

## Nutritional status, dietary diversity, and food security of adolescent girls in rural Bangladesh

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### Abstract

**Background:** Childhood malnutrition is widespread in South Asia like many other underdeveloped and developing countries and it continues throughout adolescent age. Poor nutrition of adolescents could lead to various complications later in life.

**Objective:** The objectives of this study are to assess the nutritional status, dietary diversity, and food security of adolescent girls in rural Bangladesh, as well as to assess the factors that influence them.

**Methods:** A cross-sectional study among 422 participants was conducted in two selective areas in the Narayanganj district of Bangladesh. BMI (Body Mass Index)-for-age (z-score) and Height-for-age (z-score) were considered in evaluating the nutritional status of the study participants. Food and Agricultural Organization guidelines 2011 were used to calculate Individual Dietary Diversity Score. Food insecurity was assessed by using the Household Food Insecurity Access Scale version 3.

**Results:** The findings revealed that the prevalence of underweight and stunting were 9.5% and 12.1% respectively. In addition, 13.2% and 4.3% of the respondents were found to be overweight and obese. The height-for-age (z score) was associated with the age of adolescents ( $p=0.037$ ). Mother's ( $p=0.005$ ) education were also correlated with their nutritional status. Outcomes of the Individual Dietary Diversity Score showed that 25.6%, 42.9%, and 31.5% of the adolescents had low, medium, and higher dietary diversity scores respectively, while 7.3% had different degrees of food insecurity.

**Conclusion:** Compared to underweight, overweight and obesity were shown to be more prevalent. However, a small percentage of the individuals reported various levels of food insecurity in this study. To attain an optimal level of nutrition, it is essential to ensure expanded food availability for the rural community. Proper nutrition education at primary and secondary education levels will enable teens to have diversified foods as well as assists in gaining healthy weight. [*Ethiop. J. Health Dev.* 2020; 35(3):000-000]

**Keywords:** Nutritional status, Dietary diversity, Food security, Adolescents, Rural Bangladesh

### Introduction

Adolescence is a critical timeframe for achieving optimal health and nutritional benefits that are necessary at all stages of life (1). World Health Organization considers an individual in the 10-19 years of age as an adolescent (2). Around the globe, adolescent population is about 1200 million, which is almost 19% of the world's total population and faces a series of severe nutritional difficulties in developing states (3). According to the Ministry of Health and Family Welfare of Bangladesh, around 36 million people worldwide are in the adolescent age group, which amounts to one-fifth of the country's residents (4).

In the South Asia region, childhood malnutrition is widespread which continues into adolescence (5). Socio-demographic characteristics are the major determinants of poor nutritional conditions (6). Research has found the prevalence of under nutrition in the adolescent age to be higher among females compared to males due to poor 's education in parents, lack of women empowerment, domestic violence etc. (7,8).

Food insecurity is a worldwide public health threat. Food insecurity at the household level is the leading cause of malnutrition, resulting in approximately 300,000 deaths per year (9,10). For teenagers, the cumulative impact of food insecurity has adverse mental, social, and physical consequences (11).

Moreover, having diversified foods has a positive correlation with healthier nutritional outcome among both adolescents and adults (12).

Poor body mass index (BMIs) among adolescents is prevalent in several underdeveloped and developing countries (13). Bangladesh is a least developed nation where about 26% of adolescent girls are thin, based on BMI for age. Likewise, almost 32% of the adolescence is stunted (14). The study indicated that 51.6% of adolescent girls suffer from different forms of anemia in Bangladesh (15), even though their knowledge of dietary practices is also at a lower level (14). Proper nutrition is important during adolescence to meet the demands of growth and pubertal development and to reduce the chance of chronic diseases in the future (16). The requirements of energy, protein, iron, calcium, and others nutrients needs to be increased to support sufficient growth and development of adolescence (17). On the other hand, changes in dietary practices and developing of eating disorders could lead to various kinds of complications in puberty and later in life (18).

Adolescence is a distinctive era in the life-cycle. Significant portion of adult height, weight and skeletal mass is gained during this period (17, 19). After reviewing the national level of health and demographic survey, it was discovered that there is insufficient published data on adolescent nutrition in Bangladesh (20). Hence, this study has been designed to reveal the

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adolescent's current nutritional status in rural settings along with their socio-demographic characteristics, dietary diversity, and food security.

## Methods

### *Study design, settings, and population*

A cross-sectional study was conducted in two selective areas known as Kusiara and Bandar Ghat in the Narayanganj district of Bangladesh to measure the prevalence of malnutrition, dietary diversity, and food security among adolescent girls in the rural regions. The data was collected between the periods of July and December 2019. The adolescent girls were aged between 12-16 years and resided in these rural areas.

### *Sample size and data collection procedure*

Sample Size was determined by using the equation  $n = Z^2pq/d^2$ . Whereas  $n$  = Number of desired sample size,  $Z$  = Standard normal deviation, which is 1.96 at 95% confidence interval level, and  $P$  means the prevalence of the assumed malnutrition among adolescents (50% or 0.5). The value of  $q$  has been calculated by subtracting  $P$  value from 1 ( $q = 1-p=0.5$ ). The error margin for the research was 5% ( $d=5\%$  or 0.05). Furthermore, 10% extra sample was added as a safety measure to the study to compensate for the uncertainties of loss of sample due to unpredictable reasons. Therefore, the total determined sample size was 422 (21, 22).

Data was collected from five purposively selected secondary schools and the respondents were selected conveniently within the nominated schools.

### *Data collection tools*

A semi-structured questionnaire was used to obtain quantitative information from participants related to socio-demographic characteristics, food security, and dietary diversity. Information related to anthropometry was collected by measuring height, weight, and obtaining the age of respondents. The height and weight of respondents were measured by using a digital height and weight measuring scale. The interview was completed through the locally appropriate Bengali language.

### *Nutritional status*

The nutritional status of the participants was measured by using two anthropometric indices, known as BMI-for age z-score (BAZ) and Height-for-age z-score (HAZ). Whereas, the participant with BAZ,  $<-2SD$  were considered to be "thin",  $-2SD$  to  $+2SD$ ,  $>+2SD$ , and  $>+3SD$  considered to be "healthy", "overweight", and "obese" respectively. On the other hand, HAZ,  $<-2SD$

was classified as "stunted" according to the WHO reference.

### *Individual Dietary Diversity Scores*

Individual Dietary Diversity Scores (IDDS) were calculated based on the Food and Agricultural Organization (FAO) of the United Nations guideline 2011. Data were collected based on 9 food groups. Value "one" was given for having the foods of a particular food group in the last 24 hours and "zero" for not having the food. Therefore, the sum of IDDS was categorized into three categories: low (score 0-3), medium (score 4-5) and high (score 6-9) (23).

### *Food insecurity measurement*

To assess food insecurity among study participants, Household Food Insecurity Access Scale (HFIAS) version 3 was applied. The first question of the scale is known as an occurrence question, and the remaining type is called the frequency of occurrence question. There were nine questions on the HFIAS scale, and each question was asked with a recall period of the last four weeks. The total score range among the respondents was 0-27 which was categorized into four categories (1= Food secure, 2= Mildly food insecure, 3= Moderately food insecure, 4= Severely food insecure) by following the indicated guideline (24).

### *Data processing and analysis*

The data of this study was accumulated and analyzed by using the Statistical Package for Social Science (SPSS) version 23. A chi-square test was performed to determine the association between different categorical variables. Descriptive statistics considered to represent frequency, percentage, mean, and standard deviation. Anthropometric data were analyzed by using WHO Anthro plus Software (Version 1.0.4). Microsoft Excel was used to calculate dietary diversity and food security scores. Zotero was used to create the style of references required for submission to the journal.

### *Ethical consideration*

This study was approved by the Department of Public Health Nutrition, Primeasia University, Dhaka, Bangladesh. Permission was taken in writing from the head of each school. In addition, each participant was aware of the aim of the study, and the written consent was taken from parents or guardian before obtaining information.

## Results

A total number of 422 adolescent girls aged between 12 and 16 years participated in this study.

Table 1: **Socio-demographic characteristics of the adolescent girls in rural Bangladesh in 2019.**

Variables name	Category	Frequency n= (422)	Percentage (%)
Age (years)	12	14	3.3%
	13	53	12.6%
	14	127	30.1%
	15	151	35.8%
	16	77	18.2%
Current level of education (class)	Seven	59	14%
	Eight	138	32.7%
	Nine	155	36.7%
	Ten	70	16.6%
Family size	Small (1-3 members)	27	6.4%
	Medium(4-7 members)	352	83.4%
	Large(>7 members)	43	10.2%
Family Type	Nuclear	336	79.6%
	Joint	86	20.4%
Fathers Education	Graduate & above	11	2.6%
	Secondary & Higher Secondary	92	21.8%
	Below Secondary level	165	39.1%
	Illiterate	154	36.5%
Mothers Education	Graduate & above	5	1.2%
	Secondary & Higher Secondary	103	24.4%
	Below Secondary level	197	46.7%
	Illiterate	117	27.6%
Occupation of father	Jobless	13	3.1%
	Farmer and daily labor	100	23.7%
	Business	152	36.0%
	Service holder	112	26.5%
	Others	45	10.7%
Occupation of mother	House wife	352	83.4%
	Service holder	39	9.2%
	Business	14	3.3%
	Others	17	4.0%
Monthly income (1 USD=85 BDT Approximately)	<10000 Bangladeshi taka (BDT)	143	33.9%
	10000-29000 BDT	195	46.2%
	≥30000 BDT	84	19.9%
Earning member	Single person	259	61.4%
	Two persons	124	29.4%
	More than two persons	39	9.2%

Table 1 represents the highest number of study participants were in the 15-year age group. On the other hand, only 3.3% of the respondents were 12 years old, which is the lowest percentage compared to different age groups. The table shows 12.6%, 30.1%, and 18.2% of the girls were from 13, 14, and 16 years of age respectively. 36.7% of the contributors were in class nine and 14% of the girls were in grade seven. Most of the families (83.4%) belonged to medium size family with 4-7 members. Study states, about 79.6% of the study subjects were from nuclear families. A poor percentage of the fathers completed their education at the graduate level (2.6%). It has been observed that

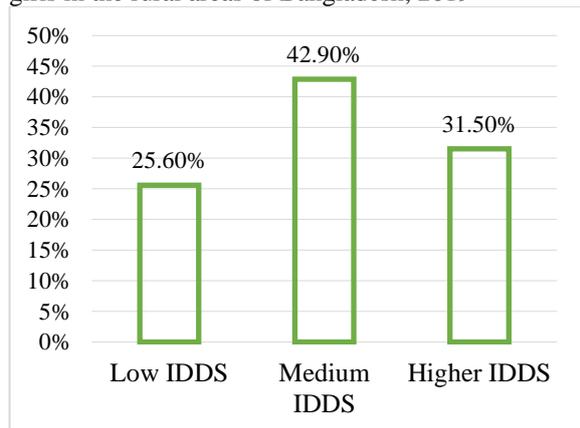
illiteracy was higher among fathers (36.5%) of the respondents compared to the mothers (27.6%). The current study also revealed, 36% of the fathers were engaged in business. In contrast, 83.4% of the mothers were occupied as a housewife. A family income below 10000 BDT per month was found 33.9%. Moreover, 46.2 % of the family earned 10000-29000 BDT per month. Income more than 29000 BDT in each month was found around 19.9%. About 61.4 % of the household had a single earning member. However, 29.4% and 9.2% of the families had two and more than two earners respectively.

**Table 2: Association of nutritional status of adolescent girls of rural Bangladesh with different factors, 2019**

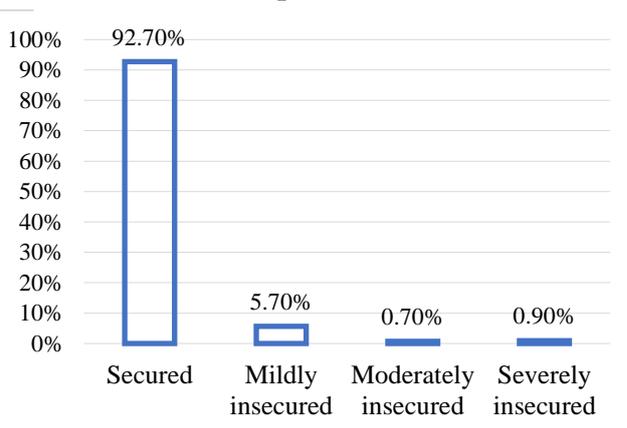
		Underweight/Stunting		Healthy		Overweight/tall		Obese		p=value
		n	%	n	%	n	%	n	%	
BMI-for-age z score (n=422)	Total	40	9.5	308	73	56	13.2	18	4.3	.707
	12 years	0	0	10	2.4	3	.7	1	.2	
	13 years	5	1.2	34	8.1	11	2.6	3	.7	
	14 years	12	2.8	94	22.3	17	4	4	.9	
	15 years	15	3.6	110	26.1	20	4.7	6	1.4	
	16 years	8	1.9	60	14.2	5	1.2	4	.9	
Mothers Education (n=422)	Illiterate	9	2.1	94	22.3	12	2.8	2	.5	.005
	Below Secondary level	28	6.6	139	32.9	21	5	9	2.1	
	Secondary & Higher Secondary	3	.7	72	17.1	22	5.2	6	1.4	
	Graduate & above	0	0	3	.7	1	.2	1	.2	
Fathers education (n=422)	Illiterate	15	3.6	121	28.7	13	3.1	5	1.2	.268
	Below Secondary level	13	3.1	118	28.0	25	5.9	9	2.1	
	Secondary & Higher Secondary	12	2.8	62	14.7	15	3.6	3	.7	
	Graduate & above	0	0	7	1.7	3	.7	1	.2	
Height-for-age z score (n=422)	Total	51	12.1	364	86.3	7	1.6	.037		
	12 years	0	0	14	3.3	0	0			
	13 years	2	.5	50	11.8	1	.2			
	14 years	7	1.7	117	27.7	3	.7			
	15 years	28	6.6	121	28.7	2	.4			
	16 years	14	3.3	62	14.7	1	.2			

Table 2 indicated that 73% of the adolescents were healthy according to BMI-for-age z score, and 86.3% of the participants were healthy based on the Height-for-age z score. Result shows, 9.5%, 13.2%, and 4.3% of the respondents were underweight, overweight, and obese, respectively. Stunting was found 12.1% among the interviewees. Remarkably, both underweight and

stunting were higher among the respondents who were 15 years old. In addition, the height-for-age z score was associated with the age of adolescent's ( $p=.037$ ). Moreover, Mother's ( $p=.005$ ) education was correlated with the BMI for z score of adolescent girls.

**Figure 1: Dietary Diversity Score of 12-16 year girls in the rural areas of Bangladesh, 2019**

Food security and Individual dietary diversity score were calculated to measure the food adequacy and nutrient intake of the targeted population. It was discovered that 31.5% of the adolescent girls had higher individual dietary diversity scores. Low and medium IDDS was 25.6% and 42.9% respectively (Figure 1). Figure 2 represents that 92.7% of the girls were "food secured" and the remaining portion had a different level of food insecurity.

**Figure 2: Food security among adolescent girls in the rural area of Bangladesh, 2019**

## Discussion

Bangladesh is one of the world's least developed countries and the nutritional status of the citizens of the country is improving as the country's socio-economic status improves (20). The prevalence of underweight and stunting were found to be 9.5% and 12.1% correspondingly in the current study. However, underweight was found in 38.6 percent of South Asian adolescents and 11.1% were too short according to their

age (25). An Indian rural study showed the frequency of underweight and stunting was 36.54% and 48.37% respectively (26) which is almost three times more likely than the present study. This may be due to differences in socio-economic status, feeding practices, study time gaps and sample size. Malnutrition among adolescents was prevalent at age 15 in this sample. Although a study on adolescents was found to have low BMI among adolescents at the age of 11 (27).

According to the current study, around 27% of adolescent girls face a double burden of nutrition (9.5 percent are underweight, 13.2 percent, and 4.3 percent in overweight and obese). Nevertheless, the proportions of underweight and overweight people found in this study were significantly lower than comparable studies. (21, 28, 29). The nutritional status of adolescent girls was shown to be highly associated with the education of their mothers. In a prior study, however, parents' educational and occupational status were found to be related to the nutritional status of youths (21).

Individual dietary diversity scores were found to be satisfactory compared to the similar study in neighbor country (12). A former study in Bangladesh showed that extreme food insecurity was 14.2% of the household (30). In the present study, half of the prior study was found to have food insecurity. This may be a positive outcome, as Bangladesh has recently achieved self-sufficiency in staple foods as a result of its rapid growth in production. (31, 32).

The aim of this study was to determine the prevalence of household food insecurity, malnutrition, and IDDS among adolescents in rural Bangladesh, as well as the factors that contribute to these conditions. However, this article was unable to recognize all aspects of household food insecurity and IDDS that influence adolescents' nutritional status. This is because of the cross sectional study's intent, design, and considered variables.

### Conclusion

Besides undernutrition, there was also a significant percentage of overweight and obese which is quite substantial in terms of the double burden of nutrition. The consumption rate was not adequate for higher diversified foods. To attain an optimal nutritional level, it is essential to ensure diversified food availability in rural settings. Proper nutrition education at the primary and secondary levels of education will enable teens to have sufficient nutritious foods. A school-feeding scheme should be implemented among this age group to eradicate under-nutrition. Particular attention needs to be given to the most vulnerable groups, including children and adolescents, from the urban area's most inferior socio-economic group. Often, when planning various projects at the community level, mothers should be given priority as they keep themselves aware of adolescent girls' needs. In view of this report's findings, it is proposed that a holistic policy should be introduced in our country's vulnerable groups to avoid the undernourishment of adolescent girls. In the future, longitudinal research on the country representative adolescent girls in rural sectors will be planned to identify the factors responsible for this issue, which will

help introduce and execute effective strategies to improve the community.

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