Nutritional Status and Food Habit of Adolescent School Girls in a Rural Area of Bangladesh

Moududur Rahman Khan*, Niger Sultana and Faruk Ahmed

Institute of Nutrition and Food Science, University of Dhaka, Dhaka-1000, Bangladesh

Abstract

A total of 136 rural adolescent school girls were examined for their nutritional status and food habit. The girls were students of classes seven to ten of two girls' high schools in a rural area of the District of Ghazipur. Anthropometric gradings were made by comparing with the NCHS median. Sixty per cent of the girls were stunted (height for age < 95%), 36% were underweight (weight for age < 75%), 32% were thin (weight for height < 90%). Analysis of blood revealed presence of anemia (Hb < 12 g/dl) in 21% of the girls. Seven percent of the girls had suboptimal serum retinol concentrations (< 30 μg/dl). Low serum iron concentration (< 60 μg/dl) was observed in 40% girls, and 57% of the girls were iron deficient (TS < 15%). Nearly all of the girls were marginally deficient in zinc and 12% were marginally deficient in copper. Seven-day food frequency analysis showed wide variation in food intake pattern. Among the foods of animal origin, fish were more common than meat. Eggs and milk did not occupy satisfactory positions in their diet. Most surprisingly, vegetables were not much common in their diet. In absence of adequate amount of meat in their diet, vegetables could be an important provider of dietary iron. It appears that there is a need to change their dietary behavior through proper nutrition education.

Key Words : Adolescent Girls, Vitamin A Deficiency, Anemia, Mineral Deficiency, Food Habit.

Introduction

Malnutrition is a persistent problem in Bangladesh[1]. Considerable effort has been made in the past decades to understand the extent and consequence of malnutrition in different population groups of the country. However, these studies mainly concerned the vulnerable groups. Little is known about the adolescent. Adolescence is a period of rapid growth. It marks an important

Bangladesh Journal of Nutrition, Vol. 13, December 2000. Institute of Nutrition and Food Science, University of Dhaka, Dhaka-1000, Bangladesh.

* *Author for Correspondence*

phase in the development of an individual in the sense that it comprises nearly half of the bodily growing period. Particularly in girls, this is the period when physiological preparation for motherhood takes place[2]. This is a stage in the life of the girls at which consequence of nutrient lack may be far reaching. It is clear that pre-pregnancy nutritional state of the mother affects intrauterine growth and birth weight of the child she bears. An adolescent girl of today will shortly become a mother and her growth during adolescence will in part mark her ability to carry successful pregnancy, and thereby determine the quality of the coming generations. Any interventions designed to have a long term effect on health of a population have to include a focus on adolescent girls[3]. Despite all these facts, little interest has been shown in the nutritional status of the adolescent girls. Few published reports that dealt with adolescence nutrition were carried out in the urban girls[4,5]. This paper reports nutritional status and food habit of a selected group of rural adolescent school girls.

Materials and Methods

Subjects

One hundred and thirty six girls attending classes seven, eight, nine and ten were selected from two girls' high schools in the Kaliganj thana in the District of Ghazipur.

Collection of Data

Family income was reported by the parents of the subjects. Other socio-economic and dietary information was collected on a form by interviewing the subjects.

Anthropometry

Crude bare foot body weight with the school uniform on was recorded to the nearest 0.1kg on a lever balance (Detecto-Medic, Detecto Scales Inc., Brooklyn, N.Y., U.S.A.). The crude weight was corrected for the weight of clothing by subtracting average weight (0.5 kg) of the school uniform. Bare foot standing height was measured to the nearest 0.1 cm with a metal scale (Detecto-Medic)

Analysis of Blood

Five millilitres of venous blood were collected. An aliquot of 0.5 ml was transferred in a heparinized tube for estimation of hemoglobin. The rest was

taken in an acid washed glass centrifuge tube, which was immediately wrapped in aluminum foil. Serum was separated after 2h at room temperature by centrifugation and stored at -20°C until further use. Hemoglobin was assayed by cayanmethemoglobin method, using commercial kit (Boehringer Mannheim, Germany). Serum vitamin A was estimated by modified method of Bieri *et al.*[6] by high performance liquid chromatography. Serum zinc and copper were estimated by atomic absorption spectrometry[7].

Results

Age of the participants is presented in Table 1 most of the girls were 13 to 15 years old, being 54% of the total, 26% were 16 and 17 year old, and 11 and 12 year olds comprised the smallest age group accounting for 19% of the total.

Table 1. Characteristics of the subjects*

Characteristic	Percentage
Age (year)	
11-12	19.1 (26)
13-14	54.4 (74)
16-17	26.5 (36)
Family income (tk per month)	
Less than 3000	53.2 (41)
3001-6000	27.3 (21)
More than 6000	19.5 (15)
Father's education	
Illiterate	9.1 (12)
Primary	39.8 (54)
Secondary	30.7 (47)
University graduation	20.5 (28)
Mother's education	
Illiterate	13.5 (18)
Primary	58.4 (79)
Secondary	30.7 (31)
University graduation	5.6 (8)
Type of house	
Brick built	77.8 (7)
Corrugated iron sheet shed	43.3 (39)
Thatched	48.9 (44)

* Figures in parentheses are the bases.

Majority (54%) of the girls came from low-income families (Table 1), earning less than 3000 Takas monthly. Little over a quarter (27%) of the families were middle income families, earning between 3001 and 6000 takes, and only 19% families earned more than 6000 takes monthly. Their homestead characteristics were also consistent with the economic conditions of their families. Half of the families lived in houses built of cheap materials such as thatch, straw or similar material (Table 1). Only 8% families lived in brick built houses and the remaining 44% had houses built of corrugated iron sheets and wood.

Levels of education completed by the parents of the subjects are presented in Table 1. Literacy was high among the parents. Fathers of only 9% and mothers of only 14% of the study subjects did not receive any formal education. Nearly 31% of the participants' fathers and 22% of the mothers earned secondary school certificate. About 21% of the fathers and 5.6% of the mothers were university graduates. The remaining parents completed different levels of primary and secondary education.

Table 2 shows the anthropometric indices of the participants. Mean (±SD) height for age was 93.9 (±3.8)% of the NCHS median. Height for age ranged from 83.9 to 102.9%. Majority (60%) of girls was stunted (height for age < 95%). Weight for age varied over a wide range of values, the lowest being 53.6% and the highest being 115.1% of the NCHS median. A substantial proportions (36%) of the girls were undernourished (weight for age < 75%). Weight for height of the girls also varied over a wide range form 74.2 to 125.4% of the NCHS median. Mean (±SD) weight for age was 96.5 (±11.6)%. Nearly one third (32%) of the girls were thin (weight for height < 90%) while 18% were overweight (weight for height >110%).

Table 2. Anthropometric indices of the subjects

Variable	Mean	±	SD	Range
Weight (kg)	38.4		6.4	24.7-60.5
Height (cm)	148.5		6.1	132.0-161.5
Wt-for-Age*	79.3		11.2	53.6-115.1
Ht-for-Age*	93.9		3.8	83.9-102.9
Wt-for-Ht*	96.5		11.6	72.4-125.4

* Percent of NCHS median.

Biochemical indices of nutritional status of the girls are presented in Table 3. Blood hemoglobin concentration in the girls ranged from 8.1 to 15.8 g/dl. Mean (±SD) concentration was 12.6 (±1.2) and median concentration was 12.8 g/dl. About 21% of the subjects were anemic by the criterion of hemoglobin concentration lower than 12 g/dl[8]. Serum retinol concentration ranged between 15.2 and 119.0 μg/dl. Mean (±SD) was 49.2 (±15.9) μg/dl and median was 47.3 μg/dl. Nearly 7% had concentrations lower than 30 μg/dl. Serum concentration varied between 25.3 and 155 μg/dl. Mean (±SD) concentration was 59.8 (±130.8) μg/dl and median was 47.5 μg/dl. Serum copper concentration ranged from 43.2 to 194.5 μg/dl. Serum zine concentration varied betamen 25.3 and 155 μg/dl. Mean and median values were 101.5 (±24.5) and 93.1 μg/dl, respectively.

Table 3. Biochemical indices of the subjects

Variable	Mean	±	SD	Range
Hemoglobin (g/dl)	12.6		1.2	8.1-15.8
Serum vit. A (μg/dl)	49.2		15.9	15.2-119.0
Serum zinc (μg/dl)	48.1		13.0	25.3-115.0
Serum copper (μg/dl)	101.5		24.5	43.2-194.4
Serum iron (μg/dl)	69.5		35.7	9.9-156.9
Transferrin saturation (%)	14.7		8.4	1.9-39.6

Table 4 shows consumption pattern of non-cereal food items by the girls obtained from 7-day intake frequency. Only 10% took 4 servings of meat or more, half took 3 times or less while 40% did not take meat at all in the 7 days preceding interview. On the other hand, 60% of the girls took fish 4 times or more, 30% took 3 times or less, and only 10% did not take fish at all. Nearly a quarter (24%) did not take eggs at all. Only 13% took 4 or more, and 63% consumed 3 or fewer eggs per week. A good proportion (33%) did not take milk and another 38% took 3 times or less in a week. The remaining 30% took 4 times or more. Of the girls, 22% did not take leafy vegetables at all. Majority (53%) took 3 times or less, while 34% took 4 times or more. Nearly all took fruits, 87% took 4 times or more.

Table 4. Percent distribution of the subjects by consumption frequencies of selected food items

Food item	Consumption frequency (times per week)			
	0	1-3	4-7	8 and more
Meat	40	50	9	1
Eggs	24	63	12	2
Milk	33	37	30	1
Fish	10	30	36	25
G.L.V.*	22	53	19	6
Carrot	87	13	0	1
Yellow pumpkin	56	36	6	2
Fruits	2	12	27	60

*Green leafy vegetables.

Discussion

Over a fifth of the Bangladeshi population are adolescents[9]. Adolescence is a unique period of physical and mental growth and development. During this period, 15 to 18 per cent of adult height is achieved and 45 per cent of skeletal development occurs[10]. Sufficient intake of all nutrients during adolescence is important to achieve full potential for growth and development of physical work capacity[11,12]. Adolescence is also a period during which change in behavior and attitude occur. Behavioral change may lead to improper dietary habit and inadequate nutrient intake[13]. Studies in the Western population have amply shown this[14,15].

The present study investigates nutritional status and dietary habit of a sample of rural adolescent school girls. The study was carried out in 136 girls aged 11 to 17 years of two girls, high schools in Kaliganj thana in the district of Ghazipur. They were students of classes seven, eight, nine and ten when the investigation was carried out. Majority came from poor families and nearly one third of the families had medium incomes. An overwhelming majority lived in houses built with cheap building materials such as straw, bamboo and thatch, with occasional use of corrugated iron sheets.

Anthropometric measurements were used to assess adequacy of growth of the girls. Mean weight for age was 87% of the NCHS median[17]. About 36% of the

girls were underweight (wt-for-age > 75%), 60% were stunted (95% ht-for-age), and 32% were thin (wt-for-height < 90%). Hemoglobin concentrations of 12 g/dl and above are considered normal for the adolescent girls[9]. More than one fifth (21%) of the girls were judged to be anemic by this criterion. Indicators of iron status revealed presence of suboptimal iron status in a substantially high proportion of girls. Serum iron concentrations of 40% girls were lower than 40 μg/dl and serum transferrin saturation of nearly 57% were lower than 15% level, which is considered satisfactory. Vitamin A nutriture is considered to be adequate when serum retinol concentration is 30 μg/dl or higher[18]. Mean serum retinol concentration was 64.0 μg/dl. This may give an impression of satisfactory vitamin A nutriture of the girls as a whole. However, the picture that emerges on classification of the individual subjects by serum retinol level is not so satisfactory. Presence of 7% girls with serum retinol concentration below the adequate level is a matter of considerable concern.

Serum zinc and copper concentrations lower than 70 μg/dl are indicators of marginal zinc and copper status[19,20]. Nearly all (97%) of the girls were found marginally deficient in zinc and 12% were found marginally deficient in copper. Sandstead[21] suggested that mild deficiency of zinc might be due to accelerated growth during adolescence as well as poor content of zinc in foods. Recent studies suggest that soil of several areas of Bangladesh is depleted of zinc[22]. Main source of food of the girls was the agriculture produce in the locality. Foodstuffs grown on zinc deficient soil are likely to be poor dietary sources of the element, which might be a reason for high prevalence of marginal zinc status among our subjects.

Quantitative estimation of nutrient intake by the girls was not possible in this study. Instead, seven-day intake frequency of selected non-cereal food items was collected to obtain a picture of their food habit. A wide variation in intake pattern is apparent. Mean frequency of intake each week was 1.9 for eggs, 2.7 for milk, 5.5 for fish, 1.3 for meat, 2.6 for dark green leafy vegetables, and 9.9 for fruits. Of the foods of animal origin, fish were most eaten. Majority took fish regularly, 4 time or more in a week, while only 9% took meat, 12% took eggs to that level. To the opposite end, 40% did not take meat, 24% did not take eggs at all in the week preceding interview while only 10% of the girls reported having eaten no fish. For milk, 30% took it regularly, 4 times or more in a week while 30% did not take it at all. Quite surprisingly, vegetables were

not much popular among the girls. More than one fifth did not take green leafy vegetables at all. Only 19% took regularly, at least 4 times a week, and the remaining 53% took occasionally, 1 to 3 times a week. Virtually all took fruits. A great majority of 87% took fruits regularly, 60% took 8 times or more.

The present study shows the nutritional status of school going adolescent girls in a rural area of Bangladesh. Although drawing a definitive picture and generalization of the situation calls for comprehensive studies, it is apparent at this stage that suitable approaches to improve their nutrition should be considered. Literacy rate among their parents was higher than that is found in many other parts of Bangladesh, and the subjects themselves received instructions in nutrition. They are therefore expected to be better aware of the benefits of good nutrition and consequences of undernutrition than the non-school going adolescent girls or children born to rural illiterate parents. However, education seems to have little influence, if any, on their dietary pattern. Prevalence of anemia among the girls was substantial, and incidence of subclinical iron deficiency was still higher. Although no cases of overt avitaminosis A was found among the subjects, 7% had serum vitmin A concentrations below the satisfactory level. It may be argued that poor intake of foods of animal origin, particularly meat, was due to financial limitation or difficulty in obtaining them in a rural area, unsatisfactory intake of vegetables and yellow pumpking reflect a reluctance to take or lack of knowledge about importance of their presence in a daily meal. In absence of an adequate amount of meat in their diet, vegetables could be an important source of iron, as well as providing vitamin A. There appears a need to change their dietary pattern. The need to develop healthy food habit should be emphasized by appropriate nutrition education within the school curricula and its practices should be reinforced by appropriate behaviour.

References

1. Institute of Nutrition and food Science. National Nutrition Survey of Rural Bangladesh, University of Dhaka, Dhaka, Bangladesh. 1983: 81.

2. Dreizen S, Spirakis CN and Stone R E. A comparison of Skeletal growth and maturation in undernourished and well nourished girls before and after menarche. J. Peditr. 1967, 70: 256.

3. Mason J. Maternal and child nutrition-introduction. SCN news. Administrative Committee on Coordination-Subcommittee on Nutrition, United Nations. 1994; 11: 1.

4. Ahmed F, Khan MR, Karim R, Taj S, Hyedery T, Faruque MO, Margetts BM and Jackson AA. Serum retinol and biochemical measures of iron status in adolescent schoolgirls in urban Bangladesh. Eur. J. Clin. Nutr. 1996; 50 : 346.

5. Ahmed F, Zareen M, Khan MR, Banu, CP, Huq MN and Jackson AA, Dietary pattern, nutrient intake and growth of adolescent schoolgirls in urban Bangladesh. Pub. Health Nutrition. 1981; 1(2): 83.

6. Bieri JG, Tolliver TJ and Catignani GL. Simultaneous determination of alpha tocopherol and retinol in plasma or red cells by high pressure liquid chromatography. Am J. Clin Nutr. 1979; 32: 2143.

7. Milner BA and Whiteside PJ. Introduction to Atomic Absorption Spectrophotometry (2nd edn), Pye-Unicam Limited, Cambridge (UK). 1981.

8. Bothweel TH and Charlton RW. Iron deficiency in women, The Nutrition Foundation, Washington D.C. 1984: 28.

9. Bangladesh Bureau of Statistics. Statistical Pocket Book. Statistics Division, Ministry of Planning, Government of the Peoples' Republic of Bangladesh. 1998: 145.

10. Rees JM and Christine MT. Nutritional influence on physical growth and behavior in adolescence. In: Biology of Adolescence Behavior and Development (Adams G., editor). Sage Publication, California. 1989.

11. Suprr GH Effect of chronic energy deficiency on stature, work capacity and productivity. In: Chronic Energy Deiciency, Consequences and Related Issues. (Schurch, B. and Scrimshaw, N. S., eds). 1987: 95.

12. Dwyer JT. Childhood, youth and adolescence. In: Human Nutrition and Dietetics (Garrow JS, James WPT and Ann R. eds) Churchill Livingston. Edinborough. 1993: 401.

13. Pushpamma P Geervani P and lakhsmi DN. Food intake, nutrient adequacy and anthroponetry of adolescents in the Andhra Pradesh. Indian J. Nutr. Med. Res. 1982; 75: 61.

14. Durnin JVGA. Low energy expenditure in free living populations. Eur. J. Clin. Nutr. 1990: 44(1): 95.

15. Leibel LR. Behavioral and biochemical correlates of iron deficiency : A review. J. Am. Diet Assoc. 1977; 71: 399.

16. Whitehead RG, Paul AA and Cole TJ. Trends in food energy intakes throughout childhood from 1 to 18 years. Hum Nutr. Appl. Nutr. 1982; 36: 57.

17. WHO. Physical status: the use and interpretation of anthropometry. WHO Technical Report Series no. 854. World Health Organization, Geneva, Switzerland, 1995.

18. Greger JL and Entyre, GM. Validity of 24-hour dietary recalls by adolescent females. Am J Public Health. 1978; 68: 70.

19. Sandstead HH. Nutritional role of zinc and effect of deficiency. In: Adolescent Nutrition (Winick, M. ed.). John Willey and Sons, New York. 1982: 97.

20. Manna A and Rahim A. Zinc in Nutrition. Bangladesh Agricultural Research Council, Dhaka. 1988: 100.