Nutritional Status, Associated Factors and Dietary Pattern of School Going Adolescent Girls in Rural Bangladesh

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Abstract: *Adolescence is a transitional period of growth and development between childhood and adulthood. The aim of this research was to assess the prevalence of stunting and thinness to identify the factors those are associated with stunting and thinness of school going adolescent girls in a rural area of Bangladesh. A cross-sectional sample survey was carried out among the adolescent girls of Bashbunia Bagum Meherunnessa Girl's High School, Dumki, Patuakhali. A total no. of 125 adolescent girls was selected by random sampling method. In this study stunting was 20% and thinness was 13.6%. Stunting and thinness occur mainly due to low family income, chronic disease and lack of knowledge about the need of extra nutrients during this period. Adolescent girls whose monthly family income <5000 BDT were 7.20 times more likely to be stunted as compared to those whose monthly family income were >10000 BDT. Girls with irregular menstrual cycle were 2.33 times more likely to be stunted as compared to their counterpart. Adolescent girls having chronic disease were 2.06 times more likely to become thinner as compared to those who had no chronic disease. About 33.6% girls did not take milk at all in their diet. Fruits were consumed by nearly half of the girls at least 4 days in a week. However, acute (thinness) and chronic (stunting) malnutrition can be overcomed by providing stipend by emphasizing health care services and by implementing school based nutrition program focusing on nutritional knowledge, attitude and practices.*

Keywords: Adolescent, Nutritional Status, Stunting, Thinness, Malnutrition, Dietary Intake

1. Introduction

Adolescence is the second period of rapid growth and development of a human being. According to World Health Organization (WHO) people aged between 10 to 19 years are adolescents [1]. They represent approximately 20% of the world's population and most of them (~84%) are living in developing or emerging countries [2]. It is estimated that about 22.5% of the total population of Bangladesh is adolescent, in which 11% are female [3].

In most developing countries, nutrition initiatives have been focusing on children and women, thus neglecting adolescents [4]. Research shows that the prevalence of stunting in adolescence is 36% in Bangladesh, 32% in India and 47% in Nepal, and the prevalence of thinness is 53% in India, 50% in Bangladesh and 36% in Nepal [5]. Kurz KM reported that some factors are associated with under nutrition in developing countries such as: poor household economic condition, periodic food-shortage, child labor, the burden of disease, poor knowledge about long-term consequences of under nutrition in adolescent period, insufficient amount of food both in quantity and quality, and inadequate access to health and nutrition services [6]. Research also shows that in Bangladesh, low family income, lack of education and periodic food-shortage were associated with inadequate dietary intake which might have led to under nutrition [7]. The average energy intake by rural adolescent girls in Bangladesh is 81% of the recommended dietary allowance (RDA) for age [8]. Bangladesh is one of the world's most densely populated country facing major health and economic challenges. The rate of malnutrition in Bangladesh is very high among the world [9]. Chronic energy deficiency, protein energy malnutrition, low birth weight, micronutrient deficiency, maternal mortality etc. are the major nutritional problems in Bangladesh. Although malnutrition affects people of any ages, but the children, adolescent girls, pregnant and lactating mothers are most vulnerable to it [10].

Higher amount of macro and micro nutrients are required to meet the sudden growth of adolescence. In fact the need of nutrients during this period is higher than any other time in their life cycle. A strong relationship lies between nutrition and growth. Both physical and mental growth depends on proper nutrition. Optimum nutrition is very important pre-requisite to achieve full growth potential. Research shows that adolescents gain up to 50 % of their adult weight, more than 20 % of their adult height, and 50 % of their adult skeletal mass during these years [11]. Melaku and his colleagues reported that if adolescent's nutritional needs are not met, they have a high risk of mortality as a result of pregnancy and childbirth and they are more likely to give birth to low birth weight infants [2].

World Health Organization (WHO) currently recommends using BMI-for-age and height-for-age to assess the nutritional status of adolescents. The WHO growth standard for adolescents also uses thinness (low body-mass-index (BMI)-for-age (BAZ)) and stunting (low height-for-age (HAZ)) [12]. Melaku reported that, the main difference between these two indicators is that the former is a result of mainly acute (short term) nutrient deficiency (specifically macronutrients) whereas the later shows chronic (long-term) deficiency [2]. Previously different studies have used these

standards to evaluate the nutritional status of adolescents and to compare the prevalence of thinness and stunting in different settings [2], [13]–[16].

However, the published data of Bangladeshi school going adolescent girls is a few in both urban and rural areas. This study is therefore helpful to evaluate the nutritional status of school going adolescent girls, according to World Health Organization (WHO) reference [12] based on dietary intake and anthropometric measurements.

The main aim and objectives of this study was, to assess the prevalence of stunting and thinness among selected school adolescent girls, to identify the factors those are associated with stunting and thinness and to observe their dietary pattern.

2. Research Methodology

2.1 Place and Type of Study

A cross sectional sample survey was carried out in Bashbunia Bagum Meherunnessa Girl's High School.

2.2 Basis for selection of study place

- Well communicated.
- Assurance from the school authority for full co-operation.

2.3 Study population and sample size:

The study population was the students of class six to ten. We have selected 25 students from each class randomly. So our total sample size (N) was 125.

2.4 Study Variables

2.4.1 Dependent variables: The dependent variables in this study are Stunting and Thinness.
2.4.2 Independent variables: Socio-economic, demographic, health and household characteristics are the independent variables in this study.

2.5 Research Instruments

2.5.1 Development of the questionnaire
A questionnaire was developed having both open and close ended questions to obtain information related to socio-economic, demographic, health, household characteristics and dietary pattern.

2.5.2 Data collection
Data was collected by interviewing the respondents. Questions were asked passively and carefully without influencing them and answers were recorded in the respective place of the questionnaire.

2.5.3 Pilot survey
A pilot survey was done to find out practical problems and to solve these limitations by modifying questionnaire, methodology and improving data collection techniques.

2.5.4 Measurement
Age: Age of each participant was calculated from their date of birth. Which was obtained from the register book of the school.

Height: Height was marked on a wall in the school, then it was recorded to the nearest 0.1 cm with the help of a measuring tape.

Weight: Weight was measured using calibrated digital weight scales in standing position with barefoot. Weight was recorded to the nearest 0.1 kg.

2.5.5 Dietary Information
To assess the habitual dietary pattern a seven-days food frequency questionnaire was used.

2.6 Data Verification

Questionnaire was checked after completion of each interview. After finishing of all data collection informations were re-checked and entered into the computer very carefully. The data was edited if there was any discrepancy (doubt entry, wrong entry).

2.7 Statistical Analysis

Anthropometric measurements were converted to height-for-age z-scores (HAZ) and BMI-for-age z-scores (BAZ) by using WHO Anthro Plus software (v 1.0.4). The nutritional status of the study subjects were classified as stunted (HAZ < −2SD) and thin (BAZ < −2 SD) [12]. IBM SPSS (Statistical Package for Social Science) software (V23.64 bit) was used for the statistical analysis of all data. For tabular charts and graphical representation Microsoft Word and Microsoft Excel were used.

3. Results and Analysis

125 school adolescent girls of 10-17 years were interviewed. The mean (± SD) age of study subjects were 12.94 (±1.35) years. In which majority of the girls were Muslim 116 (92.8%). The predominant educational status of their parents were primary level, i.e. for mothers 51 (40.8%) and for fathers 48 (38.4%). Most of the fathers were day labor 41 (32.8%) whereas most of the mothers were housewife 116 (92.8%). Majority of the students 67 (53.6%) come from 5-6 members family (Table-1).

Table 1: Frequency distribution of demographic and socio-economic characteristics of school adolescent girls in Bashbunia Bagum Meherunnessa Girl's High School.
(n=125)

Variables	Category	Frequency	Percent
Age	10-13	82	65.6
	14-17	43	34.4
Religion	Muslim	116	92.8
	Hindu	9	7.2
Educational status of father	Illiterate	6	4.8
	Read and write	19	15.2
	Primary level	48	38.4
	Secondary level	43	34.4
	Higher secondary and	9	7.2

	above		
Occupation of father	Farmer	27	21.6
	Day labor	41	32.8
	Employee	8	6.4
	Business	17	13.6
	Other	32	25.6
Educational status of mother	Illiterate	7	5.6
	Read and write	20	16
	Primary level	51	40.8
	Secondary level	41	32.8
	Higher secondary and above	6	4.8
Occupation of mother	Housewife	116	92.8
	Employee	1	0.8
	Day labor	3	2.4
	Other	5	4
Family size	≤ 4	33	26.4
	5-6	67	53.6
	> 6	25	20
Monthly family income (BDT)	≤ 5000	2	1.6
	5001-10000	82	65.6
	>10000	41	32.8

Factors		Thinness		AOR 95% CI	p value
		Yes	No		
Monthly family income (BDT)	<5000	1	1	4.857 [.270-87.284]	0.001
	5001-10000	9	73	0.599 [.206-1.743]	0.000
	>10000	7	34	1	
Total family member	<4	5	28	1.317 [.395-4.392]	0.001
	5-6	8	59	1	
	>6	4	21	1.405 [.383-5.152]	0.000
Presence of any chronic disease	Yes	4	14	2.066 [.590-7.236]	0.000
	No	13	94	1	
Knowledge about need of extra nutrients	Yes	11	80	1	
	No	6	28	1.558 [.527-4.607]	0.000
Onset of menstruation	Yes	9	88	1	
	No	8	20	3.911[1.343-11.391]	0.000
Status of menstrual cycle	Regular	6	72	1	
	Irregular	3	16	2.250 [.508-9.964]	0.000

Table-2 represents the percent distribution of health and household characteristics that affects the nutritional status of school going adolescent girls. About 91 (72.8%) girls had knowledge about the importance of extra nutrients during the adolescence period. Menstrual cycle started for 97 (77.6%) girls, among them 78 (80.4%) had regular cycle. Nearly half of the respondent 49 (50.5%) used sanitary pad and 94 (75.2%) reported that they have sanitary latrine at home. Tube well was the common source of drinking water for 125 (100%) all girls. Of the respondent 18 (14.4%) had chronic disease.

Table 2: Frequency distribution of adolescent girl's health and household characteristics (n=125)

Variables	Category	Frequency	Percent
Presence of any chronic disease	Yes	18	14.4
	No	107	85.6
Knowledge about need of extra nutrients during adolescence period	Yes	91	72.8
	No	34	27.2
No. of feedings per day	1-2 times	17	13.6
	3 times	104	83.2
	4/4+ times	4	3.2
Onset of menstruation	Yes	97	77.6
	No	28	22.4
Status of menstrual cycle	Regular	78	80.4
	Irregular	19	19.6
Materials used during menstruation	Sanitary pad	49	50.5
	Reusable cloths	48	49.5
Availability of sanitary latrine	Yes	94	75.2
	No	31	24.8
Source of drinking water	Tube well	125	100

Table 3: Prevalence of stunting and thinness among the adolescent girls

	Frequency	Percent		Frequency	Percent
Stunted	25	20	Thinness	17	13.6
Not Stunted	100	80	No Thinness	108	86.4
Total	125	100	Total	125	100

The overall prevalence of stunting, height-for-age Z Scores <−2 SD among school adolescent girls were 25 (20%) while the prevalence of thinness, low body mass index-for-age Z score <−2SD were 17 (13.6%) (Table-3). Table 4 illustrate the factors associated with stunting of adolescent girls. Stunting, height-for-age Z scores <−2SD was significantly associated with monthly family income & onset of menstruation of adolescent girls. Adolescent girls whose monthly family income was <5000 BDT were 7.2 (AOR=7.2, 95% CI: 0.386-134.219) times and whose monthly family income was 5001-10000 BDT were 2.02 (AOR=2.025, 95% CI: 0.693-5.913) times more likely to be stunted as compared to those whose monthly family income was >10000 BDT. Adolescent girls who did not begin menstruation were 5.31 (AOR=5.312, 95% CI: 2.030-13.903) times more vulnerable to be stunted as compared to those began their menstruation.

Table 4: Factors affecting stunting of adolescent girls

Factors		Stunted		AOR 95% CI	p value
		Yes	No		
Educational status of mother	Illiterate	2	5	2.000[.134-29.808]	1.000
	Read and write	7	13	2.692 [.261-27.821]	0.069
	Primary level	10	41	1.220 [.128-11.635]	0.000
	Secondary level	4	37	.541 [.050-5.852]	0.000
	Higher secondary and above	1	5	1	
Monthly family income (BDT)	<5000	1	1	7.200 [.386-134.219]	0.000
	5001-10000	18	64	2.025 [.693-5.913]	0.006
	>10000	5	36	1	
Knowledge about need of extra nutrients	Yes	15	76	1	
	No	9	25	1.824 [.711-4.678]	0.000
Onset of menstruation	Yes	12	85	1	
	No	12	16	5.312 [2.030-13.903]	0.000
Status of menstrual cycle	Regular	8	70	1	
	Irregular	4	15	2.333 [.621-8.765]	0.000

Table 5. Factors associated with thinness of adolescent girls. Thinness, low body mass index-for-age Z scores <−2SD was significantly associated with the presence of any chronic disease, knowledge about need of extra nutrients during adolescent period and status of menstruation of adolescent girls. Adolescent girls who had any chronic disease were 2.06 (AOR=2.066, 95% CI: 0.590-7.236) times more likely to become thinner as compared to those who hadn't. Adolescent girls who had no knowledge about the need of extra nutrients during adolescence period were 1.55 (AOR=1.558, 95% CI: 0.527-4.607) times more likely to become thinner as compared to their counterpart. Adolescent girls with irregular menstrual cycle were 2.25 (AOR=2.250, 95% CI: 0.508-9.964) times more likely to become thinner as compared to those whose menstrual cycle were regular (Table-5).

Table 6: Weekly dietary pattern of adolescent girls on selected food items

Food items	Frequency of consumption, days per week				Mean days
	0 (%)	1-3 (%)	4-5 (%)	6-7 (%)	
Egg	11.2	63.2	23.2	2.4	2.68
Milk	33.6	40.8	18.4	7.2	2.08
Meat	13.6	80.8	5.6	0	1.72
Fish	0.8	22.4	46.4	30.4	4.69
Green leafy vegetables	0.8	36	45.6	17.6	3.99
Fruits	0	26.4	48	25.6	4.54

Table-6 shows the weekly dietary pattern of adolescent girls on selected food items. Consumption of Rice as the main source of energy was universal to all respondents (data not shown in the table). But the consumption of other food items was not frequent among the girls. The average days of consumption in a week 2.68 for egg, 2.08 for milk, 1.72 for meat, 4.69 for fish, 3.99 for green leafy vegetables and 4.54 for fruits. It also shows that about 33.6% girls did not eat milk at all, whereas nearly half of the girls consumed fish, green leafy vegetables and fruits at least 4-5 days in a week.

4. Discussion

Our current study found that the prevalence of stunting, was 20%. This findings is relatively lower with the other study done in rural Bangladesh (32%) [7]. It also lower than the findings of another previous study done in Bangladesh (36%) [5]. This difference may be due to the gap of study time and small sample size. However this prevalence is higher than the findings of previous study done among garo adolescent in sherpur district, Bangladesh (15.1%) [17], this findings is relatively similar with the study done in southeast Ethiopia (20.9%) [18]. Similarly, it is also lower than the prevalence reported from rural community Bangladesh (48%) [19], Nigeria (57.8%) [20], Ethiopia (26.5%) [21] and West Bengal India (37.8%) [22].

This study reveals that the prevalence of thinness was 13.6%. This findings is lower than the study done in rural Bangladesh (26%) [7], another study in Bangladesh (50%) [5] and Ehiopia (58.3%) [21]. This findings is relatively similar with the study done in Agarfa Ethiopia (13.6%) [23], hyryana India (13.7%) [24], West Bengal India (14.7%) [22]. Similarly it also higher than the prevalence reported

from southeast Ethiopia (11.9%) [18]. This difference may be due to the differences in socio economic status, culture, feeding practices, study time gap etc.

In the present study monthly family income was important socio-economic factor which showed a significant relationship with stunting. Adolescent girls whose family monthly income was <5000 BDT were 7.2 (AOR=7.2, 95% CI: 0.386-134.219) and whose family monthly income was 5001-10000 BDT were 2.02 (AOR=2.025, 95% CI: 0.693-5.913) times more likely to be stunted as compared to those whose monthly family income was >10000 BDT. This can be explained as poor family are not able to provide adequate food and health services to their girls which ultimately affect their nutritional status.

Our current study found that status of menstrual cycle also had the significant relationship with stunting of adolescent girls. Adolescent girls with irregular menstrual cycle were 2.33 (AOR=2.333, 95% CI: 0.621-8.765) times more likely to be stunted as compared to their counterpart. The findings of the study is supported by the study done in southeast Ethiopia [18]. This result can be explained as malnourished adolescent girl's menstruation cycle is irregular due to the presence of any chronic malnutrition as they were stunted.

The study shows that a significant relationship lies between adolescent girl's knowledge about need of extra nutrients during this period and thinness. The girls who had no knowledge about it were 1.55 (AOR=1.558, 95% CI: 0.527-4.607) times more likely to become thinner as compared to their counterpart. This might be explained as due to their ignorance. They didn't take sufficient amount of nutritious food as a result they become thinner.

This study found that the presence of any chronic disease had a significant relationship with the thinness. Adolescent girls who had any chronic disease were 2.06 (AOR=2.066, 95% CI: 0.590-7.236) times more likely to become thinner as compared to those who hadn't. This may be explained by the fact that chronic disease affect their metabolism and they become malnourished.

This study also found that, rice was the main energy source of the girls. It also shows that about 33.6% girls did not take milk at all, whereas nearly half of the girls consumed fish and fruits at least 4-5 days in a week. The findings of the study is comparable with the study conducted in rural Bangladesh [7].

The major limitation of our study was, it based on only anthropometric measurement to assess the nutritional status of adolescent girls rather than other methods.

5. Conclusion

The overall prevalence of stunting and thinness among adolescent girls is high in the study area. Stunting and thinness occur mainly due to their low family income, suffering from chronic disease, lack of adequate knowledge about the need of extra nutrients during this period. Emphasis should be given to the nutritional knowledge, attitude and practices based education sessions for

adolescent girls to prevent higher prevalence of malnutrition. To overcome acute (thinness) and chronic (stunted) malnutrition. School based nutrition program is highly recommended by several governmental organizations and NGO. By improving health care services chronic disease can be reduced and controlled by providing stipend, adolescent girl's family income may be increased.

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