JOURNAL OF MEDICAL SCIENCE AND CLINICAL RESEARCH
IGM Publication   An Official Publication Of IGM Publication

Maternal Height as a Predictor of Birth Weight

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Introduction

There is enough evidence showing that the world wide problem of low birth weight (LBW), i.e. infants weighing <2500gms is one of the strongest determinants of infant mortality and morbidity. While in industrialized countries the majority of LBW infants do well owing to the advances of modern obstetric and neonatal care the chances for intact survival of LBW infants is much lower in developing countries due to inadequate or limited medical care including proper antenatal care. Maternal anthropometrics are presumed to be an important determinants of birth weight.[1] Maternal height and weight have been related to offspring weight and length at birth.[2] Previous studies have suggested that both prepregnancy body mass index (BMI) and gestational weight gain are positively associated with birth weight in the offspring and are related to risks of both low and high offspring birth weight. However further researches have shown that prepregnancy BMI reflects nutritional status, whereas weight gain during gestation reflects both nutritional status and tissue expansion.[3] the role of maternal height is not very lucid.

The present paper analyses the relationship between birth weight and maternal height to establish a relationship between maternal stature and low birth weight.

Material and Methods

A total of 1000 normotensive, non-smoking and non-morbid pregnant women were studied from first presentation at the antenatal OPD until delivery of their child. Obese and malnourished women were excluded from the study as this may influence the birth weight. Pregnancy with gestational diabetes, preeclampsia and other medical disorders including severe anaemia were not included in the study. Preterm and post term neonates, multiple gestations and intrauterine deaths were excluded from the study.

At first registration women were weighed and had their height measured; thereafter they had their weight measured at regular intervals. The measurements were made with the participants wearing a minimum amount of clothing. Height was measured using a locally made height scale. The woman maintained an upright and erect posture with her feet together and the back of her heels touching the pole of the anthropometer. The headpiece was lowered onto the woman's head (maintained in the Frankfurt plane) and the measurement was taken to the nearest 0.1 cm. The weighing machine was calibrated with known weights up to 70 kg at the beginning of each weighing session. Newborn babies were weighed within 24 h of delivery at the birth place. The newborn was weighed without any clothes.

Results

The study population consisted for 1000 antenatal women who attended the OPD and the labour room of the department and delivered either vaginally or by caesarean section in our health facility. As shown in Table 1, the mean age of the participants was 25.3yrs with a range of 21 to 30yrs. The mean height of and weight at the time of delivery was 157cms and 55.6kgs. Most of the women were primiparous and were educated till secondary school. The gestational age was 37.5 weeks and mean birth weight was 2.65kgs.

Table 1 General characteristics of the participants

Age (year)	25.3yrs
Height (cm)	157cms
Weight (kg)	55.6kgs
Parity	
P1	54%
P2	30%
>P2	16%
Education (%)	52.0
Primary school	46.4
Secondary school	1.6
Higher education	
Birth outcomes	
Birth weight (g)	2.65gms
Gestational age (weeks)	37.5weeks

Table 2 shows the distribution of cases according to height. 105 women were less than 150cms whereas 352 women were 150-155cms and maximum 463 women were between 155-160cms.

Table 2: Case distribution according to maternal height

Maternal Height	No. of participants
<150cms	105
150.1-155cms	352
155.1-160cms	463
160.1-165cms	80
>165cms	00

Table 3 shows case distribution according to birth weight. Maximum 555 infants weighed between 2.6-3.0kgs. 355 infants were low birth weight out of which 267 weighed between 2.0-2.5kgs whereas 88 were <2kgs. 90 infants weighed over 3.0kgs.

Table 3: Case distribution according to birth weight

Birth Weight	No. of infants
<2kgs	88
2-2.5kgs	267
2.6-3.0kgs	555
>3.0kgs	90

Table 4 classifies the mean birth weight in different groups of maternal height. The mean birth weight in women less than 150cms and those between 150.1-155cms was 2.1kgs and 2.4kgs respectively. There was little difference in the mean birth weights of infants born to mothers with height more than 155.1cms. However there was statistically significant difference in the mean birth weights of infants born to women less than 155cms ($p<0.05$). Beyond 165cms the mean birth weight was 3.1kgs but the difference was not statistically significant ($p>0.05$).

Table 4: Mean Birth weight distribution in different height groups

Maternal Height	Mean Birth Weight
<150cms	2.1+0.21
150.1-155cms	2.4+0.44
155.1-160cms	2.8+0.54
160.1-165cms	2.7+0.48
>165cms	3.1+0.24

Discussion

The maternal height indicates the nutritional status of the mother in the past and is considered as the proximate indicator of mother's nourishment in her childhood. It is well known that adult short stature reflects health processes throughout life apart from the genetic tendency and is associated with nutritional stress during the early stages of life. The biomechanical characteristics of mothers of short-stature must also be considered because this condition is associated with a narrower pelvis, which increases the likelihood of cephalopelvic disproportion and obstructed labor[4]. Moreover, a short-statured mother may not be able to supply sufficient amounts of nutrients to the fetus, a situation that results in greater susceptibility to a negative gestational outcome.

In our study we found that women a significant difference in the mean birth weights of infants born to mothers with a height less than 155cms and those born to mothers with a height more than 155cms. No significant differences were reported in very tall statured women and women with height between 155-160cms.

In a study conducted by Samiran Bisai on the effect of maternal height on neonatal size, the proportion of LBW was 75 %, 52.3% and 25% among short (height ≤145 cm), average (146–155cm) and tall mothers (>155cm). Short mothers had 2.74 (95%CI: 0.67–12.04) and 9 (95% CI: 1.24–78.65) fold greater risk of being LBW baby than average and tall mothers. There was a significantly decreasing trend with advancement of maternal height (x^2=6.855, p<0.01). In contrast, mean birth weight and length of baby was lower for short mothers, mean birth weight and length of baby was significantly increased with increment of maternal height.[5]

Several studies done globally and in India in recent past and latest on maternal factors associated with low birth weight highlight that the short stature of mother can contribute to low birth weight infants.[6,7] Further there have been studies undertaken to identify the height cut offs for identifying the risk for low birth weight. According to studies carried out in the west maternal height less than 156cm increased the risk of low birth weight in women whereas a case control study with matched pairs done on rural pregnant mothers of Maharashtra reported that maternal height of ≤145 cm results in infants delivered low birth weight.[8] Most studies indicate a maternal height ranging from <146 cm to <150 cm with statistical significance for LBW. However, a review by Mija-tesse Ververs, 2013[9] suggested the paucity of appropriate cut offs for maternal heights.

Conclusion

Low birth weight is a burning issue worldwide as well as in a developing country like India. It is of public health importance as well as the measure of quality of life and survival of the new generation. This study thus emphasizes the independent role of maternal height and its interrelationship with low birth weight. Though pre pregnancy maternal weight and weight gain during pregnancy remain the most important anthropometric markers that determine newborn weight, maternal height is an indicator of undernourishment during adolescence and is an useful marker to shortlist women at risk of LBW thereby needing special care. Further studies are needed to specify the cut-off levels of height below which the risk of LBW is more likely.

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