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Original Research Article

MATERNAL AND FETAL OUTCOME IN OBESITY COMPLICATING PREGNANCY

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Abstract

Background: Pregnancy is a high-risk factor when factors such as obesity increase the likelihood of adverse outcomes for mothers and children. This study aimed to evaluate the effect of obesity on maternal and perinatal outcomes, hypothesizing that a higher maternal body mass index is associated with adverse outcomes for both mothers and babies. **Materials and Methods:** This prospective cohort study included 100 mothers, 50 in the case (obese) and 50 in the control group (normal weight), at C.S.I. Rainy Multispecialty Hospital, Chennai, between 2008 and 2010. Detailed medical history and physical examinations were recorded, and relevant investigations were performed. Outcomes were monitored until delivery and postpartum discharge. **Result:** In the age group of 20-24 years, 26 (52%) were obese, while 14 (28%) were in the control group (p=0.002), and had higher rates of infertility (20% vs. 4%), gestational diabetes (10% vs. 4%), and hypertension (14% vs. 6%). The significantly higher mean maternal weight at delivery (92.7±6.02 vs. 62.84±3.22 kg, p=0.001) and neonatal birth weight (3.2±0.494 vs. 2.94±0.416 kg). Labour induction was more common in obese women than in non-obese women (26% vs. 16%, p=0.461). The primary caesarean delivery rate was higher in the obese group (34% vs. 24%), with more complications such as wound infection (12% vs. 4%) and a higher number of NICU admissions due to diabetes and preterm births. **Conclusion:** Our study highlights the significant maternal and perinatal risks associated with obesity in pregnant women, emphasizing the importance of pre-pregnancy weight management. Enhanced antenatal care and support for lifestyle changes should be provided for pregnant women.

INTRODUCTION

Pregnancy is defined as a high risk when the probability of an adverse outcome for the mother and child increases over the baseline risk of that outcome among the general population due to the presence of one or more ascertainable risk factors. One such pre-existing maternal morbidity that makes pregnancy high-risk is obesity.[1] WHO describes obesity as one of the most blatantly visible, yet most neglected, public health problems that threaten to overwhelm both more and less developed countries.[2] A recent study showed that one in five women booking antenatal care in 2002-2004 were obese.[3]

The prevalence of obesity has been increasing in developed and developing nations, although to varying degrees. In addition, with the increase in obesity prevalence, morbidities, including cardiovascular disease, diabetes, hypertension, and stroke, promote obesity. It becomes a major issue when it affects women of the reproductive age group, as obesity increases the risk of pregnancy owing to the increased incidence of gestational diabetes, preeclampsia, gestational hypertension, labour induction, increased caesarean rates, aesthetic complications, postoperative morbidity, and prolonged hospital stay. They are at an increased risk of delivering large babies and requiring NICU admission.[4]

Although routine weighing of pregnant women is carried out in most antenatal clinics, not much importance is given to the weight of the women. Prenatal counselling plays a vital role in identifying women with obesity. Advice on weight reduction before embarking on pregnancy will go a long way in reducing morbidity due to obesity during pregnancy.[5]

Aim

This study aimed to evaluate the effect of obesity on maternal and perinatal outcomes in obese women, to test the hypothesis that obesity, as determined by maternal body mass index, is associated with adverse outcomes for mothers and babies, and to quantify this risk after allowing for possible confounding factors.

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MATERIALS AND METHODS

This prospective cohort study included 100 mothers attending antenatal care at C.S.I. Rainy Multispecialty Hospital, Chennai, between 2008 and 2010. This study was approved by the Institutional Ethics Committee before initiation, and informed consent was obtained from all patients.

Inclusion Criteria

Pregnant women in their first trimester, with BMI ≥ 30 kg/m2, and between 18.5 kg/m2 and 25 kg/m2, irrespective of age, parity, and socioeconomic status, were included in this study.

Exclusion Criteria

Mothers who were not booked in the first trimester, had miscarriage, anomalous baby, BMI between 25.1 kg/m2 and 29.9 kg/m2, < 18.5 kg/m2, and who could not be followed until delivery were excluded from this study.

Methods: Pregnant mothers were classified into case (obese) and control (normal-weight) groups by reviewing 50 cases and 50 controls using random selection. A detailed history of all the women was collected, and a complete general and physical examination was performed. They were followed up until delivery and postpartum until discharge, and the outcomes were studied. The relevant history of these women included age, parity, socioeconomic status, menstrual history, infertility, hypertension, diabetes, hypothyroidism, and other medical illnesses. A detailed history of previous pregnancy outcomes was obtained. A family history of obesity, hypertension, or diabetes was also observed. Detailed physical examinations for weight gain, pulse, and BP were performed. The patients were examined for anaemia, pedal oedema, and systemic examination of the cardiovascular, respiratory, and central nervous systems., and relevant investigations were conducted for each case.

Statistical Analysis: Differences between groups were evaluated using chi-square and Student's t-tests, and statistical significance was considered at a P value of < 0.05. Odds ratios were calculated to express the relationship between the obesity group and specific maternal outcomes using one-way ANOVA and Levene's test.

RESULTS

Most obese women (38%) were between 25-29 years whereas many control women (52%) were between 20-24 yrs. The proportion of women aged > 30 years was 32% in the obese group and only 12% in the control group. This difference in the age group distribution was statistically significant (p = 0.002). Most of the women in the obese and control groups belonged to class III in socio-economic status. Among obese women, 36% were nulliparous and 56% were para-I, whereas in the control group, 44% were nulliparous and 36% were para-I. Eighteen percent of obese women had irregular menstrual patterns. Among the obese women, 20% had infertility, whereas in the control group, it was 4% [Table 1]

The gestational diabetes was 10% and 4% in the obese and control groups, and gestational hypertension was 14% and 6% in the obese and control groups, respectively. The incidence of pre-eclampsia was 10% in the obese group and 4% in the control group. Obstetric complications, such as malpresentation (breech), placenta previa, placental abruption, and multiple pregnancies, existed in both groups [Table 2].

The mean age in the obese group (27.38±3.864 years) was higher than that in the control group (25.04±3.307 years). The maternal weight at booking in the obese (83.18±5.47 kg) and the control group (54.06±3.47 kg). BMI at booking for the obese group (33.86±2.53 kg/m2) was also higher than that of the control group (21.6±0.96 kg/m2). The maternal weight at delivery (92.7±6.02 kg) was higher than (62.84±3.22 kg). The mean birth weight of neonates was significantly higher in the obese group (3.2 ± 0.494 kg) than in the control group (2.94 ± 0.416 kg). There were significant differences in age, maternal weight, BMI at booking, weight at delivery, and neonatal birth weight between the control and obese groups ($p<0.05$) [Table 3].

Labour induction was more common in obese women (26%) than in the controls (16%), but the difference was not statistically significant (p=0.461). Postdatism (6%) was the major reason for the induction of labour in the control groups. The mode of delivery during labour naturally was lower in the obese group (56%) than in the control group (66%). The primary caesarean delivery rate was higher in the obese group (34%) than in the control group (24%). The number of repeat caesarean deliveries was higher in the obese patients (10%) than in the control group (8%). Only instrumental delivery was observed in the control group. The major reasons for primary emergency caesarean delivery were failure to progress, failed induction, cephalopelvic disproportion, and foetal distress in both groups. Complications, such as wound infection, were more frequent in obese women (12% vs. 4%). Most deliveries occurred at a gestational age > 37 weeks in both groups (90% in the obese group vs. 94% in the control group) [Table 4].

Neonatal birth weights between higher percentages of neonates (3.5-3.99 kg and > 4 kg) in the (22% and 10%) compared to the (4% and 0%) in the obese and control groups were not statistically significant (p = 0.109). APGAR scores at 5 minutes showed similar outcomes between the two groups, with most neonates scoring > 7 (96% in the control group and 94% in the obese group). The difference in the APGAR at 5 min between the obese and control groups was not statistically significant (p=0.646). NICU admissions were higher in the obese group than in the control group, with an increase in admissions for infants of mothers with diabetes (16% in obese vs. 6% in control), preterm births (10% in

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obese vs. 6% in control), macrosomia, and meconium aspiration in infants of diabetic mothers, which was not statistically significant (p=0.296) [Table 5].

The caesarean delivery rate was higher in the obese group 22 (44%) than that in the control group 16 (32%). Obese women had a 1.5-fold increased risk of caesarean delivery compared with the control group. Caesarean-section rates increased with the severity of obesity [Table 6].

In the control group, 68% of the nulliparous and previously normal delivery patients had vaginal deliveries, with no vaginal deliveries in those with a previous caesarean section. In the obese group, 56% of nulliparous and previously normal delivery patients had vaginal deliveries, with no vaginal deliveries in those with a previous caesarean section. Caesarean section was more frequent in the obese group (44%) than in the control group (32%) [Table 7].

Table 1: Comparison of demographic characteristics between the groups.

		Control (%)	Obese (%)	P value
Age in years	< 20	3 (6%)	1 (2%)	0.002
	20-24	26 (52%)	14 (28%)	
	25 -29	15 (30%)	19 (38%)	
	> 30	6 (12%)	16 (32%)	
Socio-economic status(class)	I	0	0	0.59
	II	3 (6%)	6 (12%)	
	III	31 (62%)	25 (50%)	
	IV	15 (30%)	18(36%)	
	V	1 (2%)	1 (2%)	
Parity	Nulliparous	22 (44%)	18 (36%)	0.7
	PARA I	25 (50%)	28 (56%)	
	PARA II	3 (6%)	4 (8%)	
Menstrual pattern	Regular	48 (96%)	41 (82%)	0.025
	Irregular	2 (4%)	9 (18%)	
Infertility	Yes	2 (4%)	10 (20%)	0.045
	No	48 (96%)	40 (80%)	

Table 2: Pregnancy-related disorders and complications among the groups

		Control (%)	Obese (%)
Pre-pregnancy medical disorder	Diabetes	1 (2%)	3 (6%)
	Hypertension	1 (2%)	2 (4%)
	Hypothyroidism	2 (4%)	5 (10%)
	Asthma	1 (2%)	0
	Epilepsy	0	1 (2%)
	Heart disease	0	0
Pregnancy-related medical disorders	Gestational diabetes mellitus	2 (4%)	5 (10%)
	Gestational hypertension	3 (6%)	7 (14%)
	Pre-eclampsia	2 (4%)	5 (10%)
Other obstetric complication	Multiple pregnancies	1 (2%)	1 (2%)
	Abruptio placenta	0	1 (2%)
	Placenta previa	1 (2%)	0
	Malpresentation breech	2 (4%)	2 (4%)

Table 3: Comparison of maternal and neonatal characteristics between the groups.

	Mean		P-value
	Control	Obese	
Age in years	25.04±3.307	27.38±3.864	0.002
Maternal weight at booking (kg)	54.06±3.47	83.18±5.47	0.001
Maternal BMI at booking (kg/m2)	21.6±0.96	33.86±2.53	0.001
Maternal weight at delivery (kg)	62.84±3.22	92.7±6.02	0.001
Mean birth weight of the neonate (kg)	2.94±0.416	3.2±0.494	0.001

Table 4: Comparison of labour induction, mode of delivery, and obstetric outcomes in control and obese groups

		Control (%)	Obese (%)	P value
Induction of labour	Yes	8 (16%)	13 (26%)	0.461
	No	42 (84%)	37 (74%)	
Indications for labour induction	GHT	1 (2%)	3 (6%)	-
	Pre-eclampsia	1 (2%)	5 (10%)	
	Postdatism	3 (6%)	2 (4%)	
	PROM	1 (2%)	2 (4%)	
	PPROM	1 (2%)	0	
	Oligohydramnios	1 (2%)	1 (2%)	
Mode of delivery	Labour naturale	33 (66%)	28 (56%)	0.497
	Primary caesarean	12 (24%)	17 (34%)	
	Repeat caesarean	4 (8%)	5 (10%)	
	Forceps	1 (2%)	0	

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Primary caesarean delivery	Emergency	9 (18%)	13 (36%)	-
	Elective	3 (6%)	4 (8%)	
Indication for primary emergency caesarean delivery	Failure to progress	3 (33%)	3 (23%)	-
	Failed induction	2 (22%)	3 (23%)	
	Foetal distress	2 (22%)	2 (15.38%)	
	Imminent eclampsia	0	1 (7.69%)	
	CPD	1 (11%)	3 (23%)	
	Deep transverse arrest	1 (11%)	0	
	Malpresentation (breech)	0	0	
	Abruptio placenta	0	1 (7.69%)	
Complication	Wound infection	2 (4%)	6 (12%)	-
	Wound dehiscence	0	1 (2%)	
	Deep vein thrombosis	0	0	
	Lactate dysfunction	0	0	
Gestational age	> 37	47 (94%)	45 (90%)	0.749
	35-36.6	2 (4%)	3 (6%)	
	32-34.6	1 (2%)	2 (4%)	

Table 5: Neonatal outcomes in control and obese groups

		Control (%)	Obese (%)	P value
The birth weight of the neonate (kg)	1.5-1.99	1 (2%)	1 (2%)	0.109
	2-2.49	2 (4%)	1 (2%)	
	2.5-2.99	25 (50%)	13 (26%)	
	3-3.49	17 (34%)	22 (44%)	
	3.5-3.99	5 (10%)	11 (22%)	
	> 4	0	2 (4%)	
APGAR at 5 minutes	< 7	2 (4%)	3 (6%)	0.646
	> 7	48 (96%)	47 (94%)	
NICU admissions and their indication	Meconium aspiration	3 (6%)	2 (4%)	0.296
	Respiration distress	1 (2%)	0	
	Infant-DM mother	3 (6%)	8 (16%)	
	Preterm	3 (6%)	5 (10%)	
	IGUR	0	0	
	Abnormality	0	0	
	Macrosomia	0	2 (4%)	

Table 6: Mode of delivery across control, obese, and obese severity groups

Mode of delivery	Control	Obese	Obese types		
			Moderate	Severe	Very severe
Vaginal delivery	34 (68%)	28 (56%)	25 (60.97%)	2 (33.33%)	1 (33.33%)
Caesarean LSCS	16 (32%)	22 (44%)	16 (39.02%)	4 (66.67%)	2 (66.67%)

Table 7: Mode of delivery based on parity

Mode of delivery	Control			Obese		
	Nullipa rous	Previous normal delivery	Previous caesarean section	Nullipa rous	Previous normal delivery	Previous caesarean delivery
Vaginal delivery	10 (20%)	24 (48%)	0	3 (6%)	25 (50%)	0
Caesareans LSCS	12 (24%)	0	4 (8%)	15 (30%)	2 (4%)	5 (10%)

Table 8: Comparison of pregnancy-related conditions of our study with other studies

	Gestational diabetes	Pre-eclampsia	Gestational hypertension
Ehrenberg et al. (2002),[6]	8%	-	-
Arnold et al. (1980),[10]	6.50%	-	-
Robinson et al. (2005),[11]	-	18-9%-22.6%	-
Sibai et al. (1995),[12]	-	12.60%	-
Weiss et al. (2004),[13]	-	-	10.20%
Our study	10%	10%	14%

DISCUSSION

In our study, women in the obese group were slightly older than those in the normal BMI group. The mean maternal age of the obese group was 27.38±3.864 years. Obese women were less likely to be nulliparous than were multiparous women. The mean BMI of the obese group increased with increasing parity. Ehrenberg et al. (2002) reported that increasing age and parity are risk factors for obesity.[6]

Our study showed one (2%) patient in the control group and 3(6%) patients in the obese group had diabetes and failed to demonstrate such an association, which may be due to the small sample size. Previous studies by Perlow et al. (1992) and Garbaciak et al. (1985) have shown that obese women have an increased incidence of pre-existing

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diabetes and chronic hypertension, which complicate pregnancy.[7,8]

In our study population, the obese group exhibited a 10% higher risk of developing diabetes than the normal BMI group (4%). Obese women have an increased risk of gestational diabetes. In the obese group, we found an increased risk of preeclampsia (10%) compared to the control group (4%). A systemic review by Brien et al. demonstrated a consistently strong positive correlation between maternal obesity and preeclampsia risk.[9]

Our study results are consistent with those of several other studies

In our study, placental abnormalities, such as one case of placenta previa, occurred in the control group and one case of placental abruption occurred in the obese group. Bianco et al. showed an increased incidence of abruption; however, the results of Wolfe et al. (1994) including ours, did not show an association.[14,15]

In our study, obese women had an increased incidence of induced labour (26%) than the control group (16%). Ekblad et al. (1992) study showed that labour induction was more common in the obese group (36%) than in the control group (24%).[16] Cedergren et al. (2004) study reported evidence ranging from 13.1% to 18.3%, according to the severity of obesity.[17]

In our study, the mean birth weight of the neonates in the obese group was 3.2±0.494 kg and the neonates in the control group were 2.94±0.416 kg. Ehrenberg et al. (2002) and Sebire et al. (2001) showed that obese women have an increased risk of delivering high-birth-weight babies.6,18 We found that 22% of the obese group delivered babies 3.5 kg and above compared to 10% of the control group.

In our study, the neonates of obese mothers had increased NICU admissions, the major reasons for admission being infants of mothers with diabetes, preterm babies, and macrosomia. There was no difference in the Apgar scores at 5 min between the two groups. This is consistent with the results of the study conducted by Rode et al.[19] As documented in previous studies, Hood et al. (1993) found that obese women had prolonged hospital stays, which may be due to associated medical complications, wound infections, and NICU admissions.[20]

CONCLUSION

Our study highlights the numerous maternal and perinatal risks in obese pregnant women, which pose a considerable challenge to obstetrical practitioners. Additionally, massive obesity among women of childbearing age is associated with several health risks later in life. This emphasizes the importance of reducing the increasing incidence of obesity in fertile women. The best time of intervention may be before a woman considers pregnancy because it is not recommended that obese women lose weight during pregnancy. This finding implies the need for a multidisciplinary approach to pre-pregnancy advice and counselling for young women. Pregnant women with obesity should be informed of the risks that maternal obesity confers during pregnancy.

Healthcare professionals need to encourage and assist obese women in making lifestyle changes, to lose weight pre-conceptually, to optimize and potentially decrease pregnancies among obese women must be classified as high-risk pregnancies, and appropriate antenatal care should be provided with heightened surveillance, anticipation, and diagnosis of complications and early intervention if complications arise.

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