

Effect of maternal underweight on fetal outcome

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ABSTRACT

Introduction and Aim: Nutritional state of the mother before and during pregnancy is one of the important determinants along with factors like pre-pregnancy BMI, weight gain during pregnancy and gestational age which determines pregnancy outcome. Adequate gestational weight gain contributes for better pregnancy outcomes in both mother and infants for short- and long-term health.

Materials and Methods: This is an observational study conducted retrospectively over a year comprised 300 pregnant subjects in their second trimester. Incidence of anemia, preterm labour, intrauterine growth retardation (IUGR) and neonatal intensive care unit (NICU) admission were compared in women with various Body Mass index (BMI). Analysis of the data was done using SPSS version 13 using chi square test and $p \leq 0.05$ was considered statistically significant.

Results: Out of 300 subjects, 79 developed anemia, among these 64(81%) were in the underweight category. 49 cases had a preterm delivery, out of these 49 cases, about 37(75.5%) belonged to the underweight BMI category. 39 cases delivered an intra-uterine growth retarded baby. Out of these 39 cases, about 25 (64.1%) belonged to the underweight BMI category. 56 neonates required intensive care unit (NICU) admission, of which 41 (73.2%) neonates born for underweight BMI mothers.

Conclusion: The high proportions of underweight pregnancies in this study reflects the poor nutritional status. Adverse effects of maternal low body mass index target the fetus. Adequate weight gain of pregnant woman is an extremely important factor for the fetal outcome.

Keywords: Low BMI; anemia; fetal outcome; intrauterine growth retardation; pregnancy.

INTRODUCTION

Pregnancy is one of the important periods in woman's life as it is accompanied by a lot of physiological changes. The demand for nutrition intake increases to facilitate a desirable pregnancy outcome (1). Nutritional state of the mother before and during pregnancy is one of the important determinants along with the other associated factors influence the outcome of pregnancy (2, 3). The short- and long-term health outcome of pregnancy for mother and infant is always better if the weight gain during pregnancy is adequate (4). Pregnant women who were underweight at the time of conception showed profound effect of low weight gain during pregnancy and these women often have infants weighing less than 3000g which are grouped as growth retarded or small for date (5). Due to this reason, the underweight mothers are classified as "at risk" group (6).

In developing countries majority of the women in their reproductive age group are said to be underweight. A low pre-pregnancy BMI is one of the major causes of

adverse outcome of pregnancy such as intra uterine growth retardation (IUGR) and pre-term delivery. Association of other risk factors such as stress and smoking in low BMI pregnancy increases risk of these outcomes (7). Body mass index (BMI) is a simple index which is traditionally used to classify individuals based on height and weight into different categories (8). Therefore, the purpose of this study is to evaluate the influence of BMI on fetal outcome in women attending the antenatal clinic at a tertiary health care center.

MATERIALS AND METHODS

This was an observational study conducted retrospectively in one-year with follow up being done for a period of 6 months post-delivery. The study comprised of 300 pregnant subjects in second trimester and singleton pregnancy regularly attending the antenatal clinic at a tertiary health care center. Women with multiple pregnancies and Pre-pregnancy complications like diabetes-mellitus, hypertension, cardiovascular and kidney diseases were excluded. The study was started after the approval of Institutional

Ethical committee (IEC). Prior permission was obtained from the hospital authority; the pregnant subjects were briefed about the nature and purpose of the study, following which a written informed consent was taken. The study involved determination of height at the initial visit, weight at two separate occasions-prior to the commencement of pregnancy and again during the second trimester. Body Mass index (BMI) was calculated and normal, underweight, overweight and obese groups were categorized based on their BMI (4). Anaemia was taken as Haemoglobin <11 gm/dl in the

peripheral blood. Preterm delivery was defined as delivery before 37 completed weeks. Intra uterine growth retardation (IUGR) was defined as birth weight <10th percentile for gestational age. Admission of newborn to NICU for birth asphyxia, hypoglycaemia, jaundice and perinatal mortality was also noted.

Statistical Analysis

Analysis of the data was done using SPSS version 13 using chi square test and $p < 0.05$ was considered statistically significant.

RESULTS

Table 1: Relationship of BMI with anemia in pregnancy:

Anemia	Group (BMI)				Total
	Below normal	Normal	Over -weight	Obese	
Absent	52	96	61	12	221
	23.5%	43.4%	27.6%	5.4%	100%
	44.8%	86.5%	100%	100%	73.7%
Present	64***	15	0	0	79
	81%	19%	0%	0%	100%
	55.2%	13.5%	0%	0%	26.3%
Total	116	111	61	12	300
	38.7%	37%	20.3%	4%	100%
	100	100%	100%	100%	100%

$$\chi^2=85.232 \quad ***p=.000 \text{ (HS)}$$

Out of 300 subjects, 79(26.3%) developed anemia. Out of these 79, about 81% were in the underweight category, with numbers being insignificant in the

control group and nil cases being reported in the overweight/obese BMI group (Table 1).

Table 2: Relationship of BMI with preterm labour

Preterm labour	Group (BMI)				Total
	Below normal	Normal	Overweight	Obese	
Absent	79	102	58	12	251
	31.5%	40.6%	23.1%	4.8%	100%
	68.1%	91.9%	95.1%	100%	83.7%
Present	37***	9	3	0	49
	75.5%	18.4%	6.9%	0%	100%
	31.9%	8.1%	4.9%	0%	16.3%
Total	116	111	61	12	300
	38.7%	37%	20.3%	4%	100%
	100	100%	100%	100%	100%

$$\chi^2=34.215 \quad ***p=.000 \text{ (HS)}$$

Out of 300 subjects, 49(16.3%) cases had a preterm delivery. Out of these 49 cases, about 75.5% belonged to the underweight BMI category (Table 2).

Table 3: Relationship of BMI with intrauterine growth retardation

IUGR	Group (BMI)	Total
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	Below normal	Normal	Overweight	Obese	
Absent	91	104	54	12	261
	34.9%	39.8%	20.7%	4.6%	100%
	78.4%	93.7%	88.5%	100%	87%
Present	25**	7	7	0	39
	64.1%	17.9%	17.9%	0%	100%
	21.6%	6.3%	11.5%	0%	13%
Total	116	111	61	12	300
	38.7%	37%	20.3%	4%	100%
	100	100%	100%	100%	100%

$$\chi^2=13.817 \quad **p=.003 \text{ (HS)}$$

Out of 300 subjects, 39(13%) cases delivered an intra-uterine growth retarded baby. Out of these 39 cases,

about 64.1% belonged to the underweight BMI category (Table 3).

Table 4: Relationship of BMI with neonatal intensive care unit (NICU) admission

NICU	Group (BMI)			Total
	Below normal	Normal	Over -weight/obese	
Absent	75	102	67	244
	30.7%	41.8%	27.5%	100%
	64.7%	91.9%	91.8%	83.7%
Present	41***	9	6	56
	73.2%	18.4%	10.7%	100%
	35.3%	8.1%	8.2%	16.3%
Total	116	111	73	300
	38.7%	37%	24.3%	100%
	100	100%	100%	100%

$$\chi^2=35.291 \quad ***p=.000 \text{ (HS)}$$

Out of 300 subjects, 56(18.7%) neonates had an intensive care unit admission Majority of mothers of these neonates were from the underweight BMI group (Table 4).

DISCUSSION

In our study population, majority of women 38.7% were underweight, 37 % in the normal or control group and 24.3% in the overweight/obese group. These high proportions of underweight pregnancies in our study reflects the poor nutritional status of this particular group. It is well known, that maternal nutrition is not just influenced by appetite, diet, absorption and metabolism of nutrients, but also by the partitioning of these nutrients between circulation, storage and utilization. Maternal endocrinal status and the adaptation occurring in the cardiovascular system during pregnancy would also influence by contributing significantly to fetal growth and enhancing uterine blood flow. Fetal growth is thereby said to occur towards the end of this complex maternofetal supply (9).

The present study had a high prevalence of anemia among subjects with an underweight BMI. The

prevalence of anemia in this group might be due to malnourishment, younger in age (< 20 years), with a low socioeconomic condition, poor standard of living. Role of pregnancy in increasing the risks for anemia include the ever-rising demands of the body to essential nutrients chiefly iron and folic acid and multiple pregnancies with an inadequate spacing between individual pregnancies. The present study had a definite correlation between underweight BMI and the occurrence of preterm delivery. One of the identifiable factors in our study sample included younger age of childbearing with an inadequate maternal nutrition prior to the commencement of pregnancy. A highly significant association of intrauterine growth retardation in the underweight BMI group could be due to undernourished, anemic women who belonged to a low socioeconomic status, early age of commencing pregnancy and short inter-pregnancy interval. Pregnant ladies suffering from anemia was highly significant in this study which was also similar to the results of Radhakrishnan *et al.*, (10). Young age of the mother observed in this study in consistent with the studies done by Jamal *et al.*, in Pakistan and Ferraz *et al.*, in Brazil

(11, 12). A majority of women in our study population whose infants had been admitted to NICU were from the underweight BMI group. The possible contributing factors could have been extremes of maternal age. The various fetal outcome due to underweight pregnancy can be maternal anemia, scanty amniotic fluid, fetal distress, birth asphyxia, preterm delivery with or without premature rupture of membrane. decreased birth weight of the baby, small for date and baby born with birth defects (13).

CONCLUSION

An interesting finding worth noting in this study is the adverse effects of maternal low body mass index targets the fetus. Therefore, pregnant woman's weight is an extremely important factor for the birth of a healthy child. Interventions that would optimize pregnancy weight gain by enhancing the nutritional status should be implemented to improve the infant growth thereby reducing infant morbidity.

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