

Effect of Maternal Body Mass Index on Pregnancy Outcome

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Abstract

Introduction: Maternal body mass index (BMI) is one of the most important predictor of nutritional status of pregnant lady. Both nutritional intake and maternal weight are modifiable factors which can influence pregnancy outcome. Either underweight or overweight, both can have significant impact on outcome of pregnancy. Most of the developing countries including India are now facing double burden because of extreme socioeconomic distribution. Obese women are more prone for developing gestational hypertension, preeclampsia, gestational diabetes mellitus, macrosomia, postpartum hemorrhage, and increased incidence of operative deliveries.

Aims and Objectives: To determine the maternal risk in terms of antepartum, intrapartum, postpartum complications and perinatal outcome in relation to extremes of maternal BMI.

Materials and Methods: This was a prospective study conducted for a period of 1 year. Total 150 patients were taken for study after satisfying all inclusion and exclusion criteria. However, 40 patients were excluded from study due to loss of follow-up. All patients were followed up till delivery and various outcomes were studied and analyzed.

Results: A total of 72 (65.45%) patients were in the age group of 21-30 years. Our study has shown that both underweight and overweight women had adverse maternal and perinatal outcome. In underweight group, there was high incidence of anemia which has affected 35% of patients. Low APGAR score and neonatal intensive care unit admissions were more frequent in BMI Group 3, 4, and 5 patients.

Conclusion: It can be concluded from our study that extremes of maternal BMI is associated with adverse maternal and perinatal outcome. Adequate preconceptional counseling should be given to all women in reproductive age group so that they can attain normal BMI before conception.

Key words: Body mass index, Gestational diabetes mellitus, Gestational hypertension, Macrosomia, Obesity, Pregnancy outcome

INTRODUCTION

Maternal body mass index (BMI) is one of the most important predictor of nutritional status of pregnant lady. Both nutritional intake and maternal weight are modifiable factors which can influence pregnancy outcome.¹ Either underweight or overweight both can have a significant impact on outcome of pregnancy.

Worldwide there has been alarming increase in the incidence of obesity and overweight, particularly in the past two to three decades. In the latest report, the WHO has indicated that approximately 1.6 billion adults are overweight and around 400 million are obese. Obesity as thus becomes a major contributor for global burden of chronic diseases and disabilities.²

Most of the developing countries including India are now facing double burden because of extreme socioeconomic distribution. On one side, there is overweight and obesity which has reached epidemic proportions and on the other side there is underweight and undernourishment. In India, 26% of pregnant women are overweight and 8% are obese.³

Pregnancy complications secondary to overweight and obesity have been studied from as early as 1945, and it has

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been well established that these women are more prone for developing gestational hypertension, preeclampsia (PE), gestational diabetes mellitus (GDM), macrosomia, postpartum hemorrhage, and increased incidence of operative deliveries.^{4,5} Furthermore, it has been showed that low APGAR score and perinatal deaths are more common in neonates of obese women.^{6,7} However, effect of underweight remains bit unclear. There are some studies which have reported increased incidence of anemia, intrauterine growth retardation, low birth weight (LBW) babies, and preterm labor. While some studies have reported a protective effect on some pregnancy complications such as GDM and PE.⁸ Hence, this study is to determine the effect of maternal BMI on pregnancy outcome.

Aims and Objectives

1. To determine the maternal risk in terms of antepartum, intrapartum, and postpartum complications in relation to extremes of maternal BMI
2. To determine the perinatal outcome in relation to extremes of maternal BMI.

MATERIALS AND METHODS

This was a prospective study conducted at the Department of OBG, Institute of Maternal and Child Health attached to Government Medical College, Kozhikode, for 1 year from March 2012 to February 2013.

Inclusion Criteria

1. Primigravida with singleton pregnancy
2. Booked cases with their first visit before 12 weeks of gestation
3. No history of any medical disorders.

Exclusion Criteria

1. Multipara
2. Multiple pregnancy
3. Presence or history of any medical disorders.

A total of 150 patients were taken for study after satisfying all inclusion and exclusion criteria. However, 40 patients were excluded from study due to loss of follow-up. Hence, sample size of this study was 110. The measurements of height and weight were taken by means of standard methodology described by Lohman *et al.*⁹ BMI of patients was calculated using formula:

$$\text{BMI} = (\text{weight in kilograms}/\text{height in meters}^2).$$

Based on BMI, patients were divided into five groups (according to the WHO and NIH guidelines).

A complete history regarding present and past illness was noted. Detailed general physical and systemic examination was performed. Baseline routine investigations were performed. All findings were noted down in a predesigned pro forma and records were maintained till delivery. All patients under study were counseled to have follow-up visits as per standard protocol till delivery. Decision regarding mode of delivery was taken depending on the particular case. All the babies were examined by a pediatrician. APGAR scores of the babies were assessed and neonatal intensive care unit (NICU) admissions were recorded.

The obstetrical outcomes studied

- Miscarriage
- Impaired glucose tolerance (IGT), GDM
- Gestational hypertension
- PE, eclampsia
- Anemia
- Preterm delivery
- Mode of delivery
- Postpartum complications.

The neonatal outcomes studied:

- Birth weight
- Maturity
- NICU admission
- Perinatal death.

RESULTS

In our study total 110 patients were studied. In all BMI groups maximum numbers of patients were in the age group of 21 to 30 years (Tables 1-3).

Table 1: Category and group of patients based on BMI

Group	Category	BMI
1	Underweight	≤19.9 kg/m ²
2	Normal	20-24.9 kg/m ²
3	Overweight	25-29.9 kg/m ²
4	Obese	30-34.9 kg/m ²
5	Morbidly obese	≥35 kg/m ²

BMI: Body mass index

Table 2: Number of cases in each group

Group	Category	Number of cases (%)
1	Underweight	32 (29.09)
2	Normal	37 (33.063)
3	Overweight	27 (24.54)
4	Obese	10 (9.09)
5	Morbidly obese	4 (3.63)

Table 3: Age-wise distribution

Group	Age in years		
	≤20	21-30	31-35
1	8	20	4
2	4	28	5
3	3	16	8
4	2	5	3
5	0	3	1
Total (%)	17 (15.45)	72 (65.45)	21 (19.09)

Complications like Gestational hypertension was more common in Group 3,4 and 5. Anaemia was more common in Group 1 (Table 4).

Table 4: Complications during antepartum period

Complications	BMI group (total number of cases) (%)				
	1 (32)	2 (37)	3 (27)	4 (10)	5 (4)
Miscarriage	3 (9.37)	1 (2.7)	2 (7.4)	1 (10)	0
Impaired glucose tolerance	0	5 (13.51)	1 (3.7)	0	0
GDM	0	2 (5.4)	2 (7.4)	0	0
GHT	3 (9.37)	2 (5.4)	4 (14.8)	2 (20)	1 (25)
Preeclampsia	0	1 (2.7)	1 (3.7)	2 (20)	1 (25)
Eclampsia	0	0	0	0	1 (25)
Anemia	10 (31.25)	7 (18.91)	3 (11.1)	1 (10)	1 (25)
Antepartum hemorrhage	0	0	0	1 (10)	0

BMI: Body mass index

Compared to women with normal BMI(Group 2), LSCS rate was more common in Group 2,3,4 & 5. LSCS rate in Group 2,3,4 & 5 was 19.5%, 32%, 44.5% and 25% respectively (Table 5).

Table 5: Mode of delivery

BMI group	1	2	3	4	5	Total
Number of cases (excluding miscarriages)	29	36	25	9	4	103
Normal delivery (%)	25 (86.20)	29 (80.5)	17 (68)	5 (55.5)	3 (75)	79 (76.7)
LSCS (%)	4 (13.8)	7 (19.5)	8 (32)	4 (44.5)	1 (25)	24 (23.3)

BMI: Body mass index, LSCS: Lower segment Cesarean section

Table 6: Postpartum complications

BMI group	1	2	3	4	5
Number of cases (excluding miscarriages)	29	36	25	9	4
Nil complications (%)	22 (75.86)	25 (69.4)	14 (56)	5 (55.5)	2 (50)
Perineal laceration	0	2	3	1	1
Postpartum Hemorrhage	1	0	1	0	0
Urinary tract infection	2	3	4	1	0
Respiratory tract infection	1	2	1	0	0
Wound infection	3	3	3	2	1

BMI: Body mass index

Postpartum complications increased with increase in BMI (Table 6). Macrosomia was more common in Group 5 with mean Birth weight of babies being 3.36 kg (Table 7). Rate of NICU admission was more common in Group 4 and 5 patients (Table 8).

Table 7: Maternal BMI and birth weight of babies

BMI group	1	2	3	4	5
≤2.5 kg	18	3	2	1	1
2.6-3.5 kg	11	19	7	2	0
3.6-3.9 kg	0	14	13	4	2
≥4 kg	0	0	3	2	1
Mean birth weight	2.32	2.94	3.2	3.28	3.36

BMI: Body mass index

Table 8: Maternal BMI, APGAR score, and NICU admission

BMI group	1	2	3	4	5	Total (%)
APGAR score						
1'9	25	31	21	7	3	87 (84.46)
1'<9	4	5	4	2	1	16 (15.53)
NICU admission (%)	6 (20.67)	10 (27.7)	9 (36)	3 (33.3)	2 (50)	

BMI: Body mass index, NICU: Neonatal Intensive Care Unit

Table 9: Neonatal deaths in different groups

BMI group	Number of neonatal deaths	Causes
1	2	Low birth weight, Perinatal asphyxia
2	0	
3	1	Low birth weight, RDS
4	1	MAS, sepsis
5	0	

BMI: Body mass index, RDS: Respiratory distress syndrome, MAS: Meconium Aspiration Syndrome.

DISCUSSION

In our study, 72 (65.45%) patients were in the age group of 21-30 years, which reflects the normal child bearing age group of women.

Our study has shown that both underweight and overweight women had adverse maternal and perinatal outcome. The women who were overweight/obese/morbidly obese had significantly higher risk of gestational hypertension, PE and IGT. Rate of lower segment cesarean section (LSCS) was also higher in these groups. This is in line with other studies like Bhattacharya *et al.*¹⁰

In underweight group, there was high incidence of anemia which has affected 35% of patients. This is due to lower socioeconomic status and nutritional deficiencies. This

correlates with other studies like Jain *et al.*¹¹ In our study, we have found out that underweight mothers are associated with increased risk of giving birth to LBW babies. This is consistent with other studies such as Han *et al.*, 2011¹² and Kanadys 2007.¹³

Our study has shown that macrosomia or babies with higher birth weight is common in obese and overweight women. Similar results were obtained with other studies such as Isaacs *et al.*;¹⁴ Bianco *et al.*, 1998;¹⁵ Cedergren, 2004.¹⁶

Low APGAR score and NICU admissions were more frequent in BMI Group 3, 4, and 5 patients. Scott-Pillai *et al.*, 2004,⁷ also had similar results. Perinatal deaths were more common in underweight category because of LBW and severe perinatal asphyxia which is similar to study conducted by Cunningham and Teale, 2013.¹⁷

CONCLUSION

It can be concluded from our study that extremes of maternal BMI is associated with adverse maternal and perinatal outcome. While underweight was associated with anemia, nutritional deficiencies and LBW babies, obese and overweight was associated with gestational hypertension, PE, GDM, increased LSCS rate macrosomia and increased neonatal morbidity. Hence, adequate preconceptional counseling should be given to all women in reproductive age group so that they can attain normal BMI before conception. With proper management of pregnant women with abnormal BMI during antepartum, intrapartum, and postpartum period, by improving the awareness, and by increasing the accessibility to medical facilities, maternal and perinatal morbidity and mortality can be minimized.

REFERENCES

1. Nutrition During Pregnancy and Lactation. Implementation Guide. 1992. p. 125. Available from: http://www.nap.edu/openbook.php?record_id=1984. [Last accessed on 2011 Apr 25].
2. Obesity: Preventing and managing the global epidemic. Report of a WHO consultation. World Health Organ Tech Rep Ser 2000;894:i-xii, 1-253.
3. McDonald SD, Han Z, Mulla S, Beyene J; Knowledge Synthesis Group. Overweight and obesity in mothers and risk of preterm birth and low birth weight infants: Systematic review and meta-analyses. *BMJ* 2010;341:c3428.
4. O'Brien TE, Ray JG, Chan WS. Maternal body mass index and the risk of preeclampsia: A systematic overview. *Epidemiology* 2003;14:368-74.
5. Kabiru W, Raynor BD. Obstetric outcomes associated with increase in BMI category during pregnancy. *Am J Obstet Gynecol* 2004;191:928-32.
6. Sahu MT, Agarwal A, Das V, Pandey A. Impact of maternal body mass index on obstetric outcome. *J Obstet Gynaecol Res* 2007;33:655-9.
7. Scott-Pillai R, Spence D, Cardwell CR, Hunter A, Holmes VA. The impact of body mass index on maternal and neonatal outcomes: A retrospective study in a UK obstetric population, 2004-2011. *BJOG* 2013;120:932-9.
8. Christensen DL, Eis J, Hansen AW, Larsson MW, Mwaniki DL, Kilonzo B, *et al.* Obesity and regional fat distribution in Kenyan populations: Impact of ethnicity and urbanization. *Ann Hum Biol* 2008;35:232-49.
9. Lohmann TG, Roche AF, Martorell R. Anthropometric Standardization Reference Manual. Campaign, IL: Human Kinetics Book; 1998.
10. Bhattacharya S, Campbell DM, Liston WA, Bhattacharya S. Effect of body mass index on pregnancy outcomes in nulliparous women delivering singleton babies. *BMC Public Health* 2007;7:168.
11. Jain P, Joshi T, Kural MR. Relation of early pregnancy BMI with maternal and fetal outcome: A prospective study. *Int J Sci Nat* 2013;4:642-5.
12. Han Z, Mulla S, Beyene J, Liao G, McDonald SD; Knowledge Synthesis Group. Maternal underweight and the risk of preterm birth and low birth weight: A systematic review and meta-analyses. *Int J Epidemiol* 2011;40:65-101.
13. Kanadys WM. Maternal underweight and pregnancy outcome: Prospective cohort study. *Arch Perinat Med* 2007;13:23-6.
14. Isaacs JD, Magann EF, Martin RW, Chauhan SP, Morrison JC. Obstetric challenges of massive obesity complicating pregnancy. *J Perinatol* 1994;14:10-4.
15. Bianco AT, Smilen SW, Davis Y, Lopez S, Lapinski R, Lockwood CJ. Pregnancy outcome and weight gain recommendations for the morbidly obese woman. *Obstet Gynecol* 1998;91:97-102.
16. Cedergren MI. Maternal morbid obesity and the risk of adverse pregnancy outcome. *Obstet Gynecol* 2004;103:219-24.
17. Cunningham CE, Teale GR. A profile of body mass index in a large rural Victorian obstetric cohort. *Med J Aust* 2013;198:39-42.

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