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ORIGINAL RESEARCH

Evaluation of effect of maternal anthropometry on neonatal anthropometry outcome

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Abstract

Background: The present study was conducted for evaluating the effect of maternal anthropometry on neonatal anthropometry outcome.

Materials & methods:A total of 100 subjects were enrolled. Maternal anthropometric measurements such as post pregnancy weight, height, mid-arm circumference and triceps skin fold thickness were recorded at the time of enrolment following stabilization at hospital using standard techniques. Newborn anthropometric (birth weight, length at birth, foot length and circumference of mid arm, chest, head) measurements were made and recorded within 24 hours of birth at obstetric ward of the same hospital. In case of unavailability of LMP, the gestational age by Ballard's score was used for classification of maturity and weight-for-gestational age. All newborn anthropometry was measured by standard techniques. Evaluation of all the results was done using SPSS software.

Results: Mean height, weight, and weight gain of low-birth-weight mothers was lower than those who had normal birth weight babies. Of these, the difference in mother's weight (P-value-0.000), height (P value-0.000) and weight gain (P-value- 0.000) was statically significant. The mean age of low-birth-weight mother was higher than that of normal birth weight babies and it was also statistically significant. The MUAC was similar in two groups of mother and it was not statically significant. In our study 37% of mother's were below 150 cm out of which 55% delivered LBW babies and 53% mothers were between 150-160 cm (maximum number) out of which 32% delivered LBW babies. In the group of mothers falling between 160-170 cm(10%) delivered 100% normal weight babies.

Conclusion: It isrecommending the health authorities to strengthen the maternal health programmes focusing on maternal nutrition and iron and folic acid supplementation during antenatal period. The strategy also needs to focus attention on nutrition education to facilitate better weight gain during adolescent period.

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Key words: Maternal Anthropometry, Neonatal Anthropometry, Low Birth Weight, Birth Outcomes, Maternal Health Programs, Antenatal Nutrition, Iron and Folic Acid Supplementation

Introduction

The survival and wellbeing of mothers and children are important to self as a right and also central to solving much broader economic, social and developmental challenges. When mothers and children are sick or die, their families, communities and nations suffer as well. Improving the survival and wellbeing of mothers and children will not only increase the health of societies but also decrease inequity and poverty. This is possible by the healthy mothers who produce healthy off spring.[1, 2]

In India, over half of perinatal and two-thirds of all infant deaths are due to low birth weight. LBW is a consequence of either preterm (<37 weeks of gestation) delivery or intrauterine growth retardation (IUGR) or of both. In addition to short-term consequences, such as high infant morbidity, mortality and childhood growth failure among survivors, growth retardation is a major public health problem worldwide. Fetuses which suffer from growth retardation have higher perinatal morbidity and mortality, and are at an increased risk of sudden infant death syndrome. During childhood they are more likely to have poor cognitive development and neurological impairment. Moreover, IUGR contributes to the intergenerational cycle of poverty, disease and malnutrition as sketched by United Nation Administrative Committee on Co-ordination / Sub Committee on Nutrition (ACC/SCN). The cycle of poor nutrition continues across generations. Young girls who grow poorly become stunted women, and are more likely to give birth to low birth weight infants. If those infants are girls, they are likely to continue the cycle by being stunted in adulthood, and so on, if something is not done to break the cycle. Adolescent pregnancy heightens the risk of low birth weight and the difficulty of breaking the cycle. Support is needed for good nutrition at all these stages – infancy, childhood, adolescence and adulthood- especially for girls and women.[3- 5]

The infant mortality rate often serves as a key development indicator, reflecting the combined effects of economic development, technological change, including health interventions, and the socio cultural environment. Perinatal mortality studies point to the link between the health of the mother and the birth outcomes. The high perinatal mortality rates in India reflect the poor status of women, including poor nutritional status (malnutrition and anaemia), low rates of literacy, lack of autonomy and early marriage and child birth.[6, 7] Hence; the present study was conducted for evaluating the effect of maternal anthropometry on neonatal anthropometry outcome.

Materials & methods

The present study was conducted for evaluating the effect of maternal anthropometry on neonatal anthropometry outcome. A total of 100 subjects were enrolled. Inclusion criteria for the present study included:

- Pregnant women with first visit in less than 13 weeks
- Term pregnancy i.e. between 37 weeks to 40 weeks
- Singleton pregnancy
- Maternal age between 18-35 yrs

Consent was obtained from mother in writing after explaining the study and its value in local Language.Maternal anthropometric measurements such as post pregnancy weight, height, mid-arm circumference and triceps skin fold thickness were recorded at the time of enrolment following stabilization at hospital using standard techniques. Newborn anthropometric (birth weight, length at birth, foot length and circumference of mid arm, chest, head) measurements were made and recorded within 24 hours of birth at obstetric ward of the same hospital and

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gestational age assessed by Ballard's physical and neurological maturity scoring method of newborn and then matched with gestational age as calculated from history of maternal last menstrual period (LMP). In case of unavailability of LMP, the gestational age by Ballard's score was used for classification of maturity and weight-for-gestational age. All newborn anthropometry was measured by standard techniques. Evaluation of all the results was done using SPSS software.

Results

The study included the subjects enrolled from March 2013-March 2014 in S.A.I.M.S obstetrics ward. The mean age of mother was 26.19 years ± 3.999 years) in study group and 24.57 years ± 3.304 years in control. The mean parity was 4 in study group and 2 in control group. The mean weight gain was 7.222 kg±0.776kg in study group and 8.820kg±1.100 in control. The mean height was 150.57 cm±3.812 in study group and 156.15cm±6.509 in control. Mean height, weight, and weight gain of low birth weight mothers was lower than those who had normal birth weight babies. Of these, the difference in mother's weight (P-value-0.000), height (P value-0.000) and weight gain (P-value- 0.000) was statically significant. The mean age of low birth weight mother was higher than that of normal birth weight babies (p- value 0.030) and it was also statistically significant. The MUAC was similar in two groups of mother (P value- 0.178) and it was not statically significant.In our study 37% of mother's were below 150 cm out of which 55% delivered LBW babies and 53% mothers were between 150-160 cm (maximum number) out of which 32% delivered LBW babies. In the group of mothers falling between 160-170 cm(10%) delivered 100% normal weight babies.

Table 1: Anthropometric variables

Anthropometry of Mother	Study Group	Control Group	P-value
Mother's age	26.19+3.999	24.57+3.304	.030*
Mother's Ht.	150.57+3.812	156.15+6.509	.000*
Mother's Wt.	58.76+4.252	58.66+5.904	.000*
MUAC	25.89+2.470	25.26+2.065	.178
Wt. Gain	7.222+0.776	8.820+1.100	.000*

*: Significant

Table 2: Mother height and low birth weight

Height of Mother (cm)	Study group	Control group	P-value
140-150 (37%)	20(55%)	17(45%)	0.000
150-160 (53%)	17(32%)	36(68%)	
160-170 (10%)	00(0%)	10(100%)	

Discussion

Human fetal growth is characterized by sequential patterns of tissue and organ growth, differentiation, and maturation. In early gestation, the major determinant of fetal growth is the fetal genome. But in late pregnancy, environmental, nutritional, and hormonal influences become increasingly important. Several maternal anthropometric and demographic variables like pregravid weight, height, body mass index, gestational weight gain, parity, and gestational age at delivery independently predict birth weight. Among hormones, insulin plays an important role as an endocrine metabolic regulator of fetal growth and birth weight, principally due to its anabolic action. Pregnancy per se is a state of hyperinsulinemia owing to the action of insulin antagonists like placental estrogen, progesterone, human placental lactogen (hPL), cortisol, prolactin, human chorionic gonadotropin (hCG), etc. which

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increases with advancing gestation.[8- 10]Hence; the present study was conducted for evaluating the effect of maternal anthropometry on neonatal anthropometry outcome.

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Dougherty and Jones carried out a study in which they divided the sample into the groups Lower quartile (157 cm or less) and upper quartile (169cm or more) and remainder was taken as reference category. The analysis showed that there was a very stronger effect of height on birth weight, even when the other entire factor was controlled. Babies born to mother in upper quartile were 81gm heavy and those born to mothers in lower quartile were 132gm light.[11] Tyagi et al found that in both light weight (mean weight <45 kg) and short height mothers (mean height <150cm), the incidence of LBW babies was 51.5% compared to 9.2% in higher spectrum.[12]Kamaldoss et al found that the rate of LBW was high for mother's with <145 cm (29.7%) than mother's more than 145 cm (24.2%). This difference was however statistically not significant. By odds ratio calculation it is seen that mothers with, 145cm height have 1.32 times the risk of delivering LBW babies than mothers with more than 145 cm.[13]Dhall and Bagga (1995) studied maternal determinants of birth weight of north Indian babies. It was seen that the birth weight in mothers <140 cm tall and between 140 and145 c, were 155 gm and 37 gm less than those of reference category (151-155cm). Similarly the babies of mother more than 155cm tall were 93gm heavier than that mother with 151-155cm height.[14]

Malik et al found a strong correlation between birth weight and maternal height. Maternal height <145cm contributory significantly to high rate of LBW.[15] Sharma et al (1999) observed that incidence of LBW was maximum 26.6 % in mother having height <150 cm. As mother height increased incidence of LBW decrease and minimum incidence was observed when mother height was between 152 to 160 cm and more.[16]Deswal et al studied the risk factor for LBW. On conditional logistic regression, maternal height was found significantly associated with LBW after adjustment for other factors.[17]Ghate et al found that mean birth weight increase and proportion of LBW decrease with increasing height.[18]Sachdev found that maternal anthropometry criteria like weight and height have been significantly associated with IUGR and LBW.[19]Khatun and Rahman studied the socioeconomic determinants of low birth weight. Out of 20 possible risk variables analyzed, it was observed that maternal height was significantly associated with the incidence of LBW.[20]Sargoor et al carried out a studied on parent to new born body composition association in south India and found that both maternal and paternal height predicted neonatal trunk plus head length.[21,22]

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Conclusion

In conclusion, this study emphasizes the significant impact of maternal anthropometry on neonatal anthropometric outcomes. The findings reveal that low birth weight mothers exhibited lower mean height, weight, and weight gain compared to those with normal birth weight babies. The maternal age and height were identified as important factors influencing birth weight, with statistically significant differences observed.

These results underscore the importance of maternal health programs that focus on nutrition, iron, and folic acid supplementation during the antenatal period. Furthermore, attention to adolescent nutrition education to facilitate healthy weight gain is essential to break the intergenerational cycle of poor nutrition.

The study aligns with global efforts to improve the survival and well-being of mothers and children, acknowledging that the health of societies is intricately linked to the health of mothers and their offspring. Recommendations are made for health authorities to strengthen maternal health programs, emphasizing nutritional interventions and education.

Limitations

Despite the valuable insights gained from this study, certain limitations should be acknowledged. The sample size of 100 subjects may limit the generalizability of the findings to a broader population. Additionally, the study was conducted at a specific obstetrics ward, potentially introducing selection bias. The reliance on Ballard's score for gestational age in cases of unavailable last menstrual period data may introduce some variability.

Future research with larger and more diverse samples, conducted across multiple healthcare settings, would enhance the robustness and applicability of these findings. Despite these limitations, the study provides valuable contributions to the understanding of maternal anthropometry's role in neonatal outcomes and serves as a foundation for further investigations in this critical area of maternal and child health.

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