

High Body Mass Index in Pregnancy, its Effects on Maternal and Fetal Outcome

¹Dr. Vaishnavi Sinwar, Junior Resident, Third Year PG, Department of Obstetrics and Gynaecology, Mahatama Gandhi Medical College and Hospital, Jaipur, India

²Dr. Jaya Choudhary, Professor and Unit Head, Department of Obstetrics and Gynaecology Mahatama Gandhi Medical College and Hospital, Jaipur, India

³Dr. Ranjana Atal, Associate Professor, Department of Obstetrics and Gynaecology Mahatama Gandhi Medical College and Hospital, Jaipur, India

⁴Dr. Sejal Saklani, Junior Resident, Third Year PG, Department of Obstetrics and Gynaecology, Mahatama Gandhi Medical College and Hospital, Jaipur, India

Corresponding Author: Dr. Jaya Choudhary, Professor and Unit Head, Department of Obstetrics and Gynaecology Mahatama Gandhi Medical College and Hospital, Jaipur, India.

How to citation this article: Dr. Vaishnavi Sinwar, Dr. Jaya Choudhary, Dr. Ranjana Atal, Dr. Sejal Saklani, “High Body Mass Index in Pregnancy, its Effects on Maternal and Fetal Outcome”, IJMACR- February - 2025, Volume – 8, Issue - 1, P. No. 185 – 192.

Open Access Article: © 2025 Dr. Jaya Choudhary, et al. This is an open access journal and article distributed under the terms of the creative common’s attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Background: Increasing BMI in women poses multiple threat of illness especially in the reproductive age group impacting pregnancy. Pregnant women with overweight and obesity are at a higher risk of developing complications at all stages of the physiological pregnancy.

Methods: The study was conducted among the pregnant women attending the antenatal clinic in Mahatma Gandhi Medical College and Hospital from January 2023 to October 2023. A total 100 primigravida included. BMI was calculated on first visit and in each trimester, all booked patient was

followed throughout pregnancy and delivery for any maternal and fetal complications.

Results: (58.0%) of patients were with normal BMI, (14.0%) were underweight, (22.0%) were overweight and (6.0%) patients were obese. APH was seen in (3.57%) cases in high BMI. PIH was present in total 7 cases, (25.0%) cases belonged to high BMI grade. Anemia was present in total 8 cases. GDM was present in 11 cases, belonged to high BMI grade. PPH was present in total 4 cases of high BMI. 4 cases of high BMI had birth weight less than 2.5 kg and 24 cases having more than 2.5 kg.

Conclusions: There is importance of pre-pregnancy counseling in maintaining weight of women during pregnancy to avoid pregnancy maternal and fetal outcomes.

Keywords: BMI, Maternal and fetal outcomes, maternal nutrition

Introduction

The rapid rate of socio-economic development and socio-cultural changes, changes in dietary pattern and changes in lifestyle, increasing BMI has become a healthcare burden to the nation. This increasing rate of BMI has affected all age groups universally. It causes major medical ailments like hypertension, Diabetes, cardiovascular, neurovascular diseases, arthritis and causes a lot of morbidity and mortality. Obesity is defined as abnormal growth of adipose tissue due to an enlargement of fat cell size (hypertrophic obesity) or an increase in fat cell number (hyper plastic obesity).¹ According to the WHO, obesity is one of the most common and most neglected public health problems in both developing and developed countries.² Globally 1 out of 6 adults is obese, Due to obesity nearly 2.8 million individuals die each year.³ Studies from different parts of India have provided evidence of the rising prevalence of obesity.⁵⁻⁷ There is increase in obesity in Indian women from 10.6% to 14.8% during last decade in urban areas at the same time in rural area, 48.2% of pre-pregnant women are underweight.^{8,9}

There are various markers used to diagnose obesity like Body Mass Index (BMI), waist circumference, calculation of waist to hip circumference, measuring the thickness of skin fold, techniques such as ultrasound and biochemical markers like total cholesterol, triglyceride, low density lipoproteins, high density lipoproteins etc. BMI involves two factors i.e., height and weight,

irrespective of age, gender, race, family history or sex. It is calculated by dividing a person's body weight in kilograms by their height in meters squared (weight [kg] height [m]²) as shown below:

$[\text{Weight (kg)} \div \text{height (m}^2)] = \text{BMI}$ The BMI cutoffs are:

- Below 18.5 Underweight
- 18.6-24.9 Normal weight
- 25.0-29.9 Overweight
- 30 and greater Obese
- 40 and greater Morbid or extreme obesity

The risk for obesity related obstetric complications appear to start from a BMI of about 21 kg/m². Obese and overweight females undergoing pregnancy and child birth as calculated by maternal BMI will have higher risk for significant antenatal, postpartum and neonatal complications. Diabetes, hypertensive disorders including pre-eclampsia, postdate pregnancies, caesarean sections, macrosomia, thrombo-embolism, fetal deaths have all been associated with maternal obesity.¹⁰⁻¹³ There is linear relationship between maternal obesity and fetal macrosomia.¹⁴ The women who are overweight and obese have more chances to require a caesarean section for delivery.^{15,16}

Materials and Methods

This is a Prospective study conducted in the Department of Obstetrics and Gynecology, Mahatma Gandhi Medical College and Hospital, Sitapura, Jaipur, from January 2023 to October 2023.

Inclusion criteria

- Singleton pregnancy
- Primigravida
- Booked patients.

Exclusion criteria

- Patients not giving consent.
- Multifetal gestation

- Patient with known medical complication like diabetes mellitus, cardiac disease hypertension, chronic renal disease and endocrinal dysfunctions, pre-eclampsia, eclampsia, gestational diabetes mellitus and ASA>GRADE 2.

Consent was taken from all the patients who had participated in the study. A total number of 100 cases who attended antenatal checkup outpatient Department of MGMCH were taken.

All the cases were primigravida and booked patient in first trimester. They were selected based on inclusion and exclusion criteria. BMI was calculated by measuring height and weight ratio on first visit and in each trimester, all booked patient in study group were followed throughout pregnancy and delivery for any maternal and fetal complications.

The data were analysed for the patients in the study:

Antenatal variables

Abortion, Preeclampsia, Gestational diabetes mellitus, Oligohydramnios, Abruption placenta, Anaemia, PROM

Intrapartum variables

Vaginal delivery, Caesarean section, Instrumental delivery

Postpartum variables

PPH, Duration of hospital stay, Wound infection/gaping, Pyrexia, Lactational dysfunction

Neonatal variables

IUGR, Preterm, Macrosomia (>4 kg), Post-term, Still birth, NICU Admission, Need for intubation.

Maternal outcomes

- Pregnancy induced hypertension
- Mode of Delivery- cesarean, instrumentation (ventouse, forceps etc.), normal vaginal delivery
- Preterm and Postterm delivery

- Gestational diabetes mellitus

Perinatal Outcomes

- Low Birth Weight
- APGAR score at 1 and 5 minute
- Admission to NICU
- Macrosomia

Valuation parameter

- Patients were categorized according to first trimester BMI.
- It was calculated by using formula = (weight in kilograms/height in meters²)

The BMI cutoffs are

- Below 18.5 Underweight
 - 18.6-24.9 Normal weight
 - 25.0-29.9 Overweight
 - 30 and greater Obese
- 40 and greater Morbid or extreme obesity

Results

BMI

Table 1 shows distribution of cases according to BMI group. 14 cases were in group I (≤ 18.5). 58 cases were in group II (18.51-24.99). 22 cases were in group III (25-29.99) and 6 cases were in group IV (≥ 30). In the study conducted by Tharihalli et al, in which 15% cases were underweight, 68% were normal, 12% were overweight and 5% were obese.²⁰ Majority of the cases were from normal BMI group followed by underweight patients. The probable reason being most of the patients coming to our hospital were from lower and lower middle class. In western countries 28% women are overweight and 11% are in obese category, according to RCOG.²¹ In this study we included these 28 cases were having BMI >25 means group 3 and group 4 for study i.e., high BMI patients.

Table 1:

BMI Group	No. of cases (%)
I (≤ 18.5)	14 (14.0 %)
II (18.51-24.99)	58 (58.0%)
III (25-29.99)	22 (22.0%)
IV (≥ 30).	06 (6.0%)
Total	100 (100.0%)

Graph 1:

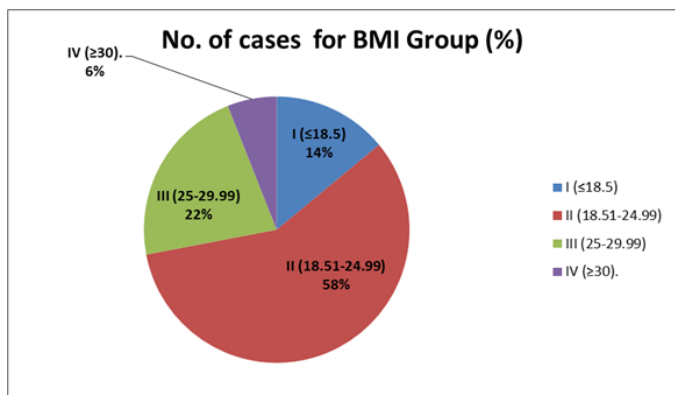


Table 2 shows distribution of cases according to age. Most of the patients age group were 21-25 years (50.0%) followed by 26-30 years (25.0%), 18-20 years (14.3%) while only 10.7% cases were in the age group >30 year. Similar observation were found by John et al where only 4% females were in age group <24 years, 58% in 25-30 years, 38% in 31-35 years.¹⁹

Table 2: Distribution of cases according to age group

Age group (years)	No. of cases	Percentage
18-20	4	14.3
21-25	14	50.0
26-30	7	25.0
>30	3	10.7
Total	28	100

Graph 2:

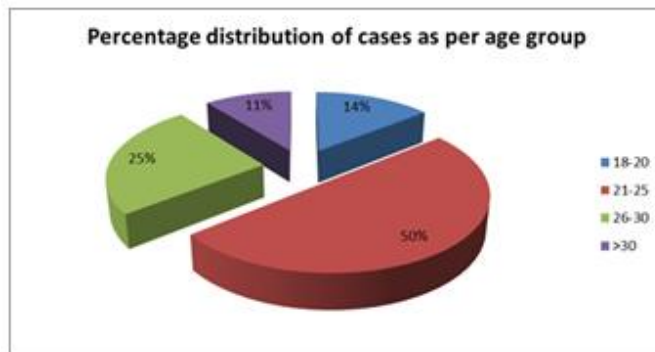
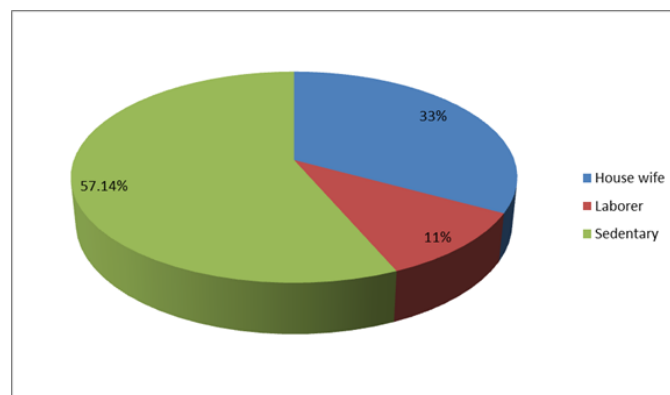


Table 3: Distribution of cases according to occupation

Occupation	No. of cases	Percentage
House wife	9	33.33
Laborer	3	10.71
Sedentary	16	57.14
Total	28	100

In present study, maximum number of cases 57.14% were sedentary, 10.71% cases were laborer and 33.33% cases were housewives.

Graph 3:



Maternal Outcomes

According to maternal outcome in relation to BMI out of 28 cases 1 from APH, 39.58% gestational diabetes mellitus, 25% of PIH. Similar findings were reported by Tharihalli and Thathagari.²² Obesity is known as one important risk factor for pregnancy related hypertension and preeclampsia. Frederick et al found that every 1 kg/m² increase in pre pregnancy BMI resulted in an 8%

increased risk of preeclampsia (adjusted RR= 1.08; CI = 1.05-1.11).²³ Anemia was present in 8 cases of high BMI, Preterm delivery was present in 5 cases.

Table 4: Distribution of cases according to maternal outcome in relation to high BMI (kg/m²)

Maternal Outcome	Number of cases	Percentage
APH	1	03.57
PIH	7	25.00
Anaemia	8	28.57
Pre term	5	17.85
GDM	11	39.28
IUGR	6	21.42
PPH	4	14.28

Graph 4:

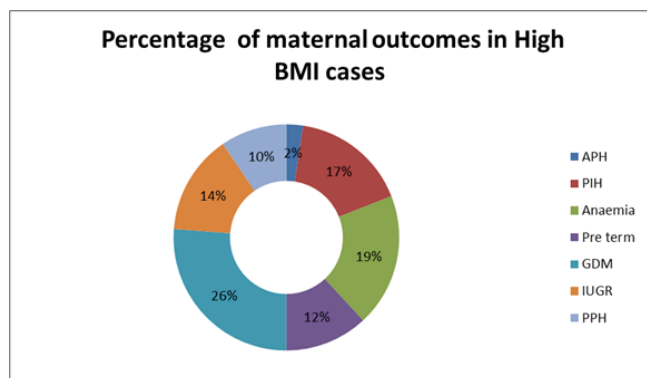


Table 5: Distribution of cases according to type of Delivery for high maternal BMI

Type of Delivery	Number of cases	Percentage
Vaginal birth	10	35.71
LSCS	18	64.28

This shows as BMI increases baby birth weight increases but chances of vaginal delivery decreases. In caesarean deliveries, this trend also found. In this study, we also found that maternal higher pre-pregnancy BMI and excessive GWG were associated with caesarean delivery. This may be that large size baby birth could cause delivery complications, such as caesarean delivery. This study observed that highest number of women has undergone caesarean section in obese group

(8 out of 9). This correlates with the study conducted by Cedergren M.24.

Table 6: Distribution of cases according to APGAR score in relation to high BMI.

Apgar Score at 5 min	No. (%)
≤7	07 (25.0)
>7	21 (75.0)

According to Apgar score at 5 minutes, 25% cases had their Apgar score ≤7 and 75% cases had >7.

Table 7: Distribution of cases according to birth weight in relation to high maternal BMI

Birth weight	Frequency	Percentage
≤2.5	4	14.28
>2.5	24	85.71

In present study, 14.28% babies had their birth weight ≤2.5 and 85.71% babies had >2.5 kg birth weight for high BMI patients.

Table 8: Distribution of cases according to fetal outcome in relation to high BMI (kg/m²)

Fetal outcome	Frequency	Percentage
Macrosomia	3	10.71
Fetal distress	11	39.28
Convulsion	0	0.00
NICU admission	8	28.57

Fetal distress was present in 11 cases while NICU admission required in total 8 cases belonged to high BMI grade III and IV respectively.

Table 9: Distribution of cases according to fetal outcome (at birth and within 7 days) in high maternal BMI (kg/m²)

Fetal outcome	Frequency	Percentage
At Birth	IUD	1 3.57
	Still Birth	0 0
Within 7 Days	Death	0 0

Discussion

Obesity is one of the most common and most neglected public health problems in both developing and developed countries. Maternal nutritional status plays an important role in weight gain which influence fetal outcome. Maternal malnutrition is the most important underlying determinant factor for adverse maternal and fetal outcome. In this study out of 100 cases there were 28 (28.0%) of patients were with high BMI and Similar observations were found by Tharihalli et al, in which 15% cases were underweight, 68% were normal, 12% were overweight and 5% cases were obese.²⁵ In present study, maximum number of cases 57.14% were sedentary, 10.71% cases were laborer and 33.33% cases were housewives. In present study maternal outcome in relation to BMI out of 28 cases 1 from APH, 39.58% gestational diabetes mellitus, 25% of PIH. Tharihalli and Thathagari in their study found similar observation.²⁵ Out of total of 500 cases, the incidence of PIH was highest in obese group (28%) and overweight group (25%) compared to normal BMI group (6.17%) and underweight group (2.6%). According to type of delivery, 35.71% had vaginal birth and rest of them had LSCS. According to Apgar score at 5 minutes, 25% cases had their Apgar score ≤ 7 and 75% cases with >7 respectively. According to fetal outcome, macrosomia was present in total 3 cases. Fetal distress was present in 11 cases while NICU admission required in total 8 cases belonged to high BMI grade III and IV respectively. In present study, 14.28% babies had their birth weight ≤ 2.5 and 85.71% babies had >2.5 kg birth weight for high BMI patients.

Conclusion

Authors conclude that BMI plays major role in maternal and perinatal outcome and high BMI had

significant maternal and perinatal outcome. We observed that as trimester advanced BMI is also increased. In overweight and obese cases or in BMI grade 3 and 4 also had maternal and fetal problems during antinatal period, during labour and post partum period. Patients suffered from more complications like PIH, GDM, PROM, IUGR and PPH. We observed that BMI grade 3 and 4 cases higher number of patients developed diabetes and hypertension both these patients delivered a macrosomic babies. In overweight and obese patients mode of delivery was LSCS due to macrosomic baby, hypertension and IUGR. Authors conclude that there is in presence of pregnancy counseling in maintaining weight of women during pregnancy to avoid pregnancy complication and both maternal and fetal outcome.

References

1. Park K. Park's Textbook of Preventive and Social Medicine. 24th ed. Banarasidas Bhanot; 2015:397.
2. Kim SY, Dietz PM, England L, Morrow B, Callaghan WM. Trends in pre-pregnancy obesity in nine states 1993–2003. *Obesity* 2007; 15:986-93.
3. Frederick IO, Williams MA, Sales AE, Martin DP, Killien M. Pre pregnancy body mass index, gestational weight gain, and other maternal characteristics in relation to infant birth weight. *Maternal Child Health J.* 2008;12:557-67.
4. Mohan V, Deepa R. Obesity and abdominal obesity in Asian Indians. *Indian J Med Res.* 2006;123:593-6.
5. Bhardwaj S, Misra A, Misra R, Goel K, Bhatt SP, Rastogi KV, et al. High prevalence of abdominal, intra-abdominal and subcutaneous adiposity and clustering of risk factors among urban Asian Indians

- in North India. *PLoS One*. 2011;6:e24362.
6. Deepa M, Farooq S, Deepa R, Manjula D, Mohan V. Prevalence and significance of generalized and central body obesity in an urban Asian Indian population in Chennai, India (CURES: 47) *Eur J Clin Nutr*. 2009; 63:259-67.
 7. Misra A, Khurana L. Obesity and the metabolic syndrome in developing countries. *J Clin Endocrinol Metab*. 2008;93(11 Suppl 1):S9-30.
 8. Mendez MA, Monteiro CA, Popkin BM. Overweight exceeds underweight among women in most developing countries. *Am J Clin Nutr*. 2005;81:714- 21.
 9. Balarajan Y, Villamor E. Nationally representative surveys show recent increases in the prevalence of overweight and obesity among women of reproductive age in Bangladesh, Nepal, and India. *J Nutr*. 2009;139:2139-44.
 10. Riz AM, Laraia B. The implications of maternal overweight and obesity on the course of pregnancy and birth outcomes. *Matern Child Health J*. 2006;10(5):153-6.
 11. Andreasen KR, Andersen ML, Schantz AL. Obesity and pregnancy. *Acta Obstet Gynecol Scand*. 2004;83(11):1022-9.
 12. Guelinckx I, Devlieger R, Beckers K, Vansant G. Maternal obesity: pregnancy complications, gestational weight gain and nutrition. *Obes Rev*. 2008; 9(2):140-50.
 13. Heslehurst N, Simpson H, Ells LJ, Rankin J, Wilkinson J, Lang R, et al. The impact of maternal BMI status on pregnancy outcomes with immediate short-term obstetric resource implications: a meta-analysis. *Obes Rev*. 2008;9(6):635-83.
 14. Ehrenberg H, Mercer B, Catalano P. The influence of obesity and diabetes on the prevalence of macrosomia. *Am J Obstet Gynecol*. 2004;191:964-8.
 15. Doherty DA, Magann EF, Francis J, Morrison JC, Newnham JP. Pre pregnancy body mass index and pregnancy outcomes. *Int J Gynae Obst*. 2006; 95(3):242-7.
 16. Callaway LK, Prins JB, Chang AM, McIntyre HD: The prevalence and impact of overweight and obesity in an Australian obstetric population. *Med J Australia*. 2006;184(2):56-9.
 17. Sahu MT, Agarwal A, Das V, Pandey A. Impact of maternal body mass index on obstetric outcome. *J Obstet Gynaecol Res*. 2007;33(5):655-9.
 18. Abenheim HA, Kinch RA, Morin L, Benjamin A, Usher R. Effect of prepregnancy body mass index categories on obstetrical and neonatal outcomes. *Arch Gynecol Obstet*. 2007;275(1):39-43.
 19. John J, Mahendran M. Maternal and fetal outcomes of obese pregnant women: a prospective cohort study. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(2):725-9.
 20. Tharihalli C, Thathagari V. Study of correlation between maternal body mass index with maternal and perinatal outcome. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(1):164-7.
 21. RCOG, 5th October 2006 Press Releases Available at <http://rcog.org.uk/index.asp? Page ID=97 & Press Release ID=126>.
 22. Tharihalli C, Thathagari V. Study of correlation between maternal body mass index with maternal and perinatal outcome. *Int J Reprod Contracept Obstet Gynecol*. 2017;6(1):164-7.
 23. Frederick IO, Rudra CB, Miller RS, Foster JC, Williams MA. Adult weight change, weight

cycling, and prepregnancy obesity in relation to risk of preeclampsia. *Epidemiology* 2006;17:428-34.

24. Cedergren M. Effects of gestational weight gain and body mass index on obstetric outcome in Sweden. *IntJ Gynaecol Obstet.* 2006;93(3):269-74.
25. Tharihalli C, Thathagari V. Study of correlation between maternal body mass index with maternal and perinatal outcome. *Int J Reprod Contracept Obstet Gynecol.* 2017; 6(1):164-7.