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## RESEARCH ARTICLE

# RELATIONSHIP BETWEEN MATERNAL NUTRITIONAL STATUS AND INFANTS GROWTH PATTERN IN KOLKATA, WEST BENGAL, INDIA

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**ABSTRACT**

To determine the relationship between maternal nutritional status and infant growth pattern, a cross sectional study was conducted in a postnatal clinic of government general hospital of south Kolkata, West Bengal, India. A total of 97 mother and their children were measured following standard techniques. Nutritional status of mothers and children's were assessed based on WHO recommended body mass index (BMI) guidelines, mid upper arm circumference (MUAC) and z-score methods, respectively. The result shows that BMI is the most important predictive variable of WAZ, LAZ and WLZ. Maternal BMI explained for 34.9%, 10.2% and 15.6% variation of WAZ, LAZ, and WLZ. When maternal MUAC enter into the model, further MUAC explained by 4.5% and 5.3% of variation for WAZ and WLZ score. In conclusion, interventions by improving maternal nutritional status could have a significant role in the prevention of childhood malnutrition.



## INTRODUCTION

Malnutrition continues to be a major public health problem throughout the developing world, particularly in sub-Saharan Africa and southern Asia including India [1]. A recent survey reported that India has more than 47 million stunted children, near about one third of the global total. Nearly one third of Indian children are born with low birth weight (LBW; birth weight <2500g). The study also documented that more than half of the mothers are underweight [2]. However, there is shortage of studies from India on childhood malnutrition, especially with regard to maternal nutritional status as measured by anthropometry. Therefore, the present study was undertaken to determine the relationship between maternal nutritional status and growth pattern among urban infants.

## MATERIALS AND METHODS

A cross sectional study was study was carried out in a postnatal clinic of government general hospital of south Kolkata. This hospital caters the needs of lower socioeconomic group of people. Before commencement of study, the protocol was approved by the Society for Applied Studies ethics committee. The estimated number of study subjects was calculated to be 92 by the standard formula ($n=4pq/d^2$) with 40% prevalence (p) of infant malnutrition (wasting)[3] and 10% desire precision (d). Assuming 10% cases will be lost during follow up, a total of 102 LBW babies were selected randomly from obstetric wards after weighing over a period of seven months from August, 2003 to March, 2004 and mothers were requested to visit postnatal clinic during months nine. All together, a total of 97 (boy=50, girls=47) mothers with child was attended postnatal clinic for follow-up during April, 2004 to December, 2004 and both mother and infant was measured after obtaining written consent from mother/guardian. All anthropometric measurements of weight and length for infants and weight, height and mid upper arm circumference (MUAC) for mothers were made on each subject following the standard techniques [4]. Body mass index (BMI) was calculated using the formula weight in kg divided by the square of height in meter. The WHO [5] recommended BMI and MUAC based classification was used to evaluate nutritional status of mothers. While, growth pattern of infants were evaluated based on age and sex specific z-score values of the NCHS reference population [6] using EPI6 software. The presence of underweight, stunting and wasting was considered if their weight-for-age (WAZ), length-for-age (LAZ) and weight-for-length (WLZ) z-score below -2SD.

## RESULTS AND DISCUSSION

The mean age, weight, height, MUAC and BMI of mothers were 26.4 ± 3.5 years, 42.34 ± 6.07 kg, 149.67 ± 5.53 cm, 21.66 ± 2.12 cm and 19.02 ± 2.54 kg/m$^2$, respectively. The corresponding mean values for age, weight and length of infants were 8.9 ± 0.4 months, 7.25 ± 0.86 kg and 67.34 ± 2.42 cm, respectively. Moreover, mean z-score for LAZ, WAZ and WLZ of infants were -1.45 ± 0.89, -1.63 ± 0.86 and -0.63 ± 0.90, respectively. This study found that about 51% mother were found to be chronic energy deficiency (CED), of these, 28.9%, 14.4% and 7.2% mothers were CED grade-I, grade-II and grade-III, respectively. While 6.2% and 1.0% mothers were found to be overweight and obese. The results of high prevalence of maternal undernutrition corroborate to earlier findings[2]. Moreover, based on MUAC, the prevalence of

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**Table 1. Stepwise regression analyses of maternal anthropotric characteristics (independent variables) with infants' WAZ, LAZ and WLZ-scores**

| Model | Dependent Variables | Independent variables | B | SEB | t | Sig. | Adj. $R^2$ |
|---|---|---|---|---|---|---|---|
| 1 | WAZ | Constant | -5.485 | 0.536 | -10.229 | 0.000 | |
| | | BMI | 0.203 | 0.028 | 7.244 | 0.000 | 0.349 |
| 2 | WAZ | Constant | -4.193 | 0.713 | -5.884 | 0.000 | |
| | | BMI | 0.260 | 0.035 | 7.486 | 0.000 | 0.349 |
| | | MUAC | -0.110 | 0.042 | -2.651 | 0.009 | 0.045 |
| 1 | LAZ | Constant | -3.599 | 0.658 | -5.473 | 0.000 | |
| | | BMI | 0.113 | 0.034 | 3.293 | 0.001 | 0.093 |
| 1 | WLZ | Constant | -3.380 | 0.641 | -5.276 | 0.000 | |
| | | BMI | 0.145 | 0.033 | 4.330 | 0.000 | 0.156 |
| 2. | WLZ | Constant | -1.905 | 0.854 | -2.231 | 0.028 | |
| | | BMI | 0.210 | 0.042 | 5.051 | 0.000 | 0.156 |
| | | MUAC | -0.126 | 0.050 | -2.525 | 0.013 | 0.053 |

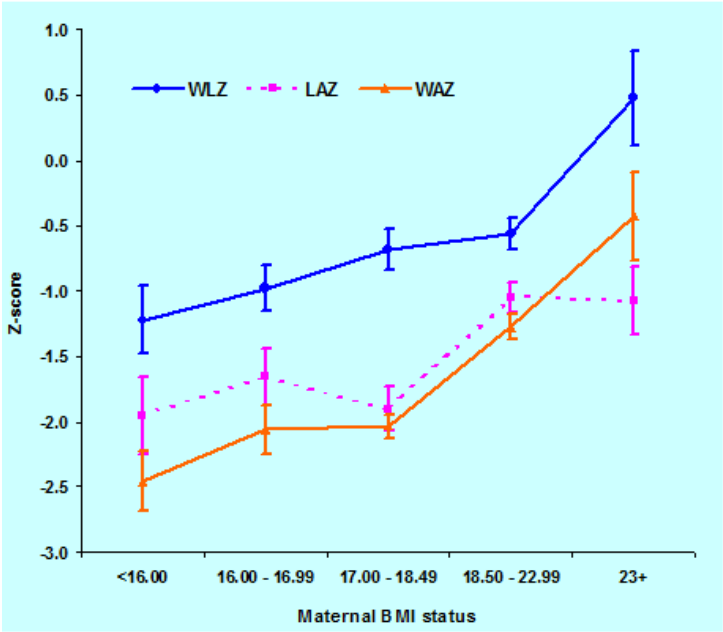


**Figure 1: Relationship between maternal body mass index and infant growth pattern (values are mean ± SE)**

under nutrition was 55.7%. There was no significant difference in the prevalence of under nutrition as assessed by BMI and MUAC (50.5 vs 55.7%, p>0.05). About 23 %, 36% and 3% children were found to be stunted, underweight and wasted [7]. It is important to note that the rate of malnourished infant was higher in undernourished (CED) mother. The mother with CED had 11.89 fold (OR= 11.89, 95% CI: 3.64-41.47) and 3.23 fold (CI: 1.07-5.84) greater chance to be an underweight and stunted infants compared to mother with normal BMI. Similarly, undernourished (based on MUAC <22.0 cm) mother had 1.32 (0.52-3.36) and 1.20 (0.41-3.53) fold greater chance to be underweight and stunted infants. A study from Bangladesh showed that mothers who were underweight was 2.5 times more likely to have underweight children [8]. Moreover, mean z-score for WAZ, LAZ and WLZ of infant had increasing trends with increased maternal BMI status (Figure 1). A separate stepwise multiple dependent variables (Table 1). Maternal age, weight, height, regression analysis was undertaken with the three Z-scores as MUAC and BMI were used as independent variables. Results reveal that the BMI is most important predictive variable of WAZ, LAZ and WLZ. Maternal BMI (model 1) explained for 34.9%, 10.2% and 15.6% variation of these three dependent variables. More importantly, in the second model for WAZ and WLZ, maternal MUAC further explained by 4.5% and 5.3% of variation for WAZ and WLZ. There is a significant association between maternal BMI with children weight and height z-scores [9,10], an increase in BMI status was associated with a lower rate of childhood undernutrition [11-13]. An earlier study suggested prevention efforts should be aimed at improving diet quality during lactation [9]**.** A study documented that the amount, fat, energy and all major nutrients concentrations of mothers' milk were associated with their nutritional status [14]. They also found that the amounts of fat and energy concentrations were significantly greater and these amounts tended to be greater, for mothers with larger arm circumference. It was important to note that during

infancy the relationship between mother and child malnutrition is affected by biological consequences of maternal malnutrition during lactation. Thus, interventions by improving maternal nutritional status could have a significant role in the prevention of childhood malnutrition.

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