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# A Study on the Nutritional Status of Preschool Children in Three Districts of Bangladesh

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**Abstract:** Malnutrition is the main nutritional problem in the developing countries like Bangladesh. The most vulnerable groups are under-5 children, adolescent girls, pregnant and lactating mothers. This study investigated the nutritional status of children aged 2-5 years of urban and rural areas of three different districts (Kushtia, Jhenidah and Jessore) of Bangladesh. The study was conducted on 200 children among those 100 were from Kushtia, 50 from Jhenidah and 50 from Jessore district. Among the children of Kushtia 55 were male & 45 were female. Among the children of Jhenidah 27 were male & 33 were female. Among the children of Jessore 32 were male & 28 were female. Analyzing anthropometric data we found that the mean height, weight and MUAC of males were 90.47 cm, 13.31 kg and 14.88 cm respectively while 88.51 cm, 12.58 kg and 14.70 cm respectively in case of female. Among the children 57% were under weight, 60% were stunted and 24.5% were found wasted. According to MUAC 35% children were normal and 12.5% children were severely malnourished in those three districts of Bangladesh.

**Keywords:** Preschool Children, Underweight, Infant, Malnutrition

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## 1. Introduction

Worldwide, adequate nutrition is being increasingly emphasized as a human right. The nutrition of preschool children is of considerable importance not only because of concern over their nutrition in formative stage of life but is widely perceived to have a substantial and persistent impact on their physical and mental development and on their health status and productivity as adults<sup>[1]</sup>. A child's nutritional status at any point in time depends on his or her past nutritional history, which may particularly account for the present status. To some extent, this nutritional history is linked to the mother's health and nutritional status. This in turn has been influenced by her living conditions and nutritional history during her own childhood. So the nutritional status of a child reflects whole society<sup>[2]</sup>.

Nutritional factors in the early years of life affect children's development in subsequent years. Bangladesh, about 60% children suffer from malnutrition<sup>[3]</sup>. Malnutrition includes a wide range of clinical disorders that are the result of an

inadequate intake of energy and protein as well as other nutrients. PEM is a state of deficient of protein and/or energy. PEM popularly called "Malnutrition" is a great problem in all countries for decades together. It is also a premier health problem in our country for a long time. Chronic mild PEM affects up to 50% of all children of the developing countries. In 2001 survey was carried out by NNP (National Nutrition Project) and showed that the average calorie shortfall was 15%, calorie consumption by adult (<1600 kcal/day) was 15%, calorie consumption by adult (<1800 kcal/day) was 25%, population of children stunted was 4.5%, low birth weight was 40-45%, anemia among mothers and children was 70%, iodine deficient population was 43% and prevalence of night blindness among pregnant women was 2.7%. All these reflect the nutritional status of the people of Bangladesh<sup>[4]</sup>

Studies carried out by several workers have shown that a large majority of preschool children in the developing countries grow at a subnormal rate as the diets consumed by

them are inadequate both in quantity and quality. Increases in global food prices have raised concerns that the prevalence of malnutrition may increase, especially in developing countries [5].

Rising food prices may decrease the ability of households to purchase food. Because poor households use a relatively large proportion of income to purchase food, increases in the price of food can directly affect the amount and type of food their income can buy, which can be reflected by decreased amounts of fat and vegetables in meals, elimination of some meals, and an overall reduction in dietary diversity [6].

Breast milk is a unique nutritional source that cannot adequately be replaced by any other food including infant formula. Breastfeeding provides optimal nutrition for infants and is associated with decreased risk for infant and maternal morbidity and mortality [7]. Maternity practices in hospitals and birth centers throughout the intrapartum period, such as ensuring mother-newborn skin-to-skin contact, keeping mother and newborn together, and not giving supplemental feedings to breastfeed newborns unless medically indicated, can influence breastfeeding behaviors during a period critical to successful establishment of lactation [8-13].

Bangladesh is a densely populated country. But most of the people are very poor & illiterate, which is responsible for malnutrition. Especially children under-5 years of age are more vulnerable group. The study has been designed to investigate the nutritional status of under-5 children of three district of Bangladesh and to find out important associated factors influencing their nutritional status.

## 2. Methodology

### *Study Area:*

The survey was conducted in the rural and urban areas of Kushtia, Jhenidah and Jessore district in Bangladesh from October-2013 to April-2014 by questionnaire method.

### *Study population:*

The family of different urban and rural areas of those districts were enumerated first. Then only those household were selected, having 2-5 years children.

### *Sample Size:*

Total 200 hundred samples were studied.

### *Sample Size Determination:*

Sample size was usually estimated by following equation-

$$n = \frac{(1.96)^2 \times (1 - p)}{P \times \epsilon^2}$$

Where:

n = sample size, p = expected prevalence of disorder in the population,  $\epsilon$  = relative precision required.

1.96 is a statistical parameter corresponding to the confidence level of 95% (an error risk of 5%). p and  $\epsilon$  can be expressed either as percentage or as fractions (10% = 0.10) but must both be expressed in the same terms [14, 15].

### *Study design:*

Among several types of study design a cross sectional study was conducted. Subjects were selected randomly. Height and

weight were measured using standard techniques. Nutritional status was assessed by height-for-age, weight-for-age and weight-for-height using the National Center for Health Statistics standards.

### *Questionnaire:*

A pre-coded questionnaire was developed to obtain relevant information regarding socio-demographic status such as age, weight, family size, health condition, dietary pattern etc. The questionnaire was pre-tested before finalization.

### *Anthropometric Measurements of Preschool Children:*

Anthropometric measurements were performed by following standard methods (Jelliffe and Jelliffe, 1989) [16].

### *Measurement of body weight:*

A weight balance (Health, Japan) was used to record body weight. The balance was standardized regularly before use. The body weight was recorded bare footed to the nearest 0.1 kg. Weighing was not done after a full meal or when the stomach was virtually empty.

### *Measurements of Recumbent Length:*

Length of height of the subject was measured using a locally constructed stadiometer or length board to the nearest 0.1 cm. the length board was set in the ground. Then the subject stood supporting the length board or lays upon the length board bare footed.

### *Measurements of the Height:*

For height measurement a stadiometer or portable anthropometer were used.

### *Measurement of MUAC:*

It was measured by a flexible and non-stretchable plastic tape to the nearest millimeter.

### *Anthropometric Indices:*

The following classification systems were applied in this study.

### *Weight for Age (W/A)*

Weight for age of the subjects was calculated from the actual body weight and standard weight of the subjects in that age using the following formula:

$$\text{Weight for age (W/A)} = \frac{\text{Actual weight of the children}}{\text{Standard weight of the child in that age}} \times 100$$

### *Height for Age (H/A)*

Height for age or length for age of the subjects was calculated from the height or length and standard height of the subjects in that age using the following formula:

$$\text{Height for age (H/A)} = \frac{\text{Actual height of the children}}{\text{Standard height of the child}} \times 100$$

### *Weight for Height (W/H)*

Weight for height of the subjects was calculated from the actual body weight and standard weight of the subjects in that height using the following formula:

$$\text{Weight for height (W/H)} = \frac{\text{Actual weight of the children}}{\text{Standard weight of the child in that height}} \times 100$$

Data analysis:

After collection of raw data through interview and observation, it was cleaned & checked for analysis. Data entering into the computer were processed. All variables were checked for distribution. Appropriate statistical tests were performed to verify the results.

Classification of Nutritional Status:

Standard Deviation Score (SD score or Z score)

The standard deviation or Z score is a measure of an individual's value in relation to the distribution of corresponding value of the group. It is calculated as follows-

$$Z \text{ score} = \frac{\text{Observed value} - \text{Median reference value}}{\text{Standard deviation of for the reference populations}}$$

Children whose scores according to anthropometric indices were found to be less than 2 SD or below the reference have been classified as being physically retarded.

### 3. Results

**Table 1.** Mean Height, Mean Weight & Mean MUAC of children by age & sex.

Age group (month)	Mean Height (cm)	Mean Weight (kg)	Mean MUAC (cm)
Male			
24-35	86.01	11.05	14.45
36-47	91.35	13.01	14.85
48-60	94.05	15.87	15.35
24-60	90.47	13.31	14.88
Female			
24-35	85.95	10.20	13.95
36-47	88.15	12.85	14.45
48-60	91.53	14.69	15.70
24-60	88.51	12.58	14.70

Table 1 shows that the height, mean weight and mean MUAC of male are 90.47 cm, 13.31 kg & 14.88 cm while female are 87.01 cm, 12.58 kg & 14.7 cm respectively.

**Table 2.** Distribution of children by weight for age (SD) according to age group.

Age Group (Month)	Weight for age (SD) of the children			
	≤ -3.00 SD	-2.99 SD to 2.00 SD	-1.99 SD to 1.00 SD	-0.99 SD to +0.99 SD
24-35	4	16	8	50
36-47	8	10	14	20
48-60	14	12	28	16
24-60	26(13%)	38(19%)	50(25%)	86(43%)

Note: Severe underweight = ≤ -3.00 SD, Moderate underweight = -2.99 SD to -2.00 SD, Mild underweight = -1.99 SD to -1.00 SD, Normal = -0.99 SD to +0.99 SD.

Table 2 represents that 13% children are severely under weight, 19% are moderately under weight, 25% children are mildly under weight and 43% children are normal according to weight for age indices.

**Table 3.** Distribution of children by height for age (SD) according to age group.

Age Group (Month)	Height for age (SD) of the children			
	≤ -3.00 SD	-2.99 SD to 2.00 SD	-1.99 SD to 1.00 SD	-0.99 SD to +0.99 SD
24-35	8	18	10	42
36-47	14	8	16	18
48-60	18	10	18	20
24-60	40(20%)	36(18%)	44(22%)	80(40%)

Note: Severe stunted = ≤ -3.00 SD, Moderate stunted = -2.99 SD to -2.00 SD, Mild stunted = -1.99 SD to -1.00 SD, Normal = -0.99 SD to +0.99 SD

Table 3 represents that 20% children are found to be severely stunted, 18% moderately, 22% are mildly and 40% are normal.

**Table 4.** Distribution of children by weight for height (SD) according to age group.

Age Group (Month)	Weight for height (SD) of the children			
	≤ -3.00 SD	-2.99 SD to 2.00 SD	-1.99 SD to 1.00 SD	-0.99 SD to +0.99 SD
24-35	3	7	6	45
36-47	5	8	8	75
48-60	3	5	4	31
24-60	11(5.5%)	20(10%)	18(9%)	151(75.5%)

Note: Severe wasted = ≤ -3.00 SD, Moderate wasted = -2.99 SD to -2.00 SD, Mild wasted = -1.99 SD to -1.00 SD, Normal = -0.99 SD to +0.99 SD

Table 4 represents that 5.5% children are found to be severely wasted, 10% moderately, 9% are mildly and 75.5% are normal.

**Table 5.** Distribution of nutritional status of children by height for age, weight for age & weight for height as Z-score (%).

Indices	≤ -3.00 SD	-2.99 SD to 2.00 SD	-1.99 SD to 1.00 SD	-0.99 SD to +0.99 SD
Height for age	20%	18%	22%	40%
Weight for age	13%	19%	25%	43%
Weight for height	5.5%	10%	9%	75.5%

Table 5 expresses that 20% children are found to be severely stunted (-3 SD and below), 18% moderately (-2.99 SD to -2.00 SD), 22% are mildly and 40% are normal according to height for age indices.

Weight for age indices shows that 13% children are severely under weight (-3 SD and below), 19% are moderately under weight (-2.99 SD to -2.00 SD), 25% are children are mildly under weight and 43% children are normal according to weight for age indices.

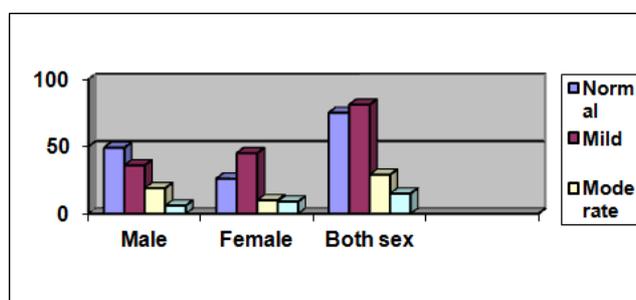
Weight for height indices represents that the prevalence of moderate wasting is 10% (-2.99 SD to -2.00 SD) and severe wasting is 5.5% (-3 SD and below) among the studied children.

**Table 6.** Distribution of children by different categories of MUAC.

MUAC	Type	Number		Total %
		Male	Female	
≥ 14.5	Normal	32	38	35% (70)
13.5-14.4	Mild malnutrition	36	30	38% (76)
12.5-13.4	Moderate malnutrition	17	12	14.5% (29)
<12.5	Severe malnutrition	11	14	12.5% (25)

Table 6 shows the distribution of children by different ranges of MUAC. In the study 35% are normal children, and 38%, 14.5%, 12.5% children are mild, moderate and severely malnourished according to MUAC measurement.

According to Gomez Classification the prevalence of mild (1<sup>st</sup> degree), moderate (2<sup>nd</sup> degree) and severe (3<sup>rd</sup> degree) malnutrition are 40.5%, 14.5% and 7.5% respectively, among them 18% male and 22.5% female are mild, 9.5% male and 5% female are moderate; 3% male and 4.5% female are severely malnourished.

**Fig. 1.** Distribution of Nutritional Status by Gomez classification.**Table 7.** Distribution of Nutritional Status by Waterlow classification.

Height for age	Weight for Height	
	>80%	<80%
>90%	Normal	Wasted
	57.5% (115)	10% (20)
<90%	Stunted	Both stunted & wasted
	23% (46)	9.5% (19)

According to Waterlow Classification, 10% and 23% children are wasted and stunted respectively. The prevalence of both stunted & wasted are 9.5% and 57.5% are normal.

## 4. Discussion

Childhood malnutrition is characterized by growth failure. Anthropometric measurement is particularly important in assessing the nutritional status of children. According to Dawson (1992), heights and weights of children, particularly those less than 5 or 6 years of age, and pregnant/lactating women, are accepted measures for monitoring their growth and nutritional status, and are also considered as an indicator of the nutritional status of the entire community. The study was carried out to find out the nutritional status of preschool children in Kushtia, Jhenaidah and Jessore district of

Bangladesh. The community based cross sectional study conducted on 200 preschool children. This nutrition survey may establish baseline nutritional data and/or ascertain the overall nutritional status of a population. The factors influencing that nutritional status of preschool children are age, sex, weight, height, anemic status, vaccination, educational qualification of parents, family income, family size, living status etc. Analyzing anthropometric data we found that the mean height, weight and MUAC of males are 90.47 cm, 13.31 kg and 14.88 cm respectively while 88.51 cm, 12.58 and 14.70 cm respectively in case of female. Among the children 57% are under weight, 60% are stunted and 24.5% are wasted. According to MUAC 35% children are normal.

According to Gomez classification, the nutritional status of the children show the prevalence of mild (1<sup>st</sup> degree), moderate (2<sup>nd</sup> degree) and severe (3<sup>rd</sup> degree) malnutrition are 40.5%, 14.5% & 7.5% respectively. Among them 18% male and 22.5% female are mild; 9.5% male and 5% female are moderate and 3% male and 4.5% female are severely malnourished.

According to Waterlow classification, 57.5%, 10% and 23% children are normal, wasted and stunted respectively. The prevalence of both stunted and wasted are 9.5%.

Child malnutrition is a major underlying cause of mortality worldwide, accounting for an estimated 2.2 million under-5 child deaths annually [8]. In Southeast Asia, multiple micronutrient deficiencies and chronic malnutrition occur in roughly one-third to one-half of preschool children. Malnutrition results in increased susceptibility to infections, reduced work productivity, limited school performance, and slowed cognitive development and growth over the lifetime. Generally the diet in rural and urban area is not well balanced & traditional dietary habits often do not confirm balance nutrition. Again male eat better & more food than female. All these observed in this study are not unlike other parts of the country.

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