

Correlation of Maternal BMI and Neonatal BMI with Placental Weight in Rural South Kerala-India

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ABSTRACT

Introduction: Birth weight and placental weight are good indicators of new born growth parameters. Maternal complications are seen in both lean and obese women. The available studies shows correlations of placental parameters with baby anthropometric variables but limited relationship to maternal BMI which will help very much to anticipate the neonatal outcome and complications.

Aim: To find out correlation of maternal BMI and neonatal BMI with placental weight in rural South Kerala.

Study Design: Prospective cohort study in a rural medical college in South Kerala.

Materials and Methods: All singleton neonates 28 weeks of gestational age and above delivered in the institution and their mothers from January 2015 to October 2015. Neonatal BMI, Maternal BMI and placental weight were calculated. Means (\bar{x}), standard deviation (SD) and frequency (%) was calculated for the statistical analysis. Student's 't' test was used to

compare the mean results of the continuous variables. Pearson correlation was used to find out the correlation between different anthropometric variables.

Results: Out of the 920 live single births 463 (50.3%) were male and 457(49.7%) were females. Among the mothers (86.2%) were between the age group of 25-29 years, about 87.7% of the mothers were unemployed. Mean birth weight was 3000gm (SD=500) Mean baby length was 48.9 (SD=2). The mean placental weight was 499gm (SD=78). Mean maternal BMI was 27 (SD 3.9) and the mean neonatal BMI was 12.5 (SD=1.9). It was found that both maternal BMI ($r=0.143$ $p<0.05$) and neonatal BMI ($r=0.350$; $p<0.05$) has a positive correlation with placental weight.

Conclusion: The placental weight correlates with maternal and neonatal BMI. Hence, the maternal BMI and placental weight can predict the neonatal outcome and postnatal complications. By serial sonological measurement of placental weight and combining it with maternal BMI it is possible to predict neonatal mortality and morbidity more accurately.

Keywords: Neonatal anthropometry, Neonatal mortality, Placental parameters

INTRODUCTION

The birth weight of a newborn is an important determinant of neonatal and postnatal morbidity and mortality and it is a very good variable for the measurement of the health status during the crucial period of the growth and development. It is an indirect measure of the health status of the community. Placental weight is a good indicator of newborn growth parameters and it predicts future child growth [1].

The perinatal mortality, morbidity and the newborn birth weight has a strong connection with the nutritional status of the mother. In India we face the double burden of obesity and under nutrition in urban and rural areas respectively [2]. The incidence of obesity in the world has been increasing rapidly. Maternal complications are seen in both lean and obese women [3]. Mothers with obesity have high incidence of pre-eclampsia,

gestational hypertension, higher incidence of induction of labour, caesarean deliveries and macrocosmic babies [4]. Meanwhile underweight mothers carry risk of preterm deliveries, low birth weight, anemia and a decreased risk of pre-eclampsia, gestational diabetes, obstetric intervention and post-partum hemorrhage [5].

The available studies show correlations of placental parameters with neonatal anthropometric variables. The studies on relationship of maternal Body Mass Index (BMI) with these variables are limited. As placenta has a very significant role in the fetal growth, its correlation with maternal BMI will help very much to anticipate the neonatal outcome and complications. Moreover, a good knowledge of neonatal growth indices is important in the better understanding of perinatal health status especially in the Indian context as the data regarding these are limited.

OBJECTIVE

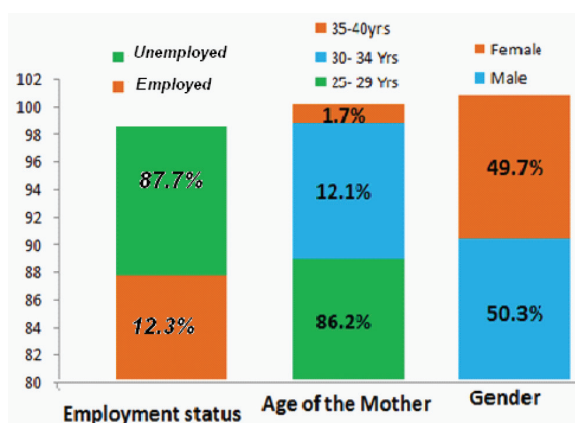
To find out correlation of maternal BMI and neonatal BMI with placental weight in rural South Kerala-India.

MATERIALS AND METHODS

It was a prospective cohort study conducted in the Department of Paediatrics, Dr. SMCSI Medical College-South Kerala, India. A total of 920 Mothers who delivered in the college hospital during the period of January 2015 to October 2015 and neonates more than 28 weeks of gestation were included. Neonates with congenital anomalies, still birth, seriously ill, babies less than 900gm and twin babies were excluded

Using a predesigned questionnaire the socio-demographic profile was obtained. Maternal anthropometric measurements were taken during the first trimester visit. All the measurements were taken using standardized instruments - stadiometer corrected to nearest 1cm, electronic weighing scale corrected to 500gm. The neonatal anthropometric measurements (birth weight and length) were taken using electronic weighing scale corrected to nearest 10gm and infantometer corrected to nearest 0.25cm. Placental weight was measured without draining the blood from surface vessels, blotting the placenta dry, or trimming the cord and membranes using electronic weighing scale corrected to nearest 10gm.

Means (x), standard deviation for quantitative variables (SD) and frequency for qualitative variables (%) were calculated for the statistical analysis. Student's 't' test was used to compare the mean results of the continuous variables. Pearson's correlation was used to find out the correlation between different anthropometric



[Table/Fig-1]: Maternal employment status, maternal age and gender of the baby.

variables and p value less than 0.05 was considered to be statistically significant. The data was analyzed using statistical package R.

RESULTS

Out of the 920 live single births 463 (50.3%) were male and 457 (49.7%) were females. Among the mothers 86.2% were between the age group of 25-29 years. About 87.7% of the mothers were unemployed [Table/Fig-1].

Mean birth weight was 3000gm (SD=500) and the mean baby length was 48.9cm (SD=2). The mean placental weight was 499gm (SD=78.0). Mean maternal BMI was 27 (SD 3.9) and the mean neonatal BMI was 12.5 (SD=1.9) [Table/Fig-2].

Statistical correlation was done using Pearson Correlation. It was found that both maternal BMI ($r=0.143$ $p<0.05$) and neonatal BMI ($r=0.350$ $p<0.05$) has a positive correlation with placental weight [Table/Fig-3].

From the study we concluded that there is no statistical significance between the employment status of mother and anthropometric parameters of the baby [Table/Fig-4].

	Mean	(SD)
Maternal Parameters		
Maternal Age (yrs)	25.8	3.5
Maternal BMI	27.0	3.9
Baby Parameters		
Baby weight	3.0 Kg	0.5 Kg
Baby length	48.9 cm	2.0 cm
Baby BMI	12.5	1.9
Placental Parameters		
Placental Weight	499.1 gms	78.0 gms

[Table/Fig-2]: Descriptive measures: Maternal, newborn and placental parameters (n= 920).

	Maternal BMI Correlation coefficient (r), p- value	Baby BMI Correlation coefficient (r), p- value	Placental Weight Correlation coefficient (r), p- value
Maternal BMI (n= 920)	1	0.196, <0.001	0.143, <0.001
Baby BMI (n= 920)	0.196, <0.001	1	0.350, <0.001

[Table/Fig-3]: Pearson's correlation of Maternal, baby's BMI and placental weight.

	Employment Status	N	Mean (Kg)	Standard Deviation	t- value	p- value
Birth Weight	Employed	113	2.977	0.455	0.006	0.996
	Not Employed	807	2.978	0.470		
Birth Length	Employed	113	49.013	2.063	-0.738	0.461
	Not Employed	807	48.865	1.992		
Baby BMI	Employed	113	12.404	1.826	0.403	0.687
	Not Employed	807	12.483	1.947		

[Table/Fig-4]: Comparison of employment status and neonatal anthropometric parameters.

DISCUSSION

The health status of women especially during their child bearing period is very important for a favorable obstetrical and neonatal outcome. It is known that mothers with sound health and good nutritional status have healthier and large babies [6]. Verma A et al., has found that babies of underweight mothers suffer from anaemia and IUGR. BMI in either extreme are dangerous [2]. Mamula O et al., has proved that third trimester hemorrhage was more in mothers with increased BMI [7]. In the study done by Ehrenberg H et al., preterm delivery was more in lean and obese pregnant women [5].

Placenta has a very important role in the intrauterine growth of fetus. In low birth weight full term and preterm babies, placental weight was less than that of corresponding normal weight babies. The low placental weight could be one reason for the observed low birth weight of babies. Placental weight has a very important role in fetal growth in terms of weight, body length and cord length. Relative weight of placenta is another parameter which was studied by Desai AB et al., in which it was inversely proportional to newborn birth weight [8].

Birth weight (BW) is the most important parameter of perinatal health status. A significant difference of birth weight is observed between babies born in affluent societies and those born in the developing countries. Maternal factors during pregnancy such as serious illness, complications of pregnancy, nutritional deprivation, emotional and physiological stress have an adverse effect on the mother which influences the weight of the newborn [9]. Birth weight which is higher in high socioeconomic group might be due to regular antenatal checkups and good nutritional supplementation [10].

Human growth is a continuous process. The studies about the placenta help to identify the conditioning nature of the growing environment of fetus. This helps as a good pointer of birth size which help to forecast the childhood growth [1].

The percentage of male and female newborns in our study (50.3% - males, 49.7% - females) closely correlates with the prevailing sex ratio in Kerala [11]. The distribution of mothers in the age group of 25-29 in this study also resembles the Kerala state statistics [12] (mean age - 25.8 years, SD - 3.5). The percentage of unemployed mothers got from our study was slightly higher in comparison with Kerala state statistics [13]. The mean birth weight was higher than south Indian standards [14].

The mean maternal BMI obtained in the first trimester (27.1) is in the pre obese category according to the International Classification of Adult BMI – WHO [15]. This may be due to large proportion of subjects being unemployed (87%) which leads to over eating and

lack of exercise. The birth weight of a newborn is an important determinant of neonatal and postnatal mortality and morbidity [16,17]. Perinatal complications such as intrauterine fetal demise (IUFD) and fetal growth restriction (IUGR) have been linked to a decrease in the placental weight [18].

LIMITATIONS

1. Preterms were not included in this study.
2. Follow-up of some mothers were not adequate.

CONCLUSION

The maternal BMI and neonatal BMI correlate with the placental weight. Hence, the maternal BMI and placental weight can predict the neonatal outcome and postnatal complications.

RECOMMENDATIONS

By serial sonological measurement of placental weight and combined with maternal BMI it is possible to predict neonatal mortality and morbidity more accurately.

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FINANCIAL OR OTHER COMPETING INTERESTS:

None.

Date of Publishing: Oct 01, 2016