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Student Research

A longitudinal study to determine association of various maternal factors with neonatal birth weight at a tertiary care hospital

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ABSTRACT

Background: Neonatal birth weight is a powerful predictor of infant growth and survival and maternal factors like poor knowledge and insufficient dietary intake are significant risk factors. Other preventable determinants like pre pregnant BMI <18.5, low gestational weight gain (GWG) and anemia are also associated with low birth weight. This study was carried out to identify the impact of these maternal factors with risk of low birth weight (LBW).

Methods: A longitudinal study was carried out on 124 booked antenatal cases at a tertiary care center. A validated protocol containing socio demography, food frequency and anthropometry was administered at the 3rd trimester. Birth weight of the newborn was noted after delivery.

Results: 26.28% children had low birth weight (<2500 g), 14.6% mothers were thin (BMI < 18.5), 55.3% mothers had a weight gain of less than 9 kgs and 45.5% were anemic. 81.81% mothers with BMI >18.5 and 28.92% women who were educated till high school had a baby with LBW. Most mothers consumed milk and vegetables daily and a few consumed non vegetarian foods but quality and quantity of food were grossly inadequate. GWG levels and Hb levels were significantly different in different birth weight groups and also were significantly associated with low birth weight.

Conclusion: Quality and quantity of maternal dietary intake during pregnancy, even in normal weight mothers (BMI > 18.5), are important determinants of birth weight. Nutritional counseling for mothers during the antenatal period is the cornerstone for healthy mother and healthy child.

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Introduction

More than 20 million infants worldwide are born with low birth weight (<2500 gm). Birth weight is a significant factor which determines vulnerability for risk of childhood infections and survival. Studies have highlighted strong associations between LBW and poor academic performance and problems related to mental, behavioral and learning difficulties later in life. At the population level, maternal factors like poor knowledge and nutritional deficiency not only predicts the present intrauterine development, but is also associated with low birth weight.[1,2] Maternal undernutrition still remain pervasive in low and middle income countries with damaging consequences. Independent factors like pre pregnancy body mass index (BMI), gestational weight gain (GWG) and anemia in pregnancy, are direct markers of intrauterine growth and birth weight.

The prevalence of maternal undernutrition with respect to BMI <18.5 kg/m^2 ranges from 10% to 19% in most countries. This is a serious problem in sub-Saharan Africa and south-eastern Asia, where more than 20% of women have a BMI <18.5 kg/m^2 but the situation is critical in India[3] where the prevalence of low BMI is 40% in women. One of the most important modifiers of weight gain in pregnancy and its impact on the health of the mother and the baby is the woman's weight at the start of the pregnancy. The range of weight gain as per the Institute of Medicine[4] recommendations are more (12–18 kg) for those with a pre pregnant BMI <18.5 than for those who are obese (11–13 kg). Indian standards however, suggest a normal weight gain of 09–14 kgs[5] during pregnancy.

An extra amount of 350 Kcal of energy and 30 g protein[5] is required during pregnancy but in most of the cases, there is hardly any difference in intake of protein and energy between the pre pregnant and pregnant states in Indian women. The consumption of foods that are important sources of protein and energy, such as dairy products, meat, fish, green leafy vegetables and soyabean is also low in rural Indian populations.

This longitudinal study was carried out to identify the impact of maternal factors like knowledge, BMI, GWG, anemia and dietary habits with risk of low birth weight in a tertiary care hospital.

Materials and methods

The assessment of maternal nutrition requires the measurement of body mass index (during initial pregnancy), weight gain during pregnancy, determination of measurement of patterns of food intake, and biochemical measurements of micronutrient status. All cases were subjected to height and weight measurements at 32–34 weeks by standard equipment (SECA) and BMI was calculated. BMI and Hemoglobin levels of the 1st trimester were derived from the antenatal cards. GWG was calculated from the difference in weight gain. Birth weight was taken during the first hour of birth to the nearest 50 g using a Salter spring balance. A validated pilot tested protocol containing socio demography, semi quantitative food frequency questionnaire and history of past illness was administered.

Taking the prevalence of low birth weight to be 20% as per NFHS 3[2] and with a desired precision of 7%, the sample size was calculated to be 123. All booked cases were included by systematic random sampling. Known cases of diabetes, hypertension, twin pregnancy, congenital malformation or any other chronic diseases were excluded. Due consent was taken and the study was cleared by the institutional ethical committee. The data collected was analyzed using SPSS Ver 20.

Results

This study was conducted at a tertiary care centre and in mothers without any complication. Most of the mothers were from an urban slum. We found 26.28% children to be having low birth weight, 14.6% mothers to be thin (BMI < 18.5), 55.3% mothers to be having a weight gain of less than 9 kgs and 45.5% were anemic. Of the thin mothers, 06 of them had a low birth weight baby, whereas in the normal or overweight mothers, 27 of them had a similar outcome. 28.92% women who were educated till high school had a baby with LBW. There was a positive association (not significant) between the selected sociodemographic parameters and antenatal care parameters with birth weight (Table 1).

From the semi quantitative food frequency questionnaire, it was observed that 64.2% women consumed non vegetarian foods with chicken being the most common meat but mean intake of such food was only 100 g twice a week. 57 out of 79 (72.16%) non vegetarians had normal birth weight outcome. One glass of milk was consumed by 76% daily, but most (51.2%) of them consumed milk only once a week. Again 26.38% of the women who consumed milk had a low weight baby. Most of mothers (39.8%) used soyabean oil but average use was 25 ml per day.

The mean birth weight was 2.79 kgs and mean GWG was 9.73 kg. GWG levels and Hb levels were significantly different in different birth weight groups and also were significantly associated with low birth weight (Table 2). The mean BMI was however not significantly different (ANOVA).

Discussion

We studied the birth weight of urban Indian newborn babies in relation to their mothers' knowledge and their nutritional status in pregnancy.

The study found a higher prevalence of neonatal low birth weight than that of the national data (NFHS 3). We found 14.6% mothers to be thin (BMI of <18.5). More than half of the mothers had a less than recommended weight gain and almost half of them were anemic. Most studies and surveys conducted in India and elsewhere have found maternal literacy, undernourishment[3] and anemia[3] to have profound effects on maternal weight gain and birth weight and same have been corroborated in this study. In our study, infants born to 36% mothers with GWG <9 kgs were at increased risk for fetal growth deficits, which is similar to a study from north India.[6] 45.5% women were anemic (Hb < 10.9 gm%) similar to other studies[3,7,8] and were more likely to have a low birth weight baby. However, 27 mothers with normal BMI (>18.5) had a low