DIETARY INTAKE, PHYSICAL ACTIVITIES AND NUTRITIONAL STATUS OF ADOLESCENT GIRLS IN AN URBAN POPULATION OF BANGLADESH

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Abstract

In Bangladesh, under-nutrition is a common health problem, but for socio-cultural background, it is most predominant among the female population starting from their early life to motherhood. For the adolescent girls, there has been no such study though they will be the future mothers. Therefore, this study is designed to address the lifestyle and nutrition of the Bangladeshi female adolescents. The study was conducted purposively in Dhaka selecting randomly 15 of 95 City corporation wards of Dhaka City. All adolescent girls aged 10–18 years were considered eligible participants of an urban population of Bangladesh. The study included socio-demographic information, clinical examination, dietary intake, physical activities and body mass index (BMI = weight in kg / height in m. sq.). Overall, 352 adolescent girls volunteered. Socio-economically, 51% of them had monthly family income $\geq$ 20,000 BDT and 11.4% had < 10,000 BDT. Of the participants, 14.8% had BMI < 18.5, 80.7% had 18.5 – 24.9, and 4.6% had $\geq$ 25. BMI was found not to have significant association with physical activities. No clinical signs of vitamin A deficiency were observed. On clinical examination 75% of the participants were found healthy, 15.9% had anemia and 5.7% had diarrhea. Compared with the national dietary intake, the cereal intake was lower but protein containing foods like pulse and nuts, meat, egg, fish, milk and milk products were found very much close to the national intake. On the average, 95 % of calorie, 93.5 % of protein and 96.5 % of fat requirement were met. For micronutrient requirement, very low intake was observed with calcium (62 %) and iron (63 %). In conclusion, the participants consumed rice daily with frequent consumption of vegetables. Although the study subjects were mostly from higher class of urban dwellers their dietary intake was found not healthy as evidenced by daily rice intake and very low intake of fruits, calcium and iron indicating lack of awareness regarding food habit. Further study is needed to confirm the study findings and to initiate health education on diet among the Bangladeshi adolescent girls.

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Introduction

Of the total eight Millennium Development Goals (MDG), two are pertinent to women health – a) Goal 3, "Promote gender equality and empower women" and b) Goal 4, "Reduce child mortality". To achieve these goals the global responsibility lies prioritizing the need to improve health status of female children and adolescent. Adolescents are defined by the World Health Organization (WHO) as persons aged 10-19 years.[1] They comprise 20% of the global population, and about 80% of them live in developing countries[2] like Bangladesh. During this important period of growth and maturation, children gain 20% and 50% of their adult height and weight, respectively.[3] Puberty starts at this stage meaning sexual maturation. The changes

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both in physical growth and mental development take new dimension. This is the age when and an individual shifts to be independent in decision making. Body composition and dietary patterns acquired during this period are likely to be continued as adults.[4] It is important for adolescents to lay out the foundation for chronic disease prevention by the promotion and maintenance of healthful lifestyles. Therefore, for a wide variety of reasons related to the rapid physical and emotional development during this period, adolescence represents a period of peak concern. Little attention has been paid to adolescent nutrition in developing countries. A series of studies conducted with small unrepresentative samples in Latin America and the Caribbean, sub-Saharan Africa, and Asia represent the most complete examination of this topic.[5] Girls and boys were included in seven of the eleven studies. Stunting was highly prevalent (around 50%) in nine of these studies and in all three Asian countries studied (Philippines, Nepal, and India). Current or acute under-nutrition was relatively low in most of these samples (3-13%), except in three countries. Adolescent girls were reported at a higher risk of dietary inadequacy and poorer nutritional status than boys in several countries of Asia.[6] However, there is minimal understanding about adolescent dietary patterns in developing countries. Studies from industrialized countries show that adolescents have unique dietary patterns. Adolescents may place themselves at particular nutritional risk by choosing to follow extreme eating patterns.[7] Research on child nutrition in several lower and middle income countries shows that obesity is emerging as an important problem.[8] Of greatest concern are the biological and behavioral risk factors linking adolescent obesity and adult health. Considering the importance of future mothers, who are destined to nurture future generation, this study addressed the Bangladeshi female adolescents with regards to their dietary intake and nutritional status.

Materials and Methods

Study design

We selected Dhaka City purposively. The City has 95 city corporation wards. We selected 15 of the 95 wards randomly. All adolescent girls of age group 10 – 18 years were considered eligible for this study.

A questionnaire was developed to obtain relevant information on socioeconomic status, dietary intake, history of illness and physical activity. All questions were designed and checked by field trial. The interviewer were trained for definition of data included in the questionnaire.

Anthropometric assessment

The anthropometric data were collected based on standard methods. Age of the subjects under study was determined by interrogation and confirmed through probing if the birth certificate or the health card were unavailable. Measurements of weight and height were obtained from all subjects. The subjects were weighed wearing minimal cloths and bare footed. Three weight measurements were obtained using a bathroom weighing scale and the average was calculated and recorded to the nearest 0.1 kg. The height was measured with a wooden measuring board without shoes and the average was calculated and recorded to the nearest 0.1 cm.

Clinical examination

A clinical examination was conducted to detect the clinical signs of vitamin A deficiency and nutritional anemia as well as to detect other health problems.

Dietary assessment

Food consumption was assessed with the 24-hour recall method. The participants were shown various standardized utensils such as serving plates, cups, spoons and models of different foods to get the nearest possible approximation of serving sizes of the cooked food consumed. The serving weight of different food items was calculated from this information. Equivalent raw food weight was obtained by using a conversion table for Bangladeshi foods developed at the Institute of Nutrition and Food Science (INFS),[9] University of Dhaka. A program package, based on Bangladeshi and Indian food composition table[10,11] was used to calculate the nutrients from raw weight of edible portion of food.

Statistical analysis

The data was first checked, cleaned, and entered into the computer (using SPSS for Windows version 12.0) from the numerical codes on the form. The data was edited if there were any discrepancy found. The frequency distribution of the entire variables was checked by using SPSS for Windows version 12.0 program.

For purposive data analysis, the raw anthropometric data of SPSS windows were transferred to the Epi-Info 3.4.3 to obtain derived indices of anthropometric measurements such as weight for age, height for age, weight for height-Z scores, percentiles and % median and age. The indices derived from Epi-Info 3.4.3, were then transferred again SPSS for windows for further analysis. The new variables obtained were recorded on the basis of analysis such as age, sex, education, income etc.

After summarizing the collected data for each of the suggested indicators to answer the questions based on the objective of the study, analysis was preceded according to the plan.

Results

Out of 352 girls 68 (19.3%) were 10-13 year of age, 156 (44.3 %) were 14-16 year of age and 128 (36.4 %) were 17-19 year of age. Among them about 17.0% respondents were from a family of up to 3 members, 70.5% from 4-5 members and 12.5% were from a family with more than 5 members.

The results revealed that, 9.1% respondents had a monthly family income < 10,000 BDT; 11.4% had income 10,000-15,000; 25.0% had income 15,001-20,000 and 51% had income > 20,000.

Table 1 summarizes the average of height, weight and BMI of the study population. Most results are stratified by three age groups (10 - 13 years , 14 - 16 years and 16 - 19 years) based on the consideration that the sample is inadequate to present more detailed age breakdowns.

The Body mass index was calculated as weight in kg / and height in meter square. The BMI revealed that 14.8% of the girls were underweight (BMI < 18.5), 80.7% were within normal limits (BMI 18.5 – 24.99) and 4.6 were either overweight or obese (BMI ≥ 25).

Table 1: *Mean ($\pm$ SD) of height, weight and BMI of adolescent girls according to age group.*

Age Group	Height(cm)	Weight(Kg)	BMI(Kg/m^2)
10 – 13 yr	143.45 (4.59)	44.58 (5.38)	21.66 (2.34)
14 – 16 yr	152.21 (8.31)	48.44 (7.04)	20.90 (3.02)
17 – 19 yr	152.05 (9.61)	47.84 (7.75)	20.94 (4.70)

Values are mean (s.d.)

Fig.1: *Frequency distribution of BMI adolescent girls*

The WHO classification was used for interpretation of the results (Fig. 1).

Physical activities in the form of exercise/ walking/ playing were found to have no significant association with BMI.

No clinical signs of vitamin A deficiency such as night blindness, bitot spots, keratomalacia and conjunctival xerosis were observed. But among the respondents 15.9% were suffering from anemia, 2.3% were suffering from fever/coldness and headache, 5.7% were suffering from diarrhea, another 2.3% were suffering from measles, and almost 74% were not suffering in any disease (Fig. 2).

Table 2: *Percent distribution of the respondents on the BMI and exercise time*

Time spent per day	Body Mass Index (BMI)				Total
	<18.5	18.5-24.99	25.0-29.99	>30.0	
20 minute	24 (6.8)	52 (14.8)	8 (2.3)	-	84(23.9)
30 minute	8 (2.3)	112 (31.8)	-	4 (1.1)	124 (35.2)
1 hour	8 (2.3)	84 (23.9)	-	-	92 (26.1)
>1 hour	12 (3.4)	36 (10.2)	-	4 (1.1)	52 (14.8)
Total	52 (14.8)	284 (80.7)	8 (2.3)	8 (2.3)	352 (100)

Fig. 2: *Percent distribution of diseases of adolescent girls within last two months*

Table 3: *Food intake (per capita per day) of adolescent girls in comparison to National data (1995-96)*

Food groups	Food intake (Mean $\pm$ SD)	National[12]
Cereal (g)	341.0 $\pm$ 74.0	452.0
Root & tubers (g)	45.0 $\pm$ 36.0	70.0
Pulse & nut (g)	11.0 $\pm$ 4.5	10.0
Vegetable (g)	87.9 $\pm$ 26.0	113.0
Fruits (g)	14.0 $\pm$ 5.0	13.0
Meats (g)	8.0 $\pm$ 4.0	6.0
Fish (g)	26.0 $\pm$ 8.0	32.0
Milk and milk product(g)	10.0 $\pm$ 4.0	13.0
Fats & oils (g)	5.2 $\pm$ 2.3	6.0

Per capita food intake of the studied population and comparison with the national intake (95 – 96) is presented in Table 3. Cereal intake was found to be lesser, intake of protein containing foods like pulse & nuts, meat, egg, fish, milk & milk products were very much close to the national intake.

Percentages of calorie and nutrient requirement fulfilled by the population are depicted in Table 4. The intakes of all macronutrients were less than the average requirement of Bangladeshi adolescent except carbohydrate. On the average the studied population fulfilled 95 % of calorie, 93.5 % of protein and 96.5 % of their fat requirement. They also fulfilled almost 62 %, 63 %, 120 %, 93 %, 77 %, 104 %, 112.5 % of their Ca, Fe, Vit A, Thiamin, Riboflavin, Niacin and Vit C requirement respectively.

Table 4: *Mean calorie and nutrient intake (per capita per day) and percentage of the requirement by different socio-economic groups*

Calorie and nutrients	RDA[10]	Mean intake	% of RDA
Energy (kcal)	2200	2090.0 (256.0)	95.00
Protein (g)	46	43.0 (14.8)	93.48
Fat (gm)	15	14.5 (6.9)	96.67
Carbohydrates (g)	250	380.0 (73.5)	130.40
Calcium (mg)	450	279.0 (310)	62.00
Iron (mg)	30	19.0 (12.3)	63.33
Vitamin A (RE)	720	862.0 (322.0)	119.72
Thiamine (mg)	1.2	1.12 (0.7)	93.33
Riboflavin (mg)	1.4	1.08 (0.4)	77.14
Niacin (mg)	16.4	17.2 (5.0)	104.88
Vitamin C (mg)	30	33.8 (11.0)	112.67

(Figures in parentheses are standard deviation)

Table 5: *Food consumption pattern of the adolescent girls*

Food item	Consumption frequency			
	Weekly		Fortnightly (%)	Monthly Never (%)
	5-7 day / week(%)	1-4 day / week(%)		
Rice	100.0	-	-	-
Flour	60.5	39.5	-	-
Roots & Tuber	-	86.0	14.0	-
Dal (Pulses)	33.0	65.0	2.0	-
Leafy vegetables	50.0	45.0	5.0	-
Non-leafy vegetables	17.0	83.0	-	-
Fish	7.0	93.0	-	-
Meat	5.0	48.0	46.0	1.0
Egg	18.0	58.0	24.0	-
Milk	12.0	43.0	40.0	5.0
Milk products	-	35.0	58.0	7.0
Fruits	8.0	26.0	56.0	10.0

Consumption frequencies of different food items among the adolescent girls are shown in Table 5. It depicts that, all the studied population consumed rice daily. All types of vegetables were frequently consumed by all the adolescent girls. But their milk, egg and fruits consumption were very less.

Discussion

The present study revealed that more than 70 % girls were from a family from 4-5 members and more than 50 % respondents had a total monthly family income of above 20,000 taka. This level of income is higher than any normal Bangladeshi family, which means these girls have better access to nutrients compared to any girl from low income family may be from a village.

Malnutrition was calculated by using BMI, a measure of nutrition through which it was observed that 19 % of the girls were under nourished, 74 % were having normal BMI which revealed that they were well nourished and only 7 % were obese. Although in some other studies reported prevalence rate of undernourishment among adolescent is higher than the current study but even this prevalence rate (19 %) also need intervention because 20-30 % underweight is high prevalence rate and is indicated as a serious situation and needs immediate intervention.[13] Obesity or overweight in the adolescent girls was only 7.0 %, which is less than that in developed countries.

Three meals per day were taken by 90-95 % of the girls i.e. of Breakfast, Lunch and Dinner. Girls were

consuming rice as well as chapatti (wheat) but the frequency and quantity was low, so the overall consumption of cereals was 341 gm/per person/ day which is lower than the national consumption of cereals which was 452 gm/person/day. Protein intake was 43.0 gm/day/person, which was also less than the requirement of protein which was 46 gm/day/ person. Average pulses and nuts consumption was 11 gm/day/ person which was higher than the national consumption of 10 gm/day/person. Average consumption of vegetables 87.9 gm/day, 5.2 gm/day of edible oil, and these figures are not better than the national consumption figures, which are 113 gm/day and 6.0gm/ day respectively.

Less consumption of meat and more consumption of pulses were due to the high cost of meat, which a large proportion of population cannot afford. In present study on average in the girls 10-19 years of age the Caloric consumption was 2090 ± 256 calories. This was lower than the RDA for these girls and only fulfilled 95% of the RDA.

No clinical signs of vitamin A deficiency were seen in the study population. Although this study shows a low prevalence rate of anemia but in reality anemia was recognized as the greatest nutritional problem among women as 52% of non-pregnant women suffer from Anemia (WHO, 1992). The present study reveals that the prevalence of anemia was 15.9%. The cause of anemia in the selected girls was low intake of iron foods as meat / meat products and green leafy vegetables. Meat intake was poor and only contributes to 10% of the total protein intake. Intake of protein in the girls was sufficient, but the major portion of the proteins was having low biological value. The main source of iron for the girls was from cereals (wheat & rice), but the iron in the cereal food groups is less bio-available to the body because of the high contents of inhibitors i.e. phytate and tannins.

Conclusion

Nutritional status of the Bangladeshi adolescent girls was found nearly adequate in terms of caloric intake, and vegetables and pulses but was inadequate with regards to fruits, meat, milk and milk products. Although the study subjects were mostly from higher class of urban dwellers their dietary intake was not balanced as evidenced by daily rice intake and very low intake of fruits, calcium and iron indicating a lack of awareness regarding healthy diet. Further study is needed to confirm the study findings and to initiate health education on diet in order improve the health of the future mothers of Bangladesh, the adolescent girls.

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