk of caesarean section in overweight/obese women had increased by 80%. Ratnasiri *et al*¹⁵ did a retrospective cohort study and found that the rate of caesarean delivery increased with increasing maternal BMI from 22.2% in underweight women to 51.7% in women with class III obesity. Simko *et al*¹⁶ also reported increased caesarean delivery rate in overweight/obese women and in their study, it was 28.5% in underweight, 34.7% in normal weight, 38% in overweight and increased to 57% in obese women. Srivastav *et al*¹⁷ also found significantly increased rate of caesarean delivery in overweight (54.5%) and obese (42.3%) women than in women with normal BMI (29.8%). The increased caesarean delivery rate in overweight/obesity could be due to associated co-morbidities, obstetric complications, slow progress of labor and fetal macrosomia.

The rate of fetal macrosomia defined as birth weight ≥ 4 kg was significantly high in our study (7.96% vs 0.88%, p value 0.02) and the risk of macrosomia increased 9 times in overweight/obese women than in normal weight women.

This result was consistent with the study done by Bhattacharya *et al*¹⁸ where they also found the increased incidence of macrosomia in obese women with Odd's ratio of 1.9 compared to normal BMI women. Jolly *et al*¹⁹ reported data from a study of 350,311 pregnancies and showed that nearly a fifth of obese women had macrosomia. Rode *et al*²⁰ also reported significantly high incidence of macrosomia in their study but did not find any difference in Apgar score of babies born to obese or nonobese women which is similar to our study.

The risk of NICU admission was also significantly high and doubled in babies born to overweight/obese women than in normal weight women in our study (28.3% vs 10.6%, $P=0.008$, $RR=2.6$). Similar to ours, El-Gilany AH *et al*²¹ found that neonates of obese women were two times more likely to be admitted to NICU than those of normal weight women and Callaway LK *et al*²² also reported that neonates born to obese women were at increased risk of admission to intensive care (AOR 2.77).

In conclusion, maternal overweight/obesity in early pregnancy is important contributor to obstetric complications mainly gestational hypertension and gestational diabetes mellitus in our study. It is also associated with increased caesarean delivery rate and postpartum hemorrhage. In neonatal outcome, the risk of macrosomia and NICU admission rate were increased. Effective intervention should be done to reduce prevalence of overweight and obesity in reproductive aged women so that complications later in pregnancy can be avoided. As a healthcare provider, it becomes our responsibility to counsel the patients on proper diet, regular physical activity and adopting healthy lifestyle to reduce weight before attempting pregnancy thus reducing adverse maternal and neonatal outcome.

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