Effect Of Maternal Body Mass Index On Perinatal Outcome

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Abstract

This study was carried out to see the effect of maternal BMI on perinatal outcome in the Institute of child and mother health, Matuail Dhaka.

This was an observational follow up study. The study was done on 100 patients in out patient department and in patient department of the institute of child and mother health during study period from July 2007 to November 2008 for duration of one year and 4 months.

Out of 100 patients 9 were drop out from the study due to pre eclampsia 3, Gestational diabetics mellitus 2, abortion 1, and rest 3 had home delivery. Ultimately 91 patients were enrolled for data analysis. Out of all respondents 44.0% were normal BMI where as 35.2% were lean, 15.4% were over weighted and 5.5% were obese. All are prime gravid patients.

According to BMI patients are categorized as group 1, 2, 3,4. Here group 1 for normal BMI, group 2 for lean, group 3 for over weight and group 4 for obese. Relative risk [RR] of low birth weight baby for group 2{Lean} was 4.365 than that of controlled mother{normal BMI}. Group 3{over weight} has least risk giving birth of low birth weight baby than group1. [Relative risk- 0.917].

Mother of group 2 (lean) women had 1.26 times group 3, (over weight) mother had 3.0 times and group 4 (obese) had 58.5 times more chance to give birth baby with neonatal complication than mothers of group 1 (normal BMI). group 2 (lean) has 2.28 times, mother group3 (over weight) had 2.43 times and group 4 (obese) had 2.43 times more chance to deliver baby with APGAR score less than 5 than that of group1 (normal BMI). The mean birth weight in the group2 (lean) as 2.39 ±0.58 kg, where as in group-1(normal BMI), group-3(overweight), group-4(obese) it was 2.69 ± 0.49, 2.82± 0.71 kg and 3.76 ± 0.39 kg respectively. Maternal nutrition of primi gravida has impact on adverse perinatal outcome.

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Introduction

Maternal BMI is one of the predictor of nutritional status of pregnant mother .BMI is calculated by height in meter square and weight in kg.It is well known that nutrients are essential materials, derived from food for all activities of human body. In the world almost half of under nourished population are estimated about 170 million. Malnutrition should be considered as a serious issue in human welfare[1]. Malnutrition passes from one generation to next A malnourished mother give birth to undernourished infant who struggle to thrive[2].

Foetus solely depends on mother for its growth and development. Infant birth weights are affected more by nutrient intake during second and third trimester. During this period a pregnant women needs extra 300 kcal per day. Poor maternal diet not only increase the risk of serious complications but often result in a difficult labour and sometimes prolonged labour[2]. In developing country like Bangladesh the prevalence of malnutrition is heighest in the world. Million of children and women are suffering from one or more forms of malnutrition which includes LBW, starting under weight, vitamin A deficiency, iodine deficiency and anaemia.

The rate of low birth weight estimated about 25% in Bangladesh[3]. WHO estimates that more than half of pregnant woman in the world have a haemoglobin level indicative of anaemia. For developing country only figure is 56% or 61% if china is excluded. Over one thired of all women in the world suffer from anaemia[4]. Almost half of Bangladeshi mother of child bearing age are suffering from chronic energy deficiency with a BMI less than 18.5. Anaemia contributes to an increased LBW rate [35-50%] and high maternal mortality rate [4/1000] in Bangladesh[3].

Common micronutrients deficiencies are vitamin A deficiency, iron and iodine deficiency[1]. Pregnancy complication related to maternal nutritional status is a growing problem which carry an increased risk of adverse perinatal outcome[5]. In developing countries there is much poverty and malnutrition. The influence of nutritional status on the degradation of health has been the subject of many studies.

The impact of low BMI or increased BMI in general population has been focus on many studies, but study pertaining to pregnant women are few. There are some studies in western countries but very few in developing countries. Low BMI < 19.8 kg /m^2 has been shown to be associated with increased risk of preterm delivery, low birth weight and anaemia. High BMI or obese 30 kg / m^2 is associated with pre eclampsia,GDM, obstretics intervention[5]. This study is designed to see the effect of maternal BMI on perinatal outcome.

Materials and Methods

This was an observational follow up study.

[descriptive study]. This study was carried out in out patient department and in patient department of Institute of child and mother health [ICMH] Matuail, Dhaka .Study population was all primigravida with their first trimester seeking health care in out patient department and inpatient department of Institute of child and mother health [ICMH] Matuail Dhaka .Study period was one year and four months from July 2007 to November 2008.

Prior to the commencement of this study the research protocol was approved by thesis approval committee. Inclusion criteria of study population were all primi gravida patient in first trimester willing to deliver in ICMH and who live with in two miles radius will be preferabely selected for better follow up. Exclution criteria of study population are women with known DM, HTN, multifoetal gestation with known medical disorder [Renal disease, Heart disease, Bronchial asthma].

Sample size was determined by formula n=z2pq/d2. Purposive sampling method was followed. Structured data sheet was used for data collection. A complete history regarding present and past illness along with clinical examination was performed. After considering selection criteria all data ware collected.

Maternal outcome variables include anaemia, neonatal variables includes birth weight of baby, macrosomia, apgar score at one minutes, preterm baby and admission to the neonatal intensive care unit were also determined. The outcome variables of underweight and obese group were compared with control group [Normal BMI]. Gestational diabetes screening was conducted at 24-28 weeks of gestation using 50gm glucose test. Pregnant women was diagnosed as GDM when glucose tolerance test was found abnormal and dropped out from the study.

Available standard care was provided to all and mode of delivery was recorded also. At birth babies were examined for any congenital malformation. Babies were assessed by APGAR score at one and five minutes after birth, birth weight, admission to neonatal ward was recorded and final outcome was noted. Results were analysed by using statistical soft ware programme SPSS vertion-15.

Results

Out of 100 patients 9 were drop out from the study due to pre eclampsia [3] Gestational diabetics mellitus [2] Abortion [1] and rest of three had home delivery. Ultimately 91 patients were enrolled for data analysis.

Table 1: Distribution of the patients by different categories of BMI

	BMI	Frequency	Percent
Group1 (normal BMI)	19.9 – 24.9 kg/m2	40	44.0
Group2 (Lean)	<19.8 kg/ m2	32	35.2
Group3 (Over weight)	25-29.9 kg/ m2	14	15.4
Group4 (Obese)	≥ 30 kg/ m2	5	5.5
Total		91	100.0

Table 1 shows out of all respondents 44.0% were normal, 35.2% were lean, 15.4% were over weighted and 5.5% were obese.

Statistical analysis was done by one way ANOVA (Post Hoc-Bonferroni) test

Table 2: Distribution of the different groups of patients by birth weight of their baby

Group	Birth weight		p	Mean birth	RR
	≤2.5 kg	>2.5 kg	value	weight	
Group 1 (n=40)-normal BMI	18 (45.0) (45.0)	22 (55.0)	2.69±0.49		
Group 2 (n=32)-Lean	25 (78.1)	7 (21.9)	2.39±0.58	4.365	(1.54-12.4)*
Group 3 (n=14)-Over weight	6 (42.9)	8 (57.1)	0.002	2.82±0.710.917	(0.27-3.13)*
Group 4 (n=5)-Obese	0 (.0)	5 (100.0)		3.76±0.39	000
Total	49 (53.8)	42 (46.2)			

Table 2 shows the mean birth weight in group2 was 2.39±0.58 kg whereas in the group1, group3,group4 it was 2.69±0.49 kg, 2.82±0.71 kg and 3.76±0.39 kg, respectively.

Table 3: Distribution of the different groups of patients by neonatal complications

Group	Neonatal complications		p value	RR (95% CI)
	Present	Absent		
Group 1 (n= 40)-Normal BMI	1 (2.5)	39 (97.5)		
Group 2 (n=32)-Lean	1 (3.1)	31 (96.9)	0.001	1.26 (0.076-20.93)
Group 3 (n=14)-Over weight	1 (7.1)	13 (92.9)		3.0 (0.175-51.45) *
Group 4 (n=5)-Obese	3 (60.0)	2 (40.0)		58.5* (4.04-846.68)
Total	6 (6.6)	85 (93.4)		

Table 3 shows out of all respondents, only 6 babies had neonatal complications. One each from group 1 and 2 had mild asphyxia, one of group 3 had meconium stained liquor. From group 4, one baby had severe asphyxia and two had deep meconium stained liquor. Out of 6 three babies were admitted to neonatal intensive care unite and all of them were discharged healthy.

Table 4: Obstetrical outcome: status of the baby

Group	**New born**		**p value**	**RR**
	Term	**Preterm**		
Group 1 (n=40)-Normal BMI	**37 (92.5)**	**3 (7.5)**		
Group 2 (n=32)-Lean	**27 (84.4)**	**5 (15.6)**		**2.28 (0.50-10.39)**
Group 3 (n=14)-Over weight	**13 (92.9)**	**1 (7.1)**	**<0.001**	**0.95 (0.09-9.95)**
Group 4 (n=5)-Obese	**4 (100.0)**	**0 (.0)**		**.000**
Total	**78 (86.7)**	**12 (13.3)**		

Table 4 shows in group 1, group 2, and group 3 had 7.5%, 15.6%, and 7.1% preterm baby respectively. Mothers of Group 2 had 2.28 times more chance to deliver preterm baby than mothers of group 1. Group 3 had least risk delivering preterm baby than group 1.

Table 5: Obstetrical outcome: APGAR score

Group	APGAR score		p value	RR
	<5	Other		
Group 1 (n=40)-Normal BMI	17 (42.5)	23 (57.5)		
Group 2 (n=32)-Lean	20 (62.5)	12 (37.5)		2.25
Group 3 (n=14)-Over weight	9 (64.3)	5 (35.7)	0.172	2.43
Group 4 (n=5)-Obese	4 (80.0)	1 (20.0)		5.41
Total	50 (54.9)	41 (45.1)		

Table 5 shows in group (1) 42.5%, in group (2) 62.5%, in group (3) 64.3% and in group (4) 80.0% baby had born with APGAR score less than 5.

Mothers of Group 2 had 2.25 times, group 3 had 2.43 times and group 4 had 5.41 times more chance to deliver baby with APGAR score less than 5 than mothers of group 1.

Discussion

The influence of BMI on the degradation of health has been the subject of many studies. BMI, which is derived from weight and height measurements, is a good marker of BMI and is used to classify people from thin to obese. The impact of low or increased BMI in the general population has been the focus of many studies, but studies pertaining to pregnant women are few. Whatever studies we have, they are from our Western counterparts; there are very few Indian studies; none from Bangladesh.

It was therefore important to conduct the present study, because the findings of Western studies may not apply to Bangladeshi population. In the USA the incidence of obesity among pregnant women ranges from 18.5% to 38.3% according to the cohort study[6], while in the present study 5.5% and in Sahu (2007) series of India 7.9% of pregnant women were obese.

Previous reports found an increased obstetric risk for low maternal BMI and highlight the importance of low maternal weight on the risk of perinatal outcome. These complications included maternal anemia, preterm labor, IUGR and low birth weight[7]. In the present study an association of neonatal complications and low birth weight was significantly seen in different BMI group.

However, the occurrence of IUGR and preterm labor had no specific relation to any BMI group. Poor nutrition, and thus poor maternal weight gain may result in iron, folic acid and other micronutrient deficiencies, contributing to low birth weight baby and different types of neonatal complications. Improving maternal nutrition and encouraging antenatal services facilitating nutrition and care during pregnancy can lead to improved perinatal outcomes in this section of the population.

In our series mother with low BMI had 4.365 times more chance to delivered an under weight baby. Mothers of Group (2) had 1.26 times, group (3) had 3.0 times and group (4) had 58.5 times more chance to give birth a baby with different types of complication than mothers of group 1.

In the study of Sahu (2007), under weight mother has 2.1 time more risk to give birth an underweight baby, 1.2 times for over weight and 0.3 times for obese mother than normal weighted mother which was comparable with our findings.

Different complications in new born baby was found low in group 2 (RR 1.26) but more in group3 (RR 3) and group4 (RR 58.5) than control(group1) mother. These findings were consistent with that of Sahu (2007) series.

Various studies have found an association of intrauterine death, low Apgar score at birth and neonatal complications among obese pregnant women[8].

This was not seen in the present study the reason may be the small sample size.

In Sahu (2007) series the proportion of low birth weight was significantly increased (p value=0.017) in the lean pregnant women. The mean birth weight in the group2 was 2581.1± 482.2g whereas in group1, group3, and group4 it was 2808.1± 478.9g, 2835.1±652.0g and 2855.6±639.9g, respectively. Similar observation was seen in our study.

Maternal BMI shows strong associations with adverse perinatal outcomes. Lean mother(group2) is associated with increased risk to give birth, low weight baby; and preterm baby, obese mother(group3) is associated with increased risk of, neonatal complications, low APGAR score baby while normal BMI women (group1)appear to have better pregnancy outcome. So, women should maintain normal BMI to achieve a healthy perinatal outcome.

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