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Assessment of nutritional status of 5-10 years Garo children in Sherpur District, Bangladesh

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Abstract

A cross-sectional study was conducted to assess the nutritional status among Garo children based on recently developed age and sex specific international body mass index (BMI) cutoff points for children and adolescents. The study subjects were selected following simple random sampling method form Jhenaigati Upazila in Sherpur District of Dhaka, Bangladesh. Data on a total of 324 children (54.01% boys and 45.99% girls) aged 5-10 years was included for the analysis. Following standard formula height and weight were measured and BMI was calculated. The overall prevalence of thinness, normal weight and overweight were 30.88%, 65.11%, and 4.01 %, respectively. The prevalence of underweight 1st degree (-1SD to -1.99SD), 2nd degree (-2SD to -2.99SD) and 3rd degree(≤-3SD) were 67.28%,14.16% and 1.59%,being 66.84%,17.15% ,0.58% for the boys and 67.75% ,11.40% ,2.01 % among the girls. The prevalence of stunting Grade I (-1SD to -1.99 SD), Grade II (-2SD to -2.99 SD) and Grade III (≤-3 SD) were 63.89%,8.95% and 1.23%, being 62.3%,9.14% ,1.14% for the boys and 63.15% ,8.72% ,2.01 % for the girls. The prevalence of grade-II and grade-III thinness were 1.02 and 1.04 times higher among girls compared to boys, whereas the prevalence of grade-I thinness was 0.91 times higher among boys compared to girls.

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Introduction

Children are the most important assets of a country because they will be tomorrow's youth and provide the human potential required for its development. Nutrition in the early years of life plays a big role in physical, mental and emotional development. Poor and inadequate nutrition may lead to malnutrition, morbidity and mortality among children. Malnourished children are more likely to grow into malnourished adults who face heightened risks of disease and death (Sommerfelt, 1998). Under-nutrition is largely due to dietary inadequacy in relation to children's needs. (National Institute of Nutrition, 2003). Children who are undernourished are less creative both physically and intellectually as adults (Gillespie S and Haddad L, 2001). Under-nutrition is coupled with more than half of all child deaths all over the World (Pelletier DL *et al,* 1995). It is highly prevalent in low and middle income countries. In Asia, the rate of under-nutrition is the highest in the world (WHO, 1999). Here one in two children is malnourished. Half of the world's malnourished children are found in only three countries, India, Bangladesh and Pakistan (V. Rattan, 1997). Age, gender and body weight largely determine the nutrient requirement of an individual. Body weights and heights of children reflect their state of health, nutrition and growth rate (Subal Das and Kaushik Bose, 2011). Weights and heights of adults represent what can be attained by an individual with normal growth (Subal Das and Kaushik Bose, 2011). Nutritional status of children can be evaluated under three broad headings, namely, clinical, biochemical and anthropometric. Choosing a suitable nutritional status measure is a complex decision based on objective data collection. For practical purposes, anthropometry is the most useful parameter for assessing the nutritional status of children (WHO, 1986). It is simple and inexpensive compared to other existing methods (FAO, 1996). The three most frequently used internationally suggested anthropometric indicators are stunting (low height-for-age), underweight (low weight-for-age) and wasting (low weight-for-height) (WHO, 1995). Stunting (ST) reflects a failure to reach linear growth potential due to sub-optimal health and/or nutritional conditions, underweight (UW) reveals low body mass relative to chronological age, which is influenced by both, a child's height and weight. ST is an indicator of chronic under nutrition, the result of prolonged food deprivation and/or disease or illness. Chronic under nutrition in childhood is linked to slower cognitive development and serious health impairments later in life that reduce the quality of life and also the economic productivity of people (Scrimshaw 1996). Alternatively, wasting (WS) is an indicator of acute under nutrition, the result of latest food scarcity or sickness. In Bangladesh there are 29 indigenous groups, among them the Garo is one of the largest indigenous communities. According to the history books, the Garo tribe entered Bangladesh in the first century. They were refugees from Mongolia and came to this region through Tibet. The Garo have stayed in Bangladesh for thousands of years. Recent estimates suggest that in total there are 97,695 Garo people. They live in the north-eastern parts of the country especially in Gagipur, Mymensingh, Netrakona, Tangail, Sherpur, Jamalpur and some in Syllet districts close to the Indian border (Rahman S. M. B., Uddin M. B., I. Hussain, 2011). The Garo tribe also has its own culture. Their dress, food habits and celebration styles can be easily distinguished from the Bengalis and other tribes.The people from the Garo tribe have different features than the original inhabitants of Bangladesh (Bengali people). Being a part of a developing country, the Garo community also suffers from poverty. Many Garo families are deprived of education. In Bangladesh most of the tribal people have their own geographically isolated life style. The objective of the present study is to evaluate the nutritional status of the Garo children aged 5-10 years of using new anthropometric indices (stunting index, underweight index and wasting index). The subjects for the present cross-sectional study were selected from Jhenaigati Upazila in Sherpur District, a hilly district of Bangladesh that has a significant number (about

16232) of tribal people and is the most populous tribal Thana among the other thanas.

Material and methods

This cross sectional study was conducted among Garo children form Jhenaigati Upazila in Sherpur District of Dhaka, Bangladesh. The study subject was selected following simple random sampling method. Samples are collected from the place of residence and schools. For the purpose of analysis, the subjects were classified into yearly intervals. A total of 326 children (54.01% boys and 45.99% girls) aged between 5 to 10 years have been investigated. Anthropometric measurements (i.e. height and weight) were performed in all subjects according to the standard procedures (Lohman *et. al,* 1988). The weight was measured by using digital scale to the nearest 0.1 kg and height was measured using anthropometer to the nearest of 0.1cm, respectively. BMI was computed using the following standard equation: BMI = Weight (kg) / height (m2). Based on the interrelationships of height, weight and age: height for age and weight for age has been calculated and accordingly their nutritional status has been determined. Nutritional status such as thinness (Cole *et.al*, 2007) and overweight (Lohman *et. al,* 1988.) was evaluated following the recently published international BMI cut-off points (Marques-Vidal *et.al*, 2008.; Jeemon *et.al*, 2009.). Those children with BMI less than the cut off value corresponding to the respective age and sex were assigned to the particular grade of thinness. Those having BMI value higher than or equal to the age and sex specific grade-I thinness value and lower than to the age and sex specific cutoff value passing through adult BMI 25kg/m² at age 18 years were considered normal. While BMI value higher than the age and sex specific cutoff value passing through adult BMI 25kg/m² at age 18 years was considered overweight. Age and sex specific new international body mass index cutoff points for the assessment of nutritional status among children are shown in Table 1.Two nutritional indices such as "weight for age z score" (WAZ), "height for age z score" (HAZ) were calculated using World Health Organization (WHO) standards (WHO, 2000). Z- Scores <-2 SD of the above indices were considered as underweight (WAZ), stunting (HAZ). Student's t-test were undertaken to test for sex differences in BMI. Proportion test were performed to test for differences in prevalence of thinness between sexes. All the analyses were done using SPSS 14.0 version.

Results and discussion

Bangladesh is the world's seventh most populous country and boasts a correspondingly high population density. Rates of malnutrition in Bangladesh are among the highest in the world. Malnutrition among children is a serious public health problem internationally, especially in developing countries like Bangladesh. Nutritional status of the present study was assessed by nutritional anthropometry which predominates over other methods of nutritional assessment (Vijayraghvan, 1987) by using the height- weight ratios i.e. weight for age and height for age. Age and sex specific new international body mass index cutoff points for the assessment of nutritional status among children are shown in Table 1. According to this reference table the details age and sex specific nutritional status of our studied subjects are presented in table 2, 3 and 4. The uses of these new cut-off points are suggested to encourage direct comparison of trends in childhood thinness and overweight/obesity worldwide. Moreover, these cut-offs provide a classification of thinness and overweight/obesity for public health purposes at the national level. In this study the overall prevalence of thinness, normal weight and overweight were 30.88%, 65.11%, and 4.01 %, respectively. The prevalence of grade-I thinness was 0.91 (OR=0.91; 95% CI: 0.39-2.08) times higher among boys compared to girls whereas the prevalence of grade-II and grade-III thinness were 1.02 (OR=1.02; 95% CI: 0.49-2.12) and 1.04 (OR=1.04; 95% CI: 0.53-2.02) times higher among girls than the boys.

Table 1. Age and sex specific new international body mass index cutoff points for the assessment of nutritional status among children.

Age	Boys					Girls				
	Thinness			Normal	Overweight	Thinness			Normal	Overweight
	III	II	I			III	II	I		
5	12.66	13.31	14.21	14.21-17.42	17.42	12.50	13.09	13.94	13.94-17.15	17.15
6	12.50	13.15	14.07	14.07-17.55	17.55	12.32	12.93	13.82	13.82-17.34	17.34
7	12.42	13.08	14.04	14.04-17.92	18.44	12.26	12.91	13.86	13.86-17.75	17.75
8	12.42	13.11	14.15	14.15-18.44	19.10	12.31	13.00	14.02	14.02-18.35	18.35
9	12.50	13.24	14.35	14.35-19.10	19.84	12.44	13.18	14.28	14.28-19.07	19.07
10	12.66	13.45	14.64	14.64-19.84	20.55	12.64	13.43	14.61	14.61-19.86	19.86

Table 2. Age and sex distribution of nutritional status of the studied subjects (BMI for Age).

Age Years	N		Thinness grade-III		Thinness grade-II		Thinness grade-I		Normal		Over weight	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
5	17	26	17.65	34.62	11.77	3.85	5.88	0	52.94	61.53	11.76	0
6	40	20	22.50	10	10.00	15	5.00	0	52.5	75	10.00	0
7	26	29	19.24	20.69	11.54	0	11.54	3.45	53.84	68.97	3.84	6.89
8	38	32	10.53	9.38	18.43	12.5	5.26	21.87	65.78	50.00	0	6.25
9	33	20	3.03	0	0	19.05	12.12	9.52	81.81	66.67	3.03	4.76
10	21	22	0	0	9.52	18.18	9.52	4.54	80.96	77.27	0	0
Total	175	149	12.57	13.42	10.28	10.73	8	7.38	64.57	65.77	4.57	3.35
Overall	324		12.86		10.39		7.63		65.11		4.01	

Prevalence of thinness

From table-2 it is seen that 7.63%, 10.39% and 12.86% of the children are suffering from chronic energy deficiency grade I, II and III respectively against 65.11% normal weighted children. Among them the percentage of boys are 8%, 10.28 % and 12.57%; whereas the girls are 7.38%, 10.73%, and 13.42% respectively. About 4.57% boys and 3.35% girls are found overweight in this study. Compared to other age groups, 9 years old boys (15.05%) and 10 years old girls (22.72 %) showed the lowest prevalence of thinness.

Prevalence of underweight

Weight for age is considered as an index of current nutritional status. It reflects the body mass, relative to chronological age and underweight (low weight for age) refers to the underlying pathological process. The percentage prevalence of weight for age according to sex and age has been shown in Tables 3.Based on the criteria of WAZ table-3 shows that, 16.97% children aged 5-10 years showed

normal (above +1SD) weight-for-age status, being 15.43% for boys and 18.84% for girls**.** In terms of underweight (WAZ below -1SD), the prevalence of underweight 1st degree (-1SD to -1.99SD), 2nd degree (-2SD to -2.99SD) and 3rd degree (≤-3SD) were 67.28%, 14.16% and 1.59%. Among them 66.84%, 17.15%, 0.58% for the boys and 67.75%, 11.40%, 2.01% for the girls. Compared to other age groups, 7 years old boys (69.23%) and 8 years old girls (71.87 %) showed the lowest prevalence of underweight. On the other hand, 8 years old boys (92.1%) and 5 years old girls (92.31 %) showed the highest prevalence of underweight. Low height for age is reflective of past nutritional and environmental conditions and indicates conditions currently being experienced by younger children in the community.

Table 3. Age and sex distribution of nutritional status of the studied subjects (Weight for age z-score).

Age Years	N		3rd Degree malnourished(severe)		2nd degree malnourished(moderate)		Ist degree malnourished(mild)		Normal	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
5	17	26	5.88	15.38	58.82	19.24	23.53	57.69	11.77	7.69
6	40	20	0	0	17.50	10	70	80	12.50	10
7	26	29	0	0	3.85	16.67	65.38	63.33	30.77	20
8	38	32	0	0	13.16	0	78.94	71.87	7.90	28.13
9	33	20	0	0	6.07	10	72.72	65	21.21	25
10	21	22	0	0	23.80	13.64	66.67	68.18	9.53	18.18
Total	175	149	0.58	2.01	17.15	11.40	66.84	67.75	15.43	18.84
Overall	324		1.59		14.16		67.28		16.97	

Table 4. Age and sex distribution of nutritional status of the studied subjects (Height for age z-score).

Age Years	N		Grade-III malnourished (severe)		Grade-II Malnourished (moderate)		Grade-I Malnourished (mild)		Normal	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
5	17	26	0	0	23.53	11.54	52.94	57.69	23.53	30.77
6	40	20	2.5	0	12.5	10	70	60	15	30
7	26	29	0	0	3.85	13.79	57.69	62.07	38.46	24.14
8	38	32	2.64	3.03	5.26	0	63.15	66.67	28.95	30.30
9	33	20	0	0	8	15	60	60	32	25
10	21	22	0	9.09	9.52	4.54	61.90	72.69	28.58	13.68
Total	175	149	1.14	2.01	9.14	8.72	62.3	63.15	27.42	26.12
Overall	324		1.23		8.95		63.89		22.84	

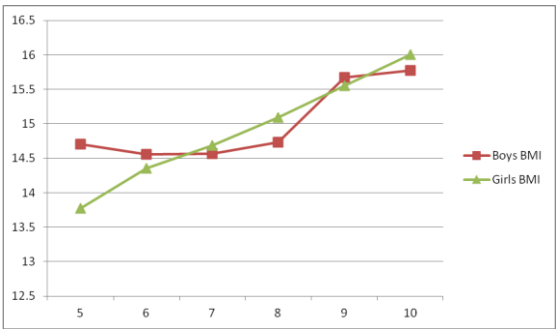

Fig. 1. Comparison of BMI by age and sex of Garo children

Prevalence of stunting

Height for age reflects the achieved linear growth and its deficits indicate long-term cumulative inadequacies of health or nutrition. Malnourished children are shorter in stature as compared to those who are brought up in better dietary care (Jelliffe, 1966; Zoppi et al., 1996). Table 4 shows results based on the criteria of HAZ. It is revealed from the data that 22.84% children aged 5-10 years showed normal (> +1SD) height for-age status, being 27.42% for boys and 26.12% for girls. Stunting is a predictor of risk and because it is strongly correlated with socio-economic status, reflects the overall development (Scrimshaw, 1964; Patwardhan, 1969; Spyckerelle et al., 1990). It is the most easily measured and predicts generalized functional impairment on a wide range of biological, behavioral and social dimensions in children (Martorell et al., 1990; Politt, 1990; Waterlow, 1992 a; Martorell et al., 1994). In terms of stunting (HAZ below -1SD), the prevalence of stunting Grade-I (-1SD to -1.99 SD), Grade-II(-2SD to -2.99 SD) and Grade-III(≤-3 SD) were 63.89%, 8.95% and 1.23% respectively, being 62.3%,9.14% ,1.14% for boys and 63.15% ,8.72% ,2.01 % for girls. Compared to other age groups, 6 years old boys (61.54%) and 5 years old girls (69.23%) showed the lowest prevalence of stunting. On the other hand, 7 years old boys (85%) and 5 years old girls (86.32 %) showed the highest prevalence of stunting. Highest percentage prevalence of Grade I (mild) stunting is shown by male children (70%) at 6 years and female children (70%) at 10 years.

Quetlet's Index, or BMI, is widely used as a measure of fatness, or the nutritional status of populations in both developed and developing countries (Khongsdier, 2001). Figure 1 presents the comparison of BMI by age and sex of the studied children. The mean BMI was significantly higher among boys and girls at the age of 10 years. The lowest BMI for age are shown at the age 7 years for boys and the 5 years for girls respectively. Improvement in the socio-economic conditions of these tribes may lead to an increase in their BMI.

Analysis of the various anthropometric nutritional indices amongst children aged between 5 to 10 years revealed the prevalence of underweight, stunted and thinness among tribal children. Most of the tribal people of our country have their own geographically isolated life style. Inadequate food habits, along with traditional socio-cultural and biological activities, may lead to a high proportion of child as well as adult under-nutrition. In general, the indirect factors such as food habits, nutrition, occupation, income level, literacy level, housing conditions, water supply, sanitation, medical facilities and awareness are found to be crucial determinants of nutritional profile of individuals and community on the whole. Prasad and Nath (1976), Vignerova et al. (1998) showed that mother's education is strongly associated with the nutritional status of children. The condition is further accentuated by the lack of awareness prevailing among majority of people regarding the type of foodstuffs required to meet the daily dietary requirements. However, it can be summarized that there are some limitations of our study such as small sample size in some age groups and inability to employ any strict sampling strategy. Consequently these results may, therefore, only be representative of a small community and not representative of the country. To obtain a broader representation, we suggest that more studies among Garo children from different parts of our country be undertaken. Other information like dietary intake, morbidity and health studies should also be collected from such tribal groups. Children with poor nutritional status enter adulthood and are

exposed to the risks of bad obstetric outcomes. Inadequate health care facilities, illiteracy and socio-economic disadvantage among tribal populations perpetuate the vicious cycle of undernutrition. Therefore, there is a need for effective implementation of valuable health and nutritional endorsement programs among the studied populations for decreasing undernutrition and overall development of tribal populations in these areas with special focus on children.

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