Print ISSN: 2321-6379
Online ISSN: 2321-595X

Original Article

Comparative Study on Neonatal Outcome between Normal Weight Pregnancy and Obesity Complicated Pregnancy

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Abstract

Introduction: Maternal pre-pregnancy body mass index (BMI) >30 kg/m^2 is associated with increased rates of many complications during pregnancy for the mother, the fetus, and the neonate. Obese pregnant women are risk of delivering large babies and the neonates of such mothers have higher Neonatal Intensive Care Unit (NICU) admissions. Therefore, we aimed to compare the neonatal outcomes between normal weight pregnancy and obesity complicated pregnancy from a sample of population of Tamil Nadu.

Aims and Objectives: The aims of our study were to compare the neonatal outcomes between normal weight pregnancy and obesity complicated pregnancy.

Materials and Methods: This was a case–control study comprising 50 normal weight pregnant women (controls) and 50 obese pregnant women (cases). It was conducted in C.S.I Rainy Multispecialty Hospital, Chennai between April 2008 and March 2010. Mothers in first trimester who had BMI >30 kg/m^2 were chosen as cases and mothers in first trimester who had BMI between 18.5 kg/m^2 and 25 kg/m^2 were chosen as controls. The following neonatal outcomes were studied: Gestational age at birth, mean birth weight, APGAR score at 5 min, and Admissions in NICU.

Results: There was no statistically significant difference (P = 0.109) in terms of gestational age at birth between neonates of obese pregnancy and neonates of normal weight pregnancy. There was a statistically significant difference (P = 0.005) in the mean birth weight between neonates (3.20 kg) of obese pregnancy and neonates (2.94 kg) of normal weight pregnancy, APGAR at 5 min showed no statistical significance (P = 0.646) between case and controls. NICU admission was also found to be statistical insignificant (P = 0.296) between two groups.

Conclusion: Obesity is a risk factor that complicates pregnancy in more ways than one, affecting both the mother and the neonate. Maintenance of weight among pregnant women within the accepted limits of BMI would go a long way in ensuring better neonatal outcomes.

Key words: Neonatal outcome, Normal weight pregnancy, Obesity complicated pregnancy

INTRODUCTION

The World Health Organization (WHO) defines obesity as an abnormal or excessive fat accumulation that presents a risk to health, using the body mass index (BMI) ≥30 kg/m^2 as a crude estimate.[1] The global prevalence of obesity has increased considerably over the past two decades, and currently, about two billion people are either overweight or obese.[2] The WHO characterizes obesity as a pandemic issue, with a higher prevalence in females, especially those of child-bearing age, than in males.[3] Obesity is a rapidly emerging public health problem for women, with around 17.9% of pregnant women in first trimester presently classed with obesity.[4]

The health consequences of obesity come from excess adipose tissue, not the size of one's body. In spite of this limitation, BMI continues to be used today, because it is easily calculated and is the best tool available from a broad-

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Month of Submission : 04-2022
Month of Peer Review : 05-2022
Month of Acceptance : 05-2022
Month of Publishing : 06-2022

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based health policy perspective.[5] It is well known that obesity increases morbidity for both mother and fetus and is associated with a variety of adverse reproductive outcomes.[6-9]

Pregnancy complications in obese women were identified as early as 1945.[10] Complications of obesity seriously affect the obstetric outcome of such women, endangering both maternal and fetal health and well-being. Chinese researchers estimate that increasing BMI is associated with increased risks of adverse obstetric outcomes, such as pre-eclampsia, gestational diabetes, and preterm delivery.[11] Since then, a number of studies have reported a clear association between maternal obesity and adverse pregnancy and neonatal outcomes. In particular, obesity in pregnancy is associated with a high rate of pre-eclampsia, pregnancy-induced hypertension, gestational diabetes, abnormal labor, cesarean section, fetal macrosomia, lower respiratory tract infections, and infant birth defects.[12-16]

Maternal obesity is associated with abnormal fetal growth. Women who are heavier are less likely to have a pregnancy complicated by a small for gestational age infant or intrauterine growth restriction, but this protective effect appears to dissipate once the maternal BMI reaches the level of obesity (30 kg/m^2). The major concern in obese pregnant women is fetal macrosomia, which appears to be increased 2–3-fold in obese parturients.[17] Although a number of factors may explain this global increase in the prevalence of fetal macrosomia, the prevailing data suggest that maternal obesity is the main factor, followed by maternal diabetes status.[17]

Moreover, there appears to be a dose dependent relationship between maternal obesity and fetal macrosomia. In a recent meta-analysis, the prevalence rates of fetal macrosomia were 13.3% and 14.6% for obese and morbidly obese women, respectively, compared with 8.3% for the normal weight control group.[18]

Conventionally, the physical condition of the newborn is assessed using the APGAR scores at 1, 5, and 10 min after birth. Low APGAR scores indicate depressed vitality and are a useful tool for prediction of adverse neonatal and long-term outcomes.[19-22] Although there are a number of possible causes of low APGAR scores[23,24] among term infants without malformations, the vast majority of cases with APGAR scores between 0 and 3 at 5 min are due to perinatal asphyxia.[25] The previous studies on offspring of women with overweight and obesity found increased risks of APGAR <7 at 1 or 5 min.[26-28]

Aims and Objectives

The aims of the study were to compare the neonatal outcomes between normal weight pregnancy and obesity complicated pregnancy.

MATERIALS AND METHODS

This study was a case–control study comprising 50 normal weight pregnant women as controls and 50 obese pregnant women as cases. It was conducted in C.S.I Rainy Multispecialty Hospital, Chennai between April 2008 and 2010 after obtaining approval from the Institutional Ethics Committee and written informed consent from the participants. Obesity is defined by the presence of excessive total body fat. Since total body fat content is difficult to measure directly and since it correlates with total body mass divided by height^2 (BMI), overweight and obesity are commonly evaluated with simple measurement of height and weight and are defined as BMI between 25 and 29.9 kg/m^2, and BMI above 30 kg/m^2, respectively.

Mothers in first trimester who had BMI >30 kg/m^2 were chosen as cases and mothers who had BMI between 18.5 kg/m^2 and 25 kg/m^2 were chosen as controls.

Inclusion Criteria

The following subjects were included for our study:

- Pregnant women with first trimester BMI >30 kg/m^2
- Pregnant women with first trimester BMI between 18.5 kg/m^2 and 25 kg/m^2
- Pregnant women of all ages, all parity, and all socioeconomic status

Exclusion Criteria

The following subjects were excluded from our study:

- Mothers not booked at first trimester, miscarriage, mothers carrying anomalous baby, pregnant women with first trimester BMI between 25.1 kg/m^2 and 29.9 kg/m^2, pregnant women with first trimester BMI < 18.5 kg/m^2, and pregnant women who could not be followed up until delivery.
- Detailed history was taken and physical examination was carried out in pregnant mothers who were selected according to the criteria. They were followed up to delivery and postpartum and the neonatal outcome was studied until discharge. The following neonatal outcomes were studied: Gestational age at birth, mean birth weight, APGAR score at 5 min, and admission in Neonatal Intensive Care Unit (NICU).

Statistical Analysis

Differences between the case and control groups were evaluated using Chi-square and student "*t*" test. Statistical significance was deemed at $P < 0.05$.

RESULTS

In terms of gestational age at delivery, as given in Table 1, 90% of obese pregnant women and 94% of control women

delivered at term and 10% of obese women and 6% of control group delivered preterm. The difference between the cases and controls was not statistically significant. Chi-square = 0.577 and P = 0.749. The difference between two groups is not statistically significant.

As given in Table 2 below, 44% of the neonates of obese mothers were weighing between 3.00 and 3.49 kg, while 50% of the neonates of normal weight mothers were weighing between 2.50 and 2.99 kg. About 22% babies of obese women were between 3.50 and 3.99 kg, while 10% of the neonates of normal weight mothers were between 3.50 and 3.99 kg. Two babies (4%) were > 4.00 kg in obese mothers compared to no babies above 4.00 kg in normal weight mothers. Mean birth weight of the neonate in obese mothers was 3.20 kg and the same was 2.94 kg in normal weight mothers. Chi-square = 2.868, $P = 0.005$, it is statistically significant.

As shown in Table 3, among the neonates of obese women, APGAR score at 5 min of >7 was seen in 94% of neonates, while 6% neonates had APGAR score at 5 min of <7. Among the neonates of normal weight women, APGAR score at 5 min of >7 was seen in 96% of neonates, while 4% neonates had APGAR score at 5 min of <7. $P = 0.646$, it is statistically insignificant.

As shown in Table 4, 34% of babies born to obese women and 20% of babies born to control women were admitted in NICU. Major reasons for admission in babies of obese group were infant of diabetic mother, preterm, and macrosomia, while, in control group, the reasons were meconium aspiration and infant of diabetic mother. $P = 0.296$, it is statistically insignificant.

Table 1: Gestational age at delivery

Gestational age (wks)	Controls (Normal weight pregnancy)		Cases (Obese pregnancy)	
	Number	Percentage	Number	Percentage
>37 (Term)	47	94%	45	90%
35–36.6 (Preterm)	2	4%	3	6%
32–34.6 (Preterm)	1	2%	2	4%

DISCUSSION

Data regarding maternal obesity and preterm birth are conflicting. A study done by Baeten *et al.*[16] showed that there is an increased risk of preterm birth in obese pregnant women compared to normal weight pregnant women. A study done by Sebire *et al.*[29] showed that there is no increased risk of preterm birth in obese pregnant women compared to normal weight pregnant women. As shown in Figure 1, in our study, we found out that 90% of obese pregnant women and 94% of normal weight women delivered at term, while 10% of obese pregnant women and 6% of normal weight women delivered preterm. The difference was not found to be statistically significant which is in accordance with the study of Sebire *et al.*[29]

In our study, as shown in Figure 2, we found out that 26% of obese group mothers delivered babies of weight >3.5 kg, while only 10% of the control group mothers delivered babies of weight >3.5 kg. As shown in Figure 3, the mean birth weight of the neonates of obese group was 3.2 kg and that of the control group was 2.94 kg. This is statistically significant. This finding of ours is similar to the findings of studies done by Sebire *et al.*[29] and Ehrenberg *et al.*[30]

A study done by Persson *et al.*[31] clearly demonstrates that maternal overweight and obesity are associated with increased risks of low Apgar scores (0–3) at 5 and 10 min. However, a study done by Rode *et al.*[32] had opposite results. In our study, as shown in Figure 4, there was a difference of only 2% between cases and controls in APGAR score at 5 min. This is not statistically significant. This is in accordance with the studies done by Rode *et al.*[32]

Neonates of obese mothers had increased admissions, the major reasons for admissions being preterm, macrosomia, and gestational diabetes. According to a study by Suk *et al.*,[33] NICU admission rate was significantly associated with maternal obesity. Another study done by Minsart *et al.*[34] revealed that adjusted odds ratio for NICU admission was higher for obese mothers by 38% compared to non-obese mothers. However, in our study, we got contrary

Table 2: Mean birth weight of the neonate

Birth weight (Kg)	Controls (Normal weight pregnancy)			Cases (Obese pregnancy)		
	Number (%)	Mean Birth Weight (kg)	Standard Deviation	Number (%)	Mean Birth Weight (kg)	Standard Deviation
1.50–1.99	1 (2%)	2.94	0.416	1 (2%)	3.20	0.494
2.00–2.49	2 (4%)			1 (2%)		
2.50–2.99	25 (50%)			13 (26%)		
3.00–3.49	17 (34%)			22 (44%)		
3.50–3.99	5 (10%)			11 (22%)		
>4.00	0 (0%)			2 (4%)		

Table 3: APGAR at 5 min

APGAR at 5 min	Controls (Normal weight pregnancy)		Cases (Obese pregnancy)	
	Number	Percentage	Number	Percentage
< 7	2	4.0	3	6.0
> 7	48	96.0	47	94.0

Table 4: NICU admission and their indications

Indications	Controls (Normal Weight Pregnancy)		Cases (Obese Pregnancy)	
	Number	Percentage	Number	Percentage
Meconium aspiration	3	6.0	2	4.0
Respiratory distress	1	2.0	0	0.0
Infant – DM mothers	3	6.0	8	16.0
Preterm	3	6.0	5	10.0
IUGR	0	0.0	0	0.0
Abnormality	0	0.0	0	0.0
Macrosomia	0	0.0	2	4.0
Total	10	20.0	17	34.0

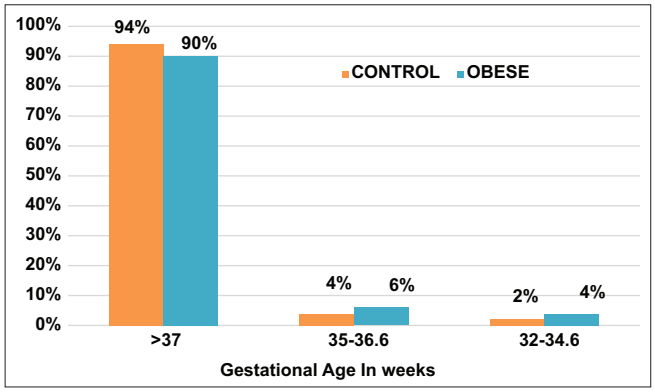

Figure 1: Gestational age at delivery

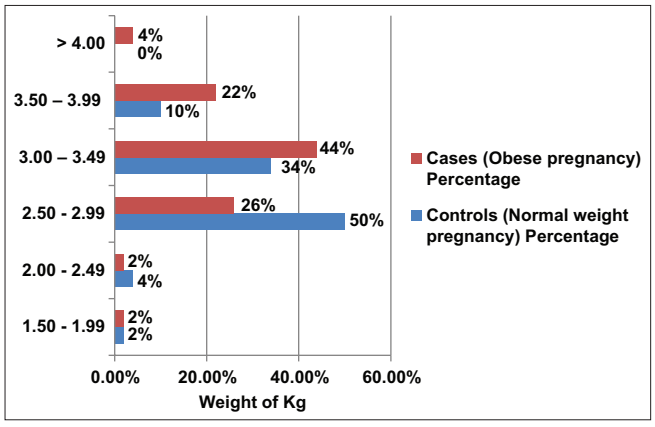

Figure 2: Birth weight of neonate

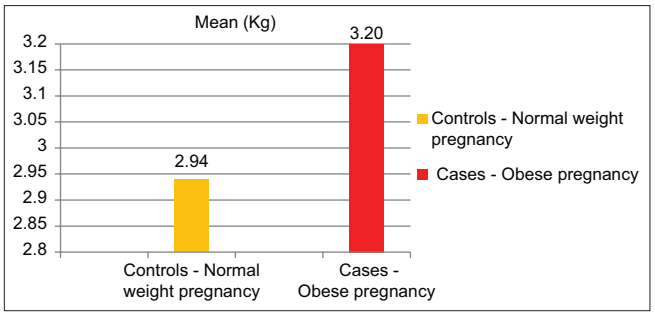

Figure 3: Mean birth weight of neonate

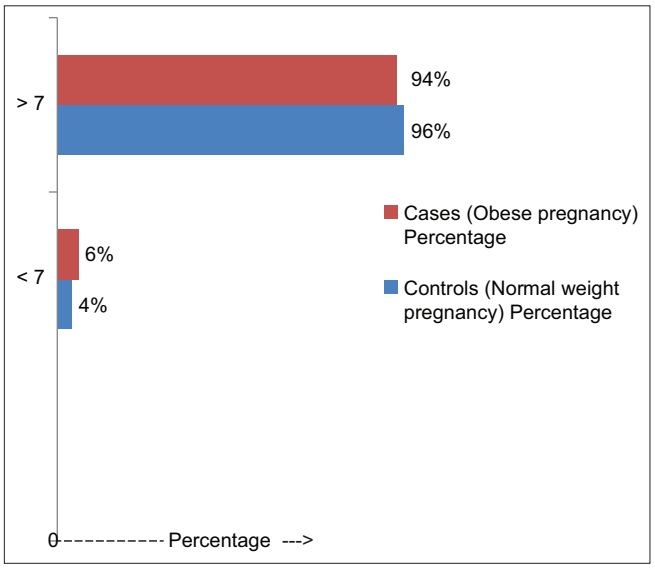

Figure 4: APGAR at 5 min

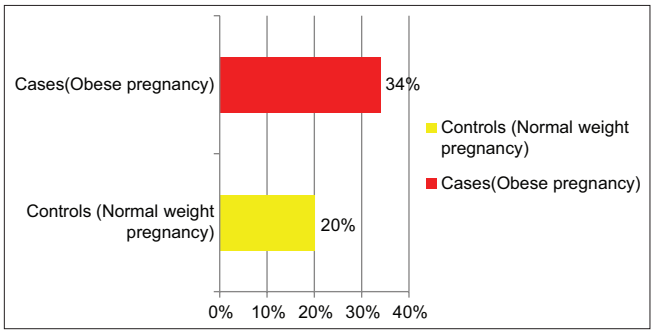

Figure 5: NICU admissions

results, as shown in Figure 5, about 34% of babies born to obese women and 20% babies born to control women were admitted in NICU. This is statistically insignificant. Major reason for admission in babies of obese group were infant of diabetic mother, preterm, and macrosomia, and in control group, the reasons were meconium aspiration and infant of diabetic mother.

CONCLUSION

Occurrence of maternal obesity continues to increase and poses major challenges not only to obstetricians but also to pediatricians, because maternal obesity affects both the mother and the neonate. The prevention of obesity

in women of reproductive age group would help us to improve neonatal health.

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How to cite this article: Sangeetha TM, Rashmi M. Comparative Study on Neonatal Outcome between Normal Weight Pregnancy and Obesity Complicated Pregnancy. Int J Sci Stud 2022;10(3):100-104.

Source of Support: Nil, **Conflicts of Interest:** None declared.