

Maternal Body Mass Index and Pregnancy Outcome

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ABSTRACT

Objectives: To evaluate the impact of the maternal body mass index on the pregnancy outcome.

Materials and Methods: Seven hundred eighty four women who had singleton pregnancies during a one year period, were categorized into 5 groups on the basis of their maternal Body Mass Index (BMI). The maternal and the neonatal outcome were noted in all the groups.

Results: In the underweight group, the incidences of anaemia and growth retardation were more, while the overweight and the

obese women had a higher risk for PIH, gestational diabetes and Large for gestational age (LGA). The groups 4 and 5 had higher incidences of LSCS, wound sepsis and neonatal ICU admissions. There was no significant increase in the perinatal mortality rate.

Conclusion: The health of women, throughout their childbearing ages, should be addressed, to improve their obstetrical and perinatal outcomes. Also, the high risk groups should be managed at tertiary centers.

Key Words: IUGR, BMI, Anaemia, PIH, Gestational diabetes

INTRODUCTION

During the last two decades, there has been an alarming rise in the incidence of obesity all over the world. India is now facing a double burden of this disease with undernutrition and underweight on one side, and a rapid upsurge in obesity and overweight, particularly in the urban settings on the other side.

The National Family Health Surveys (NFHS) in India indicated an increase in the obesity from 10.6% in 1998–1999 to 14.8% in 2005–2006, while there was only a marginal decrease in the incidence of underweight from 36.2% (1998–1999) to 33.0% (2005–2006) [1].

Both lean and obese women carry a risk for adverse pregnancy outcomes [2]. An increasing BMI is associated with an increased incidence of pre-eclampsia, gestational hypertension, macrosomia, induction of labour and caesarean deliveries [3]. The BMI is a simple index of the weight-for-height and it is calculated by dividing a person's weight in kilograms by the square of their height in meters (kg/m^2).

Underweight (a BMI of $< 19.9 \text{ kg}/\text{m}^2$) has been shown to be associated with an increased risk of preterm deliveries, low birth weight and anaemia and a decreased risk of pre-eclampsia, gestational diabetes, obstetric intervention and post-partum haemorrhage [4].

The aim of the study was to examine the association of the maternal Body Mass Index (BMI) and the obstetric and the perinatal outcomes in singleton pregnancies.

MATERIALS AND METHODS

The present study was a prospective evaluation of 784 women with singleton pregnancies, which was carried out at Geetanjali Medical College and Hospital, Udaipur, Rajasthan, India from January 2011 till December 2011.

The women with multiple pregnancies and pre-existing hypertension or diabetes were excluded from the study.

The women were categorized into five groups according to their BMI as follows (on the basis of the WHO and the National Institute of Health guidelines):

Underweight (group I)	: Less than or equal to BMI 19.9 kg/m^2
Normal (group II)	: BMI 20-24.9 kg/m^2
Overweight (group III)	: BMI 25-29.9 kg/m^2
Obese (group IV)	: BMI 30-34.9 kg/m^2
Morbidly Obese (group V)	: BMI greater than 35 kg/m^2

The group with the BMI in the normal range (20-24.9 kg/m^2) was used as the reference or the comparison group for the analysis.

The obstetrical outcomes which were included were gestational hypertension, pre-eclampsia, antepartum haemorrhage, preterm delivery, anaemia, intrauterine growth retardation, the mode of the delivery and any early post partum morbidity (within 7 days of the delivery).

The neonatal outcomes included: birth weight, the Apgar score, perinatal death and admission to the neonatal intensive care unit.

RESULTS

On the basis of the BMI, out of the 784 women, 116 (14.79%) were underweight and 406 (51.78%) belonged to the normal weight category, while 165 (21.04%), 84 (10.71%) and 13 (1.65%) women were from the overweight, obese and the morbidly obese categories respectively [Table/Fig-1].

The distribution of the BMI across the selected demographic characteristics has been displayed in [Table/Fig-2]. Overall, the lesser parity, higher education and elderly age in the overweight and the obese groups, were more compared to those among the normal and the underweight groups.

The antenatal complications according to the BMI, have been displayed in [Table/Fig-3]. In the underweight group, anaemia (58.6%) and growth retardation (17.2%) were more as compared

Group	BMI	No. of Women	% age of Women
I Underweight	<19.9	116	14.79
II Normal Weight	20-24.9	406	51.78
III Overweight	25.29.9	165	21.04
IV Obese	30-34.9	84	10.33
V Morbidly Obese	>35	13	1.65
Total		784	

[Table/Fig-1]: Distribution of Women according to BMI

BMI (group)	I n=116	II n=406	III n=165	IV n=84	V n=13
Age					
< 18 years	5(4.3%)	23(5.66%)	2(1.2%)	0(0%)	0(0%)
18-25 years	68(58.6%)	179(44.08%)	63(38.1%)	31(36.9%)	3(23.0%)
26-35 years	36(31.0%)	157(38.6%)	71(43.0%)	36(42.8%)	6(46.1%)
> 35 years	7(6.03%)	47(11.57%)	29(17.5%)	17(20.2%)	4(30.7%)
Parity					
Nulliparous	27(23.2%)	137(33.7%)	79(47.8%)	48(57.1%)	8(61.5%)
1-4	66(56.89%)	209(51.4%)	74(44.8%)	32(38.0%)	5(38.46%)
> 4	23(19.8%)	60(14.7%)	12(7.2%)	4(4.76%)	0(0%)
Education					
Primary School	42(36.2%)	159(39.1%)	38(23.0%)	11(13.09%)	0(0%)
High School	48(41.3%)	174(42.8%)	69(41.8%)	37(44.0%)	4(30.7%)
University/ College	26(22.4%)	73(17.9%)	58(35.1%)	36(42.8%)	9(69.2%)

[Table/Fig-2]: Demographic characteristics of women in different BMI groups

BMI group	I n=116	II n=406	III n=165	IV n=84	V n=13	p value
Haemorrhage	2(1.7%)	9(2.2%)	5(3.03%)	2(2.38%)	0(0%)	0.92
PIH	4(3.4%)	36(8.86%)	16(9.6%)	10(11.9%)	4(30.7%)	0.01
Gestational diabetes	0(0%)	1(0.24%)	2(1.2%)	6(7.1%)	3(23.0%)	<0.001
Anemia	68(58.6%)	147(36.2%)	25(15.1%)	8(9.5%)	1(7.6%)	<0.001
IUGR	20(17.2%)	25(6.1%)	11(6.66%)	5(5.9%)	1(7.6%)	0.002

[Table/Fig-3]: Complications during pregnancy
P <0.05 & <0.01(significant), <0.001(highly significant)
PIH—Pregnancy induced hypertension
IUGR—Intrauterine growth retardation

BMI group	I n=116	II n=406	III n=165	IV n=84	V n=13	p value
Labour Spontaneous normal delivery	101 (87%)	340 (83.7%)	126 (76.3%)	51 (60.7%)	4 (30.7%)	<0.001
LSCS	14(12.0%)	61(15.0%)	36(21.8%)	31(36.9%)	9(69.2%)	<0.001
Emergency	6	35	15	7	3	
Elective	8	26	21	24	6	
Instrumental (Forceps/vacuum)	1 (0.86%)	5 (1.2%)	3 (1.8%)	2 (2.3%)	0 (0%)	0.86
PPH	4 (3.4%)	6 (1.47%)	2 (1.2%)	1 (1.19%)	0 (0%)	0.57
Post partum Infection (wound sepsis) (LSCS)	2 (14.2%)	5 (8.1%)	4 (11.1%)	5 (16.1%)	2 (22.2%)	0.001

[Table/Fig-4]: Labour and early post-partum complications
P <0.05 & <0.01(significant), <0.001(highly significant)
LSCS—Lower segment caesarian section
PPH—Post partum hemorrhage

to those in the normal and the higher category BMI groups. The overweight and the obese women groups had a higher incidence of pregnancy induced hypertension (PIH): 9.6%, 11.9% and it was 30.7% in the groups III, IV and V respectively. The incidence of gestational diabetes was 1.2%, 7.1% and 23.0% in the groups III, IV and V respectively. The incidence of antepartum haemorrhage was almost same in all the groups.

The mode of labour and the early post-partum complications as per the BMI groups, have been shown in [Table/Fig-4]. The incidence of caesarean sections were more in the groups III, IV and V, the main indications being hypertension, diabetes, macrosomia and failed induction of labour.

Post-partum haemorrhage (PPH) was seen more in the underweight group because of anaemia, malnutrition and a higher parity and wound sepsis was seen more in the morbidly obese group [Table/Fig-5].

The preterm labour incidence didn't show any significant correlation with any group. The Small for Gestational Age (SGA) babies were more in the underweight group, while the incidence of the Large for Gestational Age (LGA) babies was significantly more in groups IV and V. The perinatal death rate was not significantly higher in any groups, but the neonatal ICU admission rate was significantly higher in the morbidly obese group.

DISCUSSION

The results of this study showed that underweight as well as overweight and obesity were associated with adverse maternal and perinatal outcomes.

The women who were overweight, obese, or morbidly obese had significantly increased risks for gestational diabetes ($p < 0.001$),

BMI group		Preterm labour	SGA	LGA	Admission to NICU	Perinatal death
I	n=116	5(4.31%)	22(18.9%)	1(0.86%)	7(6.03%)	2(1.7%)
II	n=406	15(3.6%)	23(5.6%)	8(1.97%)	19(4.68%)	3(0.73%)
III	n=165	7(4.2%)	9(5.4%)	11(6.66%)	13(7.87%)	2(1.2%)
IV	n=84	5(5.9%)	5(5.9%)	9(10.7%)	8(9.5%)	2(2.3%)
V	n=13	1(7.69%)	1(7.69%)	3(23%)	3(23%)	0(0%)
p value		0.86	<0.001	<0.001	0.03	0.69

[Table/Fig-5]: Neonatal Outcome

P <0.05 & <0.01 (significant), <0.001 (highly significant)

SGA—Small for gestational age

LGA—Large for gestational age

NICU—Neonatal intensive care unit

gestational hypertension ($p=0.01$), caesarean sections ($p<0.001$) and large for gestational age babies ($p<0.001$), which was consistent with the findings of other studies [2,3,5]. Mamula et al., [5] found an association between the third trimester haemorrhage and an increased BMI, but in the present study, no increased risk of APH was seen in the overweight and the obese groups ($p=0.92$).

The caesarean section rate was found to be increased with a higher maternal BMI, thus carrying an extra risk of a higher perioperative morbidity, which included anaesthetic problems, infections and prolonged hospitalization. We found an increased rate of wound sepsis in the underweight, obese and the morbidly obese groups in the present study ($p=0.001$).

The neonatal ICU admission rate was more in the morbidly obese group (25%), which was attributed mainly to the LGA babies and the diabetic mothers.

A study which was done by Hendler et al., [6] evaluated the relationship between the pre-pregnancy BMI and the spontaneous preterm birth and the indicated preterm birth and they found a significant occurrence of the preterm birth among the lean and the obese pregnant women. In the present study, no significant correlation of the preterm deliveries was seen in any BMI group ($p=0.86$).

With regards to the Intrauterine Growth Retardation (IUGR), we found a strong association with the underweight group (17.2%, as compared to 6-7.5% in the other groups, $p<0.001$). In the underweight group, a high incidence of anaemia was seen to affect more than 50% of the women in that group ($p<0.001$).

Apart from an increased risk of IUGR and anaemia, the mothers with a BMI of $< 19.9 \text{ kg/m}^2$ appeared to be at a lower risk for other antepartum or labour complications as compared to the women with a normal BMI range, which was consistent with other studies [2,3].

CONCLUSION

Both the extremes of the maternal BMI showed a strong association with the pregnancy complications and the perinatal outcomes. While obesity was associated with an increased incidence of pre-eclampsia, gestational hypertension, macrosomia and increased caesarean rates; the underweight women's group faced complications like IUGR and anaemia.

To conclude, the health of women throughout their child bearing years should be addressed, to improve the obstetrical and the perinatal outcomes.

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