

Original article

Correlation of early pregnancy maternal BMI and perinatal outcome

¹Dr Vasudha Sawant, ²Dr Neelima Shah

¹Associate Professor, Department of Obstetrics and Gynecology, Dr. D.Y.Patil Medical College, Kolhapur, Maharashtra, India.

²Assistant Professor, Department of Obstetrics and Gynecology, Dr. D.Y.Patil Medical College, Kolhapur, Maharashtra, India.

Corresponding author: Dr Vasudha Sawant

Abstract

Introduction-The objective of this study was to assess the relation between maternal body mass index in early pregnancy and perinatal outcome.

Material and methods-In our study 110 cases were enrolled. Body mass index was calculated in first trimester. Patient was asked for regular antenatal follow up till delivery. After delivery of the baby, birth weight, APGAR score and NICU admissions were studied and analysed in each group of BMI

Keywords- Body Mass Index, Fetal Birth Weight, Obese, Overweight.

Introduction-

Maternal BMI is one of the predictor of nutritional status of pregnant mother. The normal growth and development of the foetus is dependent on many factors. These factors include influence of environment, genetic predisposition and maternal weight during pre-pregnancy state¹. Maternal nutrition status plays an important role in weight gain. Nutritional intake and maternal weight during pregnancy are the two modifiable factors which influence foetal outcome². India is now facing a double burden of under nutrition and underweight on one side, and upsurge in obesity and overweight mostly in urban settings on the other side³. The low maternal BMI is associated with increased risk of abortions and intrauterine growth restriction, which may further cause low APGAR scores and increased prenatal deaths^{4,5}. The overweight and obese females are more prone for developing PIH, gestational diabetes, macrosomia and operative deliveries⁶. In the developing countries like India very few females come for preconception counselling so estimation

of pre-pregnancy weight record is not available. Women from rural area are not aware of their Weights⁷. so, considering this factors we decided to conduct this study as correlation of early pregnancy BMI with foetal outcome. BMI provides a reliable indicator of body fat for most people and is used to screen for weight categories that may lead to health problems. BMI does not measure body fat directly but research has shown that BMI correlates to direct measures of body fat. Common micronutrient deficiencies are vitamin A deficiency, iron and iron deficiency¹¹. Pregnancy complication related to maternal nutritional status is a growing problem which carry an increased risk of adverse prenatal outcome¹³. In the world almost half of undernourished population are estimated about 170million. Malnutrition should be considered as a serious issue¹¹. Malnutrition passes from one generation to next. A malnourished mother gives birth to undernourished infant who struggle to thrive¹². Today's infants are the future of the country. This future should be healthy and well

nourished. The WHO BMI classifications of overweight and obesity are intended for international use.

Obesity causes or exacerbates many health problems, both independently and in association with other diseases⁸. It is associated with the development of type 2 diabetes, coronary heart disease, an increased incidence of certain forms of cancer, respiratory complications and osteoarthritis of large and small joints in later life⁹. Increasing degrees of overweight and obesity are important predictors of longevity¹⁰. The impact of BMI or increased BMI in general population has been focus on many studies but study pertaining to pregnant women are few. Further exploration for this topic is needed.

Objective

To study association of maternal BMI in early pregnancy with perinatal outcome.

Material and methods

This was an observational- correlational study conducted in department of ob-gyn in Dr. D. Y. Patil medical college, Kolhapur, Maharashtra, India, a teaching hospital for the period January 2015-june 2015. After obtaining approval of ethical committee, we started conducting the study. This study was carried out in outpatient and inpatient department. Total 200 cases were selected but 90 cases were excluded due to reasons like abortion, PIH, gestational diabetes, multiple pregnancy and the most important reason, loss of follow up. So the sample size was 110.

Inclusion criteria

All pregnant women in first trimester who were registered for antenatal check up and delivery in D.Y. Patil Hospital, all were singleton uncomplicated pregnancies, registered by 12 weeks of pregnancy.

Exclusion criteria

Pregnant women with Diabetes mellitus, Hypertension, Multiple pregnancy, Medical disorders (Renal disease, Heart disease, Bronchial asthma)

All the measurements of weight and height were taken by means of standard methodology, BMI of each case was calculated by the formula

$\text{Weight in kg} / \text{height in m}^2$

The cases were classified as

Underweight if BMI <19.9kg/m²

Normal if BMI between 20-24.9kg/m²

Overweight if BMI between 25-29.9kg/m²

Obese if BMI was >30kg/m²

By WHO and NIH¹⁷

A complete history regarding present and past illness noted. Detailed clinical examination was performed. All findings were noted and record was maintained till delivery. Screening for Gestational diabetes was done at 24-28 weeks of gestation. Pregnant women who were diagnosed as GDM when GTT was found abnormal were excluded from the study. The variables for fetal outcome included were birth weight of baby, APGAR score at 1 minute and 5 minutes and admission to NICU were noted. Those women included in the study were counselled for attending ANC follow up visits according to standard protocol till they deliver. In all cases spontaneous onset of labour was awaited. When they came in labour, they were admitted in labour room. After admission in the labour room, they were again examined clinically. All standard care was provided in labour room. Their mode of delivery was recorded. All the babies were examined for any congenital anomalies. Babies were assessed by APGAR score at one minute and five minutes. Any admission to NICU was recorded and final outcome was noted. Results were analysed.

Observations and results

Table No. 1 Classification of BMI according to WHO and NIH¹⁷

	BMI	No. of cases
Underweight	<19.9	33
Normal	20-24.9	38
Overweight	25-29.9	28
Obese	>30	11
		110 TOTAL

Table No. 2 Distribution of cases according to BMI

	BMI	Cases	Percentage(%)
Underweight	<19.9	33	30%
Normal	20-24.9	38	34.5%
Overweight	25-29.9	28	25.4%
Obese	>30	11	10%

Table No. 3 Maternal BMI and fetal birth weight

BMI	Underweight	Normal	Overweight	Obese
	<19.9 GP1	20-24.9 GP2	25-29.9 GP3	>30 GP4
X +SD	2.32+0.14	2.94+0.28	3.64+0.19	4.04+0.11

Table No. 4 BMI and APGAR Score Mean Standard Deviation

BMI	No. of Cases	APGAR	
		1Minute(+0.74)	5Minutes
<19.9	33	6.79+0.74	7.79+0.74
20-24.9	38	6.76+0.85	7.79+0.84
25-29	28	6.68+0.67	7.68+0.67
>30	11	6.27+1.68	7.27+1.68

Table No. 5 BMI and NICU Admission

BMI	NICU ADMISSION	PERCENTAGE
<19.9	2	6.06%
20-24.9	1	2.63%
25-29.9	7	25%
>30	3	27.7%

Discussion

Overweight or obese women are more likely to have high birth weight babies, which increases the chances of caesarean deliveries and the babies will be born with low blood sugar, which can be associated with brain damage and seizures^{14,18}. Earlier studies show that pregnancies amongst overweight or obese women are also more likely to result in fetal distress, low APGAR scores, early infant death, and large birth weight infants¹⁵. Women who enter pregnancy in overweight or obese condition are more likely to have pregnancies resulting in certain birth defects which include

neural tube defects such as spina bifida, heart defects, cleft palate, limb reduction defects¹⁶. Total 200 cases were enrolled but 90 were excluded for various reasons like abortion, PIH, DM. out of 110 cases, 38 cases with normal BMI. 33 cases were underweight, 28 cases were overweight and 11 cases were obese i.e 34.5%, 30%, 25.4% & 10% respectively. 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 press releases on 5th October 2006¹⁹. There is limited data available on Indian population. In India, we have rural and urban areas in which there are variations in food habits, availability of food, differentiation in life style, socio economic, educational statuses. The study conducted by Sahu et al.(2007) on Indian data shows that 7.9% of pregnant women were obese⁴. Earlier studies showed that there is an increased obstetric risk for low maternal BMI. These complications included maternal anaemia, preterm labour, IUGR and low birth weight²⁰. In present study, low birth weight was significantly found in underweight patient. On the other hand overweight patients were having fetal weights on higher side i.e between 3kg-3.9kg. The obese women had birth weight above 3.5kg. In a prospective study by Jain et al.2012²¹ low birth weight babies were present in 80% of underweight patients. At the same time, various studies have found an association with low APGAR score and neonatal complications amongst obese patients. In study conducted by Daise T.A et al 2011²², there was no association of BMI and low APGAR score. Similarly present study did not show any correlation of BMI and low APGAR score. This may be due to small sample size of our study. In our study, though we did not find any significant relations between maternal BMI and low APGAR.

References

1. Pratima P and S Anuchitra , correlation between BMI and pregnancy outcome among post natal mothers with pregnancy induced hypertension. NUJHS Vol. 5, No. 1, Mach 2015.
2. Nutrition during pregnancy and lactation. Implementation guide (1992). Accessed April 2011. Available from http://www.nap.edu/openbook.php?record_id=1984; P. 125.
3. Anjana Verma and Lalit Shirmali, J Clin diagn Res. 2012 Nov; 6(9): 1531-1533. Published Online 2012 Nov 15.
4. Sahu, M.T., Agarwal, A., Das, V., Pandey, A.(2007) Impact of maternal body mass index on obstetric outcome. J Obstet Gynaecol Res. 2007 Oct.33(5):655-9.

One study by Daise TA, Yasmin N, Begum H shows that in underweight and overweight and obese patients babies had born with APGAR score less than 5. These mothers had 2 to 5 times more chances to deliver babies with APGAR score less than 5 than mothers with normal BMI. There was higher incidence of NICU admissions in babies of overweight and obese patients respectively. NICU admissions were for the reasons like weak cry, nasal flaring, grunting, chest retraction and transient tachypnoea.

Conclusion

Our study shows that maternal BMI has an effect on fetal outcome. Low BMI is associated with adverse perinatal outcome in terms of birth weight while high BMI is associated in terms of overweight and macrosomia. Also this study tries to reflect the need of new Indian guidelines of weight restriction in overweight and obese women and increase weight to normal in underweight women. A larger prospective trial is needed for better interpretation. The small sample size and short span of study are the limitations. So, definitely there is a role of pre pregnancy counselling regarding maintenance of weight of women specially during reproductive age group to maintain normal BMI as to have better pregnancy outcome.

5. Abenhaim, H.A., Kinch, R.A., Morin, L., Benjamin, A., Usher, R(2007). Effect of prepregnancy body mass index categories on obstetrical and neonatal outcomes. *Archeives of Gynecology and Obstetrics*. 275(1): 39-43
6. Kabiru, W., Raynor, B.D.(2004) Obstetric outcomes associated with increase in BMI category during pregnancy. *Am J Obstet Gynecol*. Sep;191(3):928-32.
7. Jain,p., Joshi, T. & Kural, M.R. Relation Of Early Pregnancy BMI With Maternal And Fetal Outcome: A Prospective Study.
8. Kopelman, P.G. Causes and consequences of obesity. *Med. Int*. 22, 385-388(1994)
9. Peter G. Kopelman. Obesity as a medical problem. *NATURE* Vol 404 6 April 2006
10. Lew, E, A. Mortality and weight: insured lives and the American cancer study. *Annals of Intern. Med*.103,1024-1029(1985).
11. First report on the world nutrition situation. A report compiled from information available to the United Nations agencies of the ACC/SCN, November, 1987.
12. Vankata Chalam PS, Rebella LM, 'Nutrition for mother and child, Indian Council of Medical Research special report', 1971 series no-41.
13. Sahu MT, Agarwal A, Das V, Pandey A, 'Impact of maternal body mass index on obstetric outcome', *Journal of Obstetrics and Gynaecology Research*, 2007;33:655-659.
14. http://www.surgeongeneral.gov/topis/obesity/calltoaction/fact_consequences.htm
15. Cedergren MI Maternal Morbid Obesity and the risk of Adverse Pregnancy Outcome. *Obstet Gynecol*. 2004; 103:219-24.
16. Watkins M, Rasmussen S, et al. Maternal Obesity and Risk for Birth Defects. *Pediatrics*. 2003; 111(5 suppl pt 2)1152-8.
17. O'Brien, T.G., Roche, A.F., Martorell, R. (1998). Anthropometric standardization reference manual. Campaign: Human Kinetics book.
18. Minneapolis Department Of Health and Family Support. Research Brief, January 2008.
19. RCOG, 5th October 2006 Press Releases [<http://rcog.org.uk/index.asp?pageID=97> & Press ReleaseID=126]
20. Ehrenberg HM, Dierker LRN, Milluzzi C, Mercer BM, 'Low maternal weight failure to thrive in pregnancy and adverse prenatal outcomes'. *Am J Obstet Gynecol* 2003;189:1726-1730.
21. Jain D., Khuteta, R., Chaturvedi, V., Khuteta S. (2012) Effect on pregnancy outcomes in Nulliparous Women delivering singleton babies: Observational Study. *Journal of Obstet & Gynecol India*. 62(4)429-31
22. Daise TA, Yasmin N, Begum H, Effect of maternal Body Mass Index On Perinatal Outcome, Original Article volume 23 Number 2, 2011 *MEDICINE Today*.
23. Scott-Pillai, R., Spence, D., Cardwell, C.R., Hunter, A., Holmes, V.A. The impact of body mass index on maternal and neonatal outcomes: a retrospective study in a UK Obstetric Population, 2004-2011. *BJOG* 2013; 120(8): 932-39
24. Bhattacharya, S., Campbell, D.M., Liston, W.A. (2007) Effect of Body Mass Index on Pregnancy Outcomes in nulliparous women delivering singleton babies. *BMC Public Health*. 7:168
25. James,W.P. (2008) WHO recognition of the global obesity epidemic. *Int J Obes (Lond)*,32 Suppl 7:S120-6.

26. Consensus Statement for Diagnosis Of Obesity, Abdominal Obesity and the Metabolic Syndrome for Asian Indians and Recommendations For Physical Activity, Medical and Surgical Management(Internet). (cited 2012 May24). Available from http://www.jp.org/february_2009/R-1.html.
27. The Impact Of Body Mass Index On Pregnancy Outcome. ¹HamidehPakniat; ²Fatemehmohammadi; ³FatemehRanjesh* Article 7, Volume 3, Issue 2, April 2015, Page 361-367.
28. Kumari P, Gupta M, Kahlon P, Malviya S. Association between high maternal Body Mass Index and Feto maternal outcome. J ObesMetab Res 2014;1:143-8.
29. Sebire NJ, Jolly M etall. “Is maternal underweight really a risk factor for adverse pregnancy Outcome?- A Population based Study in London” BJOG 2001, 108: 61-66.
30. WHO Expert Consultation Appropriate body-mass index for Asian Populations and its implications for policy and intervention strategies. Lancet 2004; 363: 157-63.