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Research Article

Nutritional Status of Adolescent Boys and Girls at Hatiya Island in Bangladesh

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ABSTRACT

The primary aim of the study was to assess the nutritional status of adolescents at rural area of Hatiya Island under Noakhali district, Bangladesh. An institutional based cross sectional study was carried out in the study. Three hundred and fifty eight adolescents comprising 188 boys and 170 girls from three High school of Hatiya Island participated in this study. A pre-prepared questionnaire was used to find out the association among various factors with nutritional status. Percentile of Body Mass Index (BMI) for age, Z score of BMI for age, Height for age and BMI classification for Asian population were used to analyze the nutritional status of adolescents. The mean BMI of study population was 18.30±2.35kg/m^2. Taking percentile classification of BMI for age into account, 19.8% were found thin, 77.1% normal, 2.5% overweight and 0.6% obese. In Z score classification of BMI for age, 12.3% were found thin, 27.1% mild thin, 57.5% normal, 2.58% overweight and 0.3% obese. We also found 58.7% underweight, 37.4% normal, 3.9% overweight in case of World Health Organization (WHO) BMI classification for Asian population. Moreover, the present study found 11.2% stunted adolescents in the island. No significant difference ($p>0.05$) was observed between BMI percentile and other associated factors except for mother's occupation. Different criteria of BMI demonstrated the level of undernutrition at different levels. Overall, the adolescents in that island are were found to be at risk of malnutrition. Hence, nutritional awareness programme need to be designed and implemented in the study area to improve the situation.

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1. Introduction

Adolescence, the period between 10-19 years of age, is one of the most pivotal stages of life for all human being. The transition from childhood to adulthood can cause major physiological, psychological and other body changes. Adolescent's health depends on several factors including age, gender, knowledge, families, physical and biological environment, social values and

norms etc. (WHO, 2014). Sex, age and fathers' occupation have substantial effect on nutritional status (Bidu *et al.*, 2016). A study showed that adolescent girls from low income families possess low nutritional status both in rural and urban areas (Akhter and Sondhya, 2013). Mother's literacy and professional status also have a considerable impact on the nutritional status of adolescent school children (Selvaraj *et al.,* 2016). Therefore, proper care given during adolescent period can help building a healthy and dynamic community.

Nutrition plays the crucial role for the advancement of human life. Unfortunately, most of the adolescent boys and girls especially from rural areas in Bangladesh are greatly suffering from chronic malnutrition. Due to rapid growth in adolescent period, they must satisfy the additional nutritional demands. Undernutrition is more prevalent in Bangladesh due to inadequate intake of nutrient rich foods. Anemia becomes the major health issue among adolescent girls. Factors regarding reproduction also making up girls adolescents more vulnerable than boys (Senderowitz, 1995). About 31 percent of married adolescents women were reported underweight (MOHFW, 2017). Moreover, the height of adolescent girls in Bangladesh is far less than the normal range. About 72 percent of adolescent girls were short while the expected rate is below 16% for a well-nourished population (NNS, 2015). Deficiencies of iron, calcium, vitamin A and vitamin C has also been reported in several studies in India and Bangladesh (WHO, 2006). Similarly, prevalence of obesity and overweight is also turning up alarmingly in developing countries (Biswas *et al.,* 2017).

The number of adolescent population in today's world is about 1.2 billion and more than half of all adolescents can be found in Asia region (UNICEF, 2012). In 2011, about one fifth (about 30 million) of the total population of Bangladesh including 14.4 million girls and 15.1 million boys were adolescents (Ainul *et al.*, 2017). Most of the studies conducted in Bangladesh focuses on children and pregnant women. Little attention had been given to adolescent girls and much less to adolescent boys. Moreover, the nutritional status of adolescents belongs to Island area are less considered for research study due to communication problem. That is why, the present study focuses on the nutritional status of adolescent school boys and girls living in rural area of Hatiya Island.

2. MATERIALS AND METHODS

Study place

The study was conducted at in Hatiya under an upazila of Noakhali district of under Chattogram division, Bangladesh. It has a total population of about 450,000 including 51% male and 49% female.

Study design

An institutional based cross sectional study was carried out from 22nd-28th April, 2018. Three hundred and fifty eight adolescents (13 to 17 years) studying in the 9th and 10th grade from Sukchar Union Bangabandhu High School, A. M High School and Jahazmara High School were selected for the study. A questionnaire was formulated for collecting information. Questionnaire includes information on socio-economic factors, physical activity, screen time (Time spent on television, mobile, laptop) and meal preferences.

Anthropometric measurements

Anthropometric measurements were done by using a stadiometer for height and weighing scale for weight. BMI for age (percentile) according to CDC 2000 reference value, Z score of BMI for age, Height for age according to WHO 2007 reference value and BMI for Asian population according to WHO (WHO, 2004) were used for assessing the nutritional status. The association between BMI for age (percentile) and various factors for nutritional status was also observed.

Statistical analysis

Data was analyzed by using Statistical Package for Social Science (SPSS) version 25.0. Mean value of BMI, height and weight was compared gender wise using independent sample T-test. Fisher's exact test was employed to understand the statistical significance between associated factors of nutritional status. Level of significance was set at $p<0.05$.

3. RESULTS AND DISCUSSIONS

Anthropometric measurements

About 52.5% boys and 47.5% girls participated in this study. The mean values of height and weight for boys were found higher than the mean value of girls (showed in table 1). On the other hand girls BMI is slightly greater than boys. In case of BMI, the independent sample t test showed no significant

difference ($p>0.05$) between boys and girls. However, statistical significant difference ($p<0.05$) was observed in terms of height and weight. Boys had significantly higher height and weight than girls.

Table 1: Anthropometric measurement of adolescent in three school of Hatiya Island.

Variable	Total (358)	Boys (188)	Girls (170)
BMI (kg/m^2)	18.30±2.35	18.11±2.08	18.50±2.61
Height (m)	1.58±0.08	1.62±0.08	1.53±0.05
Weight (kg)	45.63±7.68	47.73±7.57	43.30±7.12

Data are average ± standard deviation

In terms of percentile, it is apparent from the present data (Table 2) that most of the adolescents were in normal range. However, when Z score (BMI for age) was considered the prevalence of thinness (<-2SD) was observed in 12.3% of study population. More than half of total adolescents were in the normal range. Prevalence of overweight and obesity was lower among study population. On the other hand, the pervasiveness of underweight (<18.5) was observed among 58.7% of study population. About 37.4% of total adolescents were in the normal range and 3.9% adolescents were overweight. However, no obese adolescent was found when this classification was used.

Table 2: Nutritional status of adolescents using different classification of BMI.

Variable	Nutritional Status criteria	Frequency of adolescence	Percentage (%)
BMI (Kg/m^2)	<18.5/ Underweight	210	58.7
	18.5-22.9 / Normal	134	37.4
	23-27.49 / Overweight	14	3.9
	>27.5 / Obese	0	0
BMI for age (Percentile/ pctl)	<5th pctl / Thin	71	19.8
	5th-85th pctl / Normal	276	77.1
	>85th pctl / Overweight	9	2.5
	>95th pctl / Obese	2	0.6
BMI for age (Z value)	<-2 SD / Thin	44	12.3
	<-1 SD / Mild thin	97	27.1
	-1 SD to 1 SD / Normal	206	57.5
	>1 SD / Overweight	10	2.8
	>2 SD / Obese	1	0.3
Stunting	<-2 SD	40	11.2

Data obtained with different measurement scale of BMI, SD = standard deviation

BMI and associated factors

The nutritional status was almost similar between boys and girls (Table 3). About 20.2% boys and 19.4% girls were found underweight. The prevalence of thinness was found higher in 15-17 years old adolescents as compared to 13-14 years old adolescents. In terms of religion, Muslim adolescents were thinner than Hindu adolescents. Adolescents whose fathers were at least graduated were less thin than those of adolescents whose fathers were SSC pass or lower or at least HSC pass. Similarly adolescents whose mothers were graduated were seen to be less thin than those of others.

Table 3: Association between BMI for age (percentile) and Socio-demographic factors of nutritional status.

Variable	Group by variable	BMI					P value
		<5th percentile / Thin	5th – 85th percentile / Norma	>85th percentile / Overweigh	>95th percentile / Obese	Total	
Age	13-14yrs	15 (16.1%)	74 (79.6%)	3 (3.2%)	1 (1.1%)	93 (26%)	0.447
	15-17 yrs	56 (21.1%)	202 (76.2%)	6 (2.3%)	1 (0.4%)	256 (74%)	
Gender	Boys	38 (20.2%)	146 (77.7%)	3 (1.6%)	1 (0.5%)	188 (52.5%)	0.763
	Girls	33 (19.4%)	130 (76.5%)	6 (3.5%)	1 (0.6%)	170 (47.5%)	
Religion	Muslim	64 (20.5%)	238 (76.3%)	8 (2.6%)	2 (0.6%)	312 (87.2%)	0.833
	Hindu	7 (15.2%)	38 (82.6%)	1 (2.2%)	0 (0%)	46 (12.8%)	
Father's Education	SSC pass or lower	31 (18.1%)	137 (80.1%)	3 (1.8%)	0 (0%)	171 (47.8%)	0.088
	HSC pass or lower	18 (28.1%)	46 (71.9%)	0 (0%)	0 (0%)	64 (17.9%)	
	Graduate	22 (17.9%)	93 (75.6%)	6 (4.9%)	2 (1.6%)	123 (34.4%)	
Mother's Education	SSC pass or lower	50 (20.58%)	187 (77.9%)	3 (1.3%)	0 (0%)	240 (67%)	0.058
	HSC pass or lower	11 (19.3%)	43 (75.4%)	2 (3.5%)	1 (1.8%)	57 (15.9%)	
	Graduate	10 (16.4%)	46 (75.4%)	4 (6.6%)	1 (1.6%)	61 (17%)	
Mother's Occupation	Housewife	69 (21.5%)	245 (76.3%)	6 (1.9%)	1 (0.3%)	321 (89.7%)	0.004*
	Working Mother	2 (5.4%)	31 (83.8%)	3 (8.1%)	1 (2.7%)	37 (10.3%)	
Physical activity per day	<30min	6 (21.4%)	22 (78.6%)	0 (0%)	0 (0%)	28 (7.8%)	0.866
	30-60min	37 (19.9%)	141 (75.8%)	7 (3.8%)	1 (0.5%)	186 (52%)	
	>60min	28 (19.4%)	113 (78.5%)	2 (1.4%)	1 (0.7%)	144 (40.2%)	
Screen time	<30min	20 (15.5%)	105 (81.4%)	4 (3.1%)	0 (0%)	129 (36%)	0.121
	30-60min	50 (22.3%)	168 (75%)	4 (1.8%)	2 (0.9%)	224 (62.6%)	
	>60min	1 (20%)	3 (60%)	1 (20%)	0 (0%)	5 (1.4%)	
Meal preference	Protein	45 (22.5%)	149 (74.5%)	6 (3%)	0 (0%)	200 (55.9%)	0.179
	Vegetables	26 (16.5%)	127 (80.4%)	3 (1.9%)	2 (1.3%)	158 (44.1%)	

Data are frequency (percentage) of each group, * $p < 0.05$

It is noted that, no statistical significance was found in any case above. However, a statistical significant variation ($p<0.05$) was documented when mother's occupational status was considered. The thinness was less prevalent in adolescents whose mothers worked outside the house than those of adolescents whose mothers were housewife. Adolescents of working mothers were more overweight and obese shown in Table 3. In our study, no significant difference was observed in relation to nutritional status with adolescent's physical activity, screen time and meal preference. The study revealed that only 1.4% adolescents liked to watch television, computers or laptop higher than 60 minutes daily. About 62.6% adolescents liked to spend 30-60 minutes of their time on screens and 36% liked to spend less than 30 minutes. It was also obvious from our study that adolescents preferred protein than vegetables in their daily meal.

Malnutrition is a common problem in Bangladesh. Less of adequate nutritious food or sometimes excess food intake can cause malnutrition problem among population. The present study utilized three criteria of BMI to assess the nutritional status of adolescent school boys and girls. It was noted that when percentile classification was used only 19.8% adolescents were found thin or underweight (<5th percentile). However, when general BMI classification was used chronic energy deficiency (<18.5 kg/m^2) was found among 58.7% adolescent boys and girls. Similar trend was observed in the study conducted by Deshmukh et al.(2006). That report also showed an increase in underweight adolescents when BMI classification (chronic energy deficiency) was exerted. About 75.3% adolescents were found underweight (<18.5 kg/m^2) while the prevalence of thinness was found among 53.8% adolescents when percentile classification was employed (Deshmukh *et al.*, 2006). Another study carried out in rural community in Bangladesh reported 67% thinness (<5th percentile) in adolescents (Shahabuddin *et al.,* 2000). About 42.4% thinness in rural adolescents was documented in west Bengal, India (Mondal and Sen, 2012). An institutional based study carried out in Ethiopia showed only 13.68% underweight (<18.5 kg/m^2) adolescents (Mohammed and Tefera, 2015).

Stunting (<-2SD) was recorded in only 11.2% adolescents in the present study. Inadequate consumption of nutritious food during childhood could be one of the main cause of stunting (Malhotra and Passi, 2007). Selvaraj *et al.*(2016) reported 19.8% stunting (<-2SD) in semi-urban area in India. Shahabuddin *et al.* (2000) reported higher percentage (48%) of stunting (<-3SD) in rural Bangladesh. Mondal and Sen (2015) reported 46.6% stunting (<-3 SD) in rural adolescents of west Bengal, India. In Fatehabad District of Haryana, Rani and Rani (2016) found 14.5% stunted adolescents followed by 3.5% severely stunted adolescents. Another study showed 32% stunted adolescent girls in rural areas of Bangladesh (Alam *et al.,* 2010).

In our study, boys and girls both showed a similar prevalence of thinness. However, Shahabuddin *et al.* (2000) documented more thin boys (75%) than girls (59%). A study carried out by Izutsu *et al.* (2006) documented the prevalence of thinness among 43.8% boys and 30.1% girls in rural north India. Alam *et al.* (2010) reported thinness in 26% adolescent girls in rural Bangladesh. However, prevalence of overweight was found higher among girls at 3.5% than that of boys at 1.6% in the present study. Rani and Rani (2016) recorded the prevalence of overweight at 3% and 14% for boys and girls respectively in Fatehabad District of Haryana. The present study found that religion of adolescents whether they were Muslims or Hindu didn't have any effect on their nutritional status. Mohammed and Tefera (2015) also showed no significant difference between religion and nutritional status of adolescents school children.

Parent's education level has a significant relationship with the nutritional status of children (Col and Col, 2002). The present study also showed a direct accord between parent's education levels with nutritional status. However, no significant variation was observed. The present study reported lower prevalence of thinness among adolescents of graduate fathers and mothers at 17.9% and 16.4%, respectively. Similar trend was observed in the study conducted by Selvaraj *et al.* (2016) where only 12.4% adolescents of graduate mothers were found underweight. Moreover, a significant variation was observed between adolescents

of housewife mothers and working mothers. Over weight and obesity were found more pervasive among adolescents of working mothers. On the other hand, thinness was found more in adolescents whose mothers were housewife. In our study, most of the graduate mothers were employed. That might be the reason for lower prevalence of thinness among adolescent whose mothers were employed. However, Selvaraj *et al.* (2016) reported prevalence of thinness, obesity, overweight more among children of working mothers.

It is apparent from our data (Table 3) that, about 40.2% of our study population liked to spend more than 60 minutes on physical activity. About 60 minutes daily physical exercise and curtailing sedentary time is recommended for adolescents for long time health benefits (Kumar *et al.,* 2015). Doing regular exercise during adolescent period also improves overall body fitness and also important for cardiovascular health (Landry and Driscoll, 2012). Similarly, a maximum of 2 hour a day on screen is recommended for children and adolescent (Strasburger, 2013). The present study disclosed that only 1.4% of adolescents preferred to spend more than 60 minutes on screen. The reason might be shortage of electricity in the island area.

4. CONCLUSION

The study concluded that adolescent school children in the Island area are at risk of undernutrition. Most of them were suffering from chronic energy deficiency. Overweight and obesity were less prevalent. No considerable difference was observed between the nutritional status of boys and girls. Significant association did exist between mother's working status and their children's nutritional status. Nutritional programme focusing on parent's role on the health status of their children need to be designed. Similarly, government should pay special attention on school based nutrition education especially on rural island area.

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