Variability of Malnutrition by Gender among Under Five Children in Bangladesh: Illustration Using Bangladesh Demographic and Health Survey, 2011 and 2014 Data

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***Abstract*-- Bangladesh has shown a lot of progress in reducing child malnutrition in the last few years. Despite this progress, control of the variability of child nourishment with gender is still a challenge. But, gender-based nourishment equality is most important to continue the sustainable development progress of child nutrition in Bangladesh. This study unveils the underlying variability of child nourishment with gender. The relevant child data for this study were extracted from the two rounds of Bangladesh Demographic and Health Surveys (BDHS) conducted in 2011 and 2014. To examine the extract of nutrition, we used the measurement of height-for-age, weight-for-age, and weight-for-height. The main findings of this paper were, the male child had less stunting prevalence than the female in 2011 but higher in 2014. The male child had less underweight prevalence than the female in both years, whereas the male child had greater wasting prevalence than the female in both years. To reduce the variability of child nourishment, it must need to arrange split program and ensure equal food habit for each category of gender.**

***Keywords*-- Malnutrition, Variability, Stunting, Wasting, Underweight, Z-score**

I. INTRODUCTION

Malnutrition is a condition that refers to both the nutrition deficiency and over consumption of nutrients. More commonly used term 'under-nutrition' which includes stunting (low height for age), wasting (low weight for height), underweight (low weight for age) and micronutrient deficiencies or insufficiencies (a lack of important vitamins and minerals). Here we consider under-nutrition and malnutrition equivalently. Malnutrition among children adversely affects the national economy and sustainable development of a country. According to the key findings of World Health Organization, 52 million children under 5 years of age are wasted, 17 million are severely wasted and 155 million are stunted. Around 45% of deaths among children under 5 years of age are linked to under-nutrition. These mostly occur in low and middle-income countries [1]. Several studies also estimated that more than one-third of under-five deaths are attributable to under-nutrition [2], [3]. Approximately, one out of every three under-five children in developing countries is malnourished [4]. About sixteen percent of the under-five children were estimated as underweight worldwide in 2011 [5].

Child malnutrition is pervasive in Bangladesh, with nearly one-half of all children below the age of five years being either underweight or stunted. However, the country has made a significant progress in reducing the incidence of child malnutrition during the last 15 years [6], [7]. Prevalence of stunting was decreased by 18.8% (from 60.0% to 41.2%), underweight by 16.0% (from 52.2% to 36.2%) and wasting by 5.1% (from 20.6% to 15.5%) during 1996 to 2011 [8]. Another study showed that wasted child was increased by 4%, stunted and underweighted child were decreased by 17.7% and 13.8% respectively from BDHS (2004-2011) [9]. Despite the nutritional improvement, the variability of child nourishment with gender was found in Bangladesh [10]. Among the malnourished child, there was bias evidence, i.e., nutrition status varies from male to female in all forms of nutritional indicators[11]-[14].

Gender based inequality is a well-known and widespread reality in the developing countries. Nutritional variability among under-five children is the common scenario with respect to the different factors. Gender of child is a common indicator of varying the nutritional status of children aged 0-59 months. The main aim of the research was to unveil the underlying nutritional variability with the gender of under-five children in Bangladesh. So, this further analysis of Bangladesh Demographic and Health Survey data of 2011 and 2014 was conducted to identify the variability of child nourishment and the main victim of major malnourish criteria by the gender of the children to nurture them in a superior way to get a well nourish generation.

II. MATERIALS AND METHODS

2.1. Data

The relevant data for this analysis extracted from the two rounds of Bangladesh Demographic and Health Surveys (BDHS) conducted in 2011 and 2014. Demographic and Health surveys are nationally representative, population-based household surveys that monitor demographic trends, infant and child mortality, child and reproductive health, nutritional status, family planning use. The National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare of Bangladesh conducted the survey that employed a nationally representative two-stage stratified cluster sample of households. All women age 15-49 were eligible for interview in the selected households. BDHS collected anthropometric data for all children younger than 5 years from all selected households. Children were included in our analysis if they had no missing values for any of the anthropometric measurements and have complete information from their mothers. The final sample was composed of 7,647 respondents in 2011 and 6,965 respondent in 2014 for whom complete and credible anthropometric and age data were available.

2.2. Methods

Indicators: To find the variability of child nourishment with gender for BDHS 2011 and BDHS 2014, three commonly used nutrition indicators were used to evaluate the nutritional status of the children aged 0-59 months in Bangladesh. Three standard indices of physical growth that describe the nutritional status of children are:

- Height-for-age (stunting)
- Weight-for-height (wasting)
- Weight-for-age (underweight)

Each of these indices provides different information about growth and body composition that can be used to assess nutritional status.

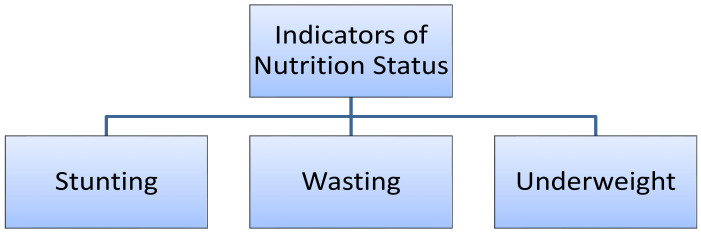

Figure 1: Indicators of Nutrition Status

Variable: Gender is categories as male and female. Nutrition status varies from male to female. According to Chen et al., the malnutrition rate was found to be substantially higher among female children than among male children [15].

2.3. Analysis

The anthropometric analysis method for measuring the nutritional status includes three widely used indicators to assess the growth of children: height-for-weight, weight-for-age, and weight-for-height. A child is considered stunted if (s) he is, in terms of height-for-age, more than two standard deviations below the median (−2 SD) of the WHO reference population. A child is wasted when (s) he is more than two standard deviations below (−2SD) the reference median for weight-for-height. A child is classified as underweight if his or her weight-for-age is lower than two standard deviations (−2 SD) from the median of the reference population.

This paper classifies the nutritional status of under-five children on the basis of the Z-scores. Mathematically, Z-scores can be defined as:

$$Z - score = (Individual\ value\ of\ the\ child - median\ value\ of\ reference\ population) / (standard\ deviation\ value\ of\ reference\ population)$$

A Z-score below $-2SD$ in any of these three indicators indicate malnutrition. STATA software has been used to calculate Z-scores.

III. RESULTS AND DISCUSSION

3.1. Stunting

Stunting is defined as the percentage of children, aged 0 to 59 months, whose height for age is below minus two standard deviations from the median of the WHO Child Growth Standards. Stunting is a risk factor for diminished survival of malnourished children [16]. Stunting is a sign of chronic malnutrition (WHO: Global Nutrition targets 2025) [17]. Here the stunting prevalence among under-five children in Bangladesh is computed and shown (Table 1) by their gender.

Table 1: Stunting prevalence of children aged 0-59 months by their gender for BDHS 2011 and 2014

Gender	Stunting Prevalence	
	BDHS 2011	BDHS 2014
Male	40.3%	37.6%
Female	41.0%	35.5%

Table 1 represents an overall decreasing trend of stunting prevalence in gender (both male and female) by comparing the last two consecutive BDHSs, i.e., 2011 and 2014. The result shows that a greater percentage of male children compared with female were stunted in BDHS 2014, but the results were just opposite, i.e., the female children were more stunted than the male children in BDHS 2011. In percentage, 41.0% female children were stunted in 2011 and 35.5% were stunted in 2014, where as 40.3% male children were stunted in 2011 and 37.6% were stunted in 2014. After all, the result reveals that the male child suffered much by stunting than the female child. Figure 2 separately presents the male and female

stunting prevalence of under-five children in the year of 2011 and 2014.

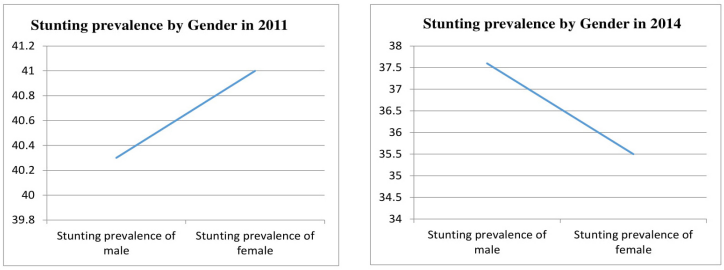

Figure 2: Stunting prevalence of children aged 0-59 months by their gender in 2011 and 2014

3.2. Wasting

Wasting is very stronger determinant of child mortality. A child who is more than two standard deviations below (-2 SD) the reference median for weight-for-height is considered to be too thin for his or her height, or wasted. This condition reflects acute or recent nutritional deficit. A monotonic decreasing trend of wasting prevalence was found for both genders of children in the last two consecutive BDHSs, i.e., 2011 and 2014 (Table 2). The study divulges that the wasting prevalence was higher among boys than girls in each of the two survey years. The pictorial representation of wasting prevalence of children aged 0-59 months is shown in Figure 3.

Table 2: Wasting prevalence among children age 0-59 months by their gender for BDHS 2011 and 2014

Gender	Wasting Prevalence	
	BDHS 2011	BDHS 2014
Male	15.9	15.2
Female	15.0	13.6

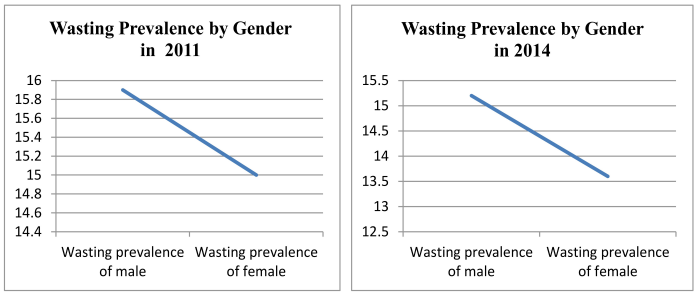

Figure 3: Wasting prevalence of children aged 0-59 months by their gender in 2011 and 2014

3.3. Underweight

Underweight prevalence, i.e. weight-for-age is a composite measure of stunting (height-for-age) and wasting (weight-for-height) [18]. Thus, it does not distinguish between acute malnutrition (wasting) and chronic malnutrition (stunting). A child can be underweight for his age because he or she is stunted, because he or she is wasted, or both. Table 3 shows the percentage of underweight prevalence of children under age five in BDHS 2011 and BDHS 2014 by their gender category. Here also an overall monotonic decreasing trend of underweight prevalence was found in gender (for both male and female) in the last two consecutive BDHSs, i.e., 2011 and 2014. Underweight prevalence was higher among girls than boys in each of the two survey years. Prevalence of underweight in female was 37.4% in 2011 and in 2014 the underweight prevalence was 32.9%, whereas the prevalence of underweight in male was 34.2% in 2011 and 32.1% in 2014. The result intensively shows that the decreasing trend of underweight prevalence in female children was more than two times higher than the male counterpart. Graphically the underweight prevalence for the year of 2011 and 2014 in under-five children is shown in Figure 4.

Table 3: Underweight prevalence among children age 0-59 months by their gender for BDHS 2011 and 2014

Gender	Underweight Prevalence	
	BDHS 2011	BDHS 2014
Male	34.2	32.1
Female	37.4	32.9

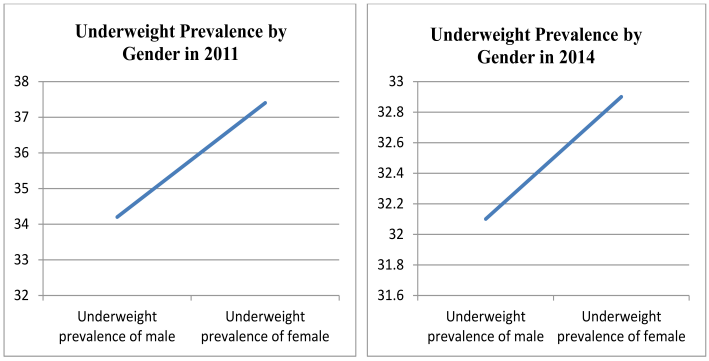

Figure 4: Underweight prevalence of children aged 0-59 months by their gender in 2011 and 2014

According to the findings of BDHS 2011, 41% children were stunted, 16% were wasted and 36% were underweight in Bangladesh [19]. With compare to the results of BDHS 2011, the results of BDHS 2014 were quite satisfactory; in BDHS 2014 36.2% children were stunted, 15% were wasted and 33% were underweight [20]. In spite of the outstanding achievements of Bangladesh in consistently reducing the malnutrition rates among children through the last few decades, there is some variability in different indicators of child malnutrition with their gender. The findings of this study tell us the scope of further improvement of child nutritional status by the gender of under five children in Bangladesh.

There are many risk factors for child malnutrition such as age of children, place of residence, division, religion, education of parents, occupation of parents, BMI of mothers, wealth index and toilet facilities used by the household etc. Several studies identified that being the male gender is a risk factor of child malnutrition in Bangladesh [11-14]. A study on 'different forms of malnutrition among under-five children in Bangladesh' also found that prevalence of malnutrition in

male children is slightly higher as compared to the same in females [21]. Despite strong son preference in South Asia, similar result was found in the study of sex differential in childhood nutritional status in South Asia [22].Poor nutritional status is the root causes of many other health-related problems of under-five children in Bangladesh. Young children are especially the most venerable to nutritional and micronutrient deficiencies. So, reducing gender-based variability and ensure equal child nutrition is the key to finding the future healthy population in Bangladesh.

IV. Conclusion

To assure the nutrition sustainably among under-five children in Bangladesh, it is essential to ensure equality of child nourishment with gender. But, Bangladesh has continuously failed to balance the nutrition indicators with essential criteria among the children aged 0-59 months by their gender. The results of this paper unveil that, in terms of the total stunted children the male children were more stunted in 2014 but were not in 2011, which indicate an increasing tendency of stunting male child in Bangladesh. Male children were found more wasted than female in both of two survey years and the difference of wasting children between male and female was higher in 2014. Similarly, female children were found more underweight prevalence in both of two survey years. This type of nutritional variability with gender for all indicators of nutrition is not expectable for ensuring child nutrition and achieving the health status of sustainable development goals. To reduce the variability and maintain equal child nourishment, it is essential to arrange the spilled program and ensure equal food habits for each category of gender. So, it is the demand of time to further investigate why the female is more underweight and why the male is more wasted; otherwise, after some decade we will get an imbalanced nourished Bangladesh.

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