OPEN ACCESS
Freely Available Online

INTERNATIONAL JOURNAL OF NUTRITION
ISSN NO: 2379-7835

Research article

DOI: 10.14302/issn.2379-7835.ijn-20-3606

Nutritional Status and Nutrition-Related knowledge Among Urban Adolescent Girls in Bangladesh

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Abstract

Background: Nutritional status of adolescent girls is very crucial for their health and has a great impact on the quality of the next generation. The present study aimed to investigate the nutritional status and nutrition-related knowledge among urban adolescent girls in Bangladesh.

Methods: A cross-sectional study involving a total 500 of adolescent girls (aged 10-19) from four schools and colleges in Dhaka city. Socio-demographic, anthropometric and nutrition-related information was collected by semi-structured questionnaires. In addition, 24 hours food recall and food frequency questionnaire was used to assess the dietary intake.

Results: The ages of the early adolescent and late adolescent girls [yrs, (Mean ± SD)] were 12±1 and 17±1 respectively. The mean (±SD) BMI of the early adolescent and late adolescent was 21.12±0.32 and 22.10±3.89 correspondingly. Among the early adolescent girls, the nutritional knowledge score was about 62% (moderate), 87% had a positive attitude and 72% had good practices in their daily lives. Whereas among the late adolescent girls, the nutritional knowledge score was about 57% (moderate), 90% showed a positive attitude and 61% had good practices. Among the subject, the average calorie intake was 1491 kcal, which was 24% lower than RDA. The Carbohydrate intake was lower than the RDA but the protein and fat intake was higher than the RDA.

Conclusions: The dietary intake of adolescent girls was found inadequate. Nutrition education and strong motivation can create positive changes in dietary intake. To understand the real phenomena of dietary intake of adolescent girls, further study is necessary to conduct with a large sample size.

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Citation: Farjana Rahman Bhuiyan, Joti Lal Barua, Kazi Abul Kalam (2020) Nutritional Status and Nutrition-Related knowledge Among Urban Adolescent Girls in Bangladesh. International Journal of Nutrition - 6(2):47-58. https://doi.org/10.14302/issn.2379-7835.ijn-20-3606

Keywords: Nutritional knowledge, malnutrition, dietary pattern, adolescent girls, Bangladesh

Received: Oct 23, 2020 **Accepted:** Nov 20, 2020 **Published:** Nov 23, 2020

Editor: Sasho Stoleski, Institute of Occupational Health of R. Macedonia, WHO CC and Ga2len CC, Macedonia.

Introduction

Nutritional status is an indicator of a distinct individual's health condition by the influence of intake and utilization of nutrients. Adequate nutrition may be a prerequisite for attaining good health, quality of life, and national proficiency. Although problems related to poor nutrition affect the entire population, women and children are especially vulnerable due to their unique physiology and socioeconomic characteristics [1]. According to the World Health Organization (WHO) adolescence is the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to19 [2]. Future adolescence is divided into early adolescence (10-14 years) and late adolescence (15-19 years). It is informed that the adolescence stage of lifespan is one of the key stages of physical growth and development. Growth occurs in the skeleton, in the muscle, and almost every system and organ of the body in adolescence except the brain and the head [3]. Rapid growth during adolescence places increased demand on energy, protein, and other nutrients. The tempo of growth during adolescence is slower in undernourished populations [4]. Protein deficiency has been shown to reduce growth during adolescence [5]. In most developing countries the adolescent's nutritional needs are very essential and critical but also neglecting adolescents than other groups of people like children and women. Fulfillment of nutrition demands of adolescents could be an important step towards breaking the cycle of intergenerational malnutrition, chronic diseases, and poverty as well [6].

In Bangladesh, adolescents were more than one-fifth (23 percent) of the entire population, which is 36 million [7]. Besides, a large number of adolescent girls suffer from various degrees of nutritional disorders. Poor nutritional status during adolescence is an important determining factor of health outcomes at a later stage of life. Few studies have been done in the last couple of years to identify the extent and consequence of malnutrition in rural and urban adolescent school girls, and adolescent female workers of Bangladesh [6, 8-12]. The results of these studies particularly confirmed the higher prevalence of anemia and iron deficiency along with some other micronutrient deficiencies. Their health and nutritional status have a great impact on the quality of the next generation and consequently the prospect of the country. Therefore, attention should be conferred to adolescent health and nutrition. The aimed of these present study to investigate the nutritional status and nutrition-related knowledge among urban adolescent girls in Bangladesh.

Materials and Methods

Study Design and Sample

The cross-sectional study design was adopted, and a total of 500 adolescent girls (aged 10-19) randomly selected from four schools and colleges, were included in this study. The desired sample size was determined using Fisher et al., 1998 formula [13]. $n = Z^2 pq/d^2$ Where; n = the desired sample size, z = the standard normal deviation at the required confidence level of 1.96, d = the level of statistical significance set, p = the proportion in the characteristics being measured and, q = 1- p. A total number of 288 (two hundred eighty-eight) early adolescents (10-14 yr) and 212 (two hundred twelve) late adolescent girls (15-19 yr) were included in the study.

Questionnaire Development

The questionnaire was divided into four sections: Socio-demographics, anthropometric measurements, nutritional knowledge, attitude & practices, and dietary pattern.

Part 1: Socio-Demographics

The socio-demographic section requires the subjects to answer questions about age, years of education, family background etc.

Part 2: Anthropometric Measurements

The anthropometric measures such as height, weight, BMI, WHR and MUAC were taken of the subjects. Standing height was measured using appropriate scales (Detect-Medic, Detect scales INC, USA) to the nearest 0.5 cm. Bodyweight was measured on a portable weighing scale to the nearest 0.5 Kg. Body mass index (BMI) of the subjects was calculated using formula [BMI= Weight (kg)/ Height (m^2)], recommended by the WHO (2004) [14]. Waist circumference was measured through a soft non-elastic measuring tape. Middle upper arm circumference (MUAC) measured by a non-stretched measuring tape with the right arm hanging tranquil. [15].

Part 3: Nutritional Knowledge, Attitude and Practices

The survey questionnaire used in this study was developed from a combination of previously administered questionnaires [16-20] to measure adolescent girls' nutritional knowledge, attitude, and practices (KAP). There were 20 questions scored (1 & 0) for yes and no respectively. The total score ranged from 0 to 20. On the basis of score participants were divided into three categories; poor knowledge with a score less than 50% {<10}, moderate knowledge from 50% to 75% (10 to 15), and good knowledge more than 75% {>15}. 15 questions for attitude answered with (1, 0) for agreeing and don't agree. The total scores ranged from 0 to 15. The score was divided into three categories; negative with a score of less than 50% {<8}, indifference from 50% to 75% {8 to 11}, and positive more than 75% {>11}. There were 10 questions scored (1, 0) for practices. The total scores ranged from 0 to 10. The score was divided into three categories; poor practices with a score less than 50% {<5}, moderate from 50% to 75% {5 to 8}, and well more than 75% {>10} [18].

Part 4: Dietary Pattern

Food consumption of the study subjects was assessed using a 24-hour recall method. To estimate the portion size of food consumed, different types of serving plates, glass, cups, and spoons were displayed. From the size and volume of food consumption obtained by this method, the weight of each serving of different food items was calculated. The equivalent weight of raw food was calculated using a conversion table for Bangladeshi foods formulated at the Institute of Nutrition and Food Science (INFS) [21]. Information about the habitual dietary pattern of the study subjects was obtained using a 7-days food frequency questionnaire on selected food items.

Statistical Analysis

The statistical tests were considered significant at p-values ≤5% (≤0.05). Frequencies were calculated for descriptive analysis. Comparison between two groups was done using students unpaired t-test for normally distributed continuous variables. Chi-squared tests were performed to determine the association among various indices. All statistical measures were performed using statistical package for social science (SPSS) for windows version 16.0 (SPSS Inc., Chicago, IL, USA).

Ethical Issue

Informed written consent was obtained from all participants after a full explanation of the nature, purpose, and procedures used for the study. Ethical approval was obtained from the ethics and research review committees of Bangladesh Institute of Research and Training on Applied Nutrition (BIRTAN).

Results

The sociodemographic characteristics of the study subjects are shown in Table 1. A total number of 288 early adolescents and 212 late-adolescent girls were included in the study. The ages of their [yrs, (Mean ± SD)] were 12±1 and 17±1 respectively. A majority (84%) were obtained from the nuclear family. Based on education, the study subjects 91% were under class 8 in early adolescence and 50% study of class 11-12 in late-adolescent girls.

Table 2 shows the distribution of the study subjects according to different BMI categories (adapted from WHO guideline - 2004). Mean (±SD) BMI in the early adolescent girls was 21.12±4.32 and in late adolescent girls was 22.10±3.89 respectively. Mean BMI was significantly (p= 0.009) higher in late adolescent girls compared with early adolescent girls. (Mean (±SD) WHR was 0.80±0.10 in the early adolescent girls and late adolescent girls were 0.78±0.09 respectively. Mean WHR was significantly higher in early adolescent girls compare to late-adolescent girls (p=0.037). Mean (±SD) MUAC was 23.10±3.37 in the early adolescent girls and late adolescent girls were 23.65±3.07. Mean MUAC was significantly higher in late adolescent girls compere to early adolescent girls (p=0.065).

Figure 1 shows the early adolescent girls' nutritional knowledge score about 62% moderate, 87% showed a positive attitude, and 73% had good practices in daily life. Besides, among the late adolescent girls, the nutritional knowledge score shows about 57% moderate, 90% showed a positive attitude, and 61% had good practices in daily life. Table 3 shows the relationship between knowledge with their attitude and practices among the study subjects. Among the early adolescent girls showed a significant association of nutritional knowledge with attitude and practices

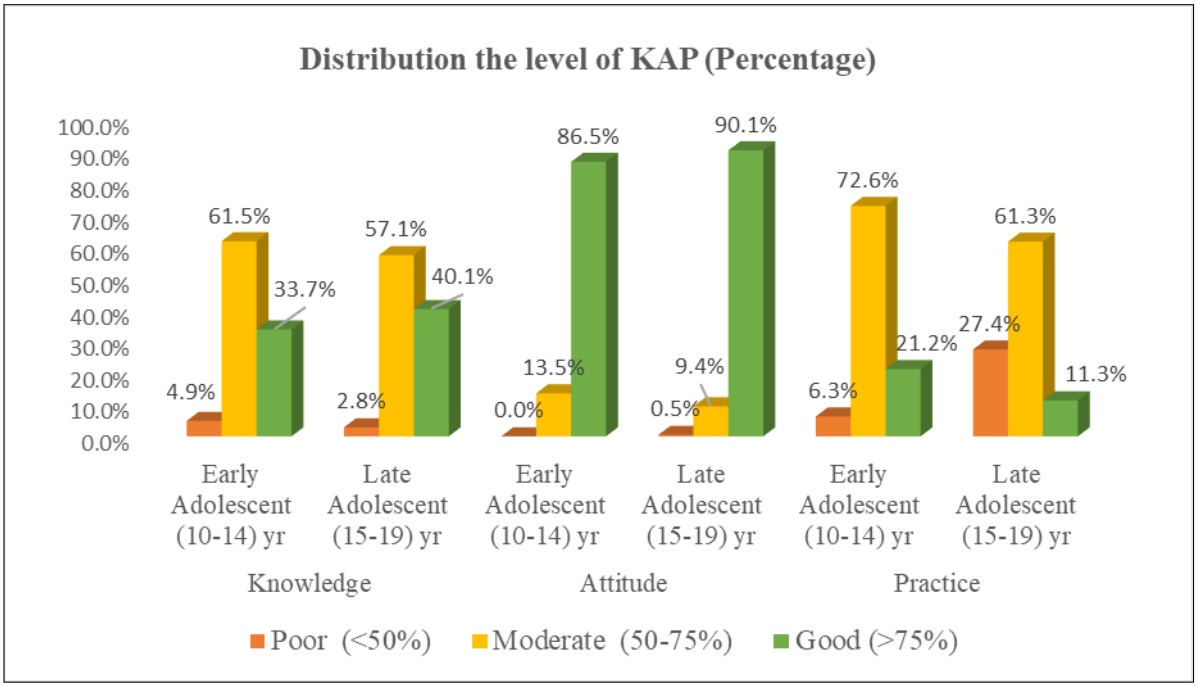

Figure 1. Distributions the level of Knowledge Attitude & Practices (KAP) of the study subjects

(p=<0.001, p=0.005). Nevertheless, in late adolescent girls showed a significant association of nutritional knowledge with attitude (p=0.002).

Mean (±SD) total Calorie (kcal/day) intake was 1447.53±285.07 in the early adolescent girls and late adolescent girls were 1550.33±326.35 respectively. Mean total Calorie (kcal/day) intake was significantly higher in late adolescent girls compere to early adolescent girls (p=<0.001). Mean (±SD) Carbohydrate (g/day) intake was 202.67±54.19 in the early adolescent girls and late adolescent girls were 227.29±66.36. Mean Carbohydrate (g/day) intake was significantly higher in late adolescent girls compared with early adolescent girls (p=<0.001). Mean (±SD) Protein (g/day) intake was 58.63±19.67 in the early adolescent girls and late adolescent girls were 55.05±17.35. Mean Protein (g/day) intake was significant higher in early adolescent girls compared with late-adolescent girls (p=<0.035). Mean (±SD) Fat (g/day) intake was 43.19±12.54 in the early adolescent girls and late adolescent girls was 45.06±12.91. Mean Fat (g/day) intake did not show any statistically significant difference between the two groups (Table 4).

There was a mean deficit of daily energy intake of total kcal (Table-5). Protein and Carbohydrate intake of the adolescent girls was 57 g/day & 213 g/day which 129.80% & 57.72% of RDA. The intake of fat by the adolescent girls was high in the RDA.

Most of the study subjects were consumed rice 2-3 times per day. They also consumed different snacks and beverages in a day but the data showed they preferred fuska to other food items. About 21% of late adolescent girls were consumed fuska 1 time in a day, whereas 55.6% of early adolescent girls were consumed 1-2 times per week. The consumption of chicken was higher than beef in both groups. They preferred big fish to small fish. About 41% of early adolescent girls and 23.6% of late adolescent girls consumed egg 1 time in a day. While only 21% of early adolescent girls and 10.8% of late adolescent girls consumed milk 1 time in a day. The consumption of vegetables was so low in both groups. They chose sour fruits over sweet fruits (Table 6).

Discussion

Adolescence is an important stage of growth and development that requires increased nutrition and adolescent anthropometry varies significantly worldwide [22]. Growth and development are closely associated to the diet received during childhood and adolescence.

Table 1. Socio-economics characteristics of the study subjects (n=500)

Characteristics	**Early Adolescent (10-14) yr (n=288) %**	**Late Adolescent (15-19) yr (n=212) %**
Age (yrs)	12±1	17±1
Educational level		
< Class 8	261 (90.6)	1 (0.5)
Class 8-10	26 (9.1)	42 (19.8)
Class 11-12	1 (0.3)	106 (50)
> Class 12	-	63 (29.7)
Monthly Family Income (TK)		
<10,000	4 (1.4)	8 (3.8)
10,000-20,000	18 (6.2)	53 (25)
20,000-30,000	80 (27.8)	74 (34.9)
>30,000	186 (64.6)	77 (36.3)
Type of Family		
Nuclear Family	242 (84)	178 (84)
Extended Family	46 (16)	34 (16)

Values are expressed as mean ± SD, and number (%)

Table 2. Anthropometric characteristics of the study subjects (n=500)

Characteristics	**Early Adolescent (10-14) yr**	**Late Adolescent (15-19) yr**	**t/p value**
Body Mass Index (kg/m^2)	21.12 ±4.32	22.10±3.89	***0.009***
Underweight <18.5	90 (31.3%)	31 (14.6 %)	
Increasing but acceptable risk (18.5-23)	118 (41.0%)	107 (50.5%)	
Increased risk (23-27.5)	54 (18.8%)	49 (23.1%)	
High risk >27.5	26 (9.0%)	25 (11.8%)	
Waist Hip Ratio (WHR)	0.80±0.10	0.78±0.09	***0.037***
Mid Upper Arm Circumference (MUAC, CM)	23.10±3.37	23.65±3.07	***0.065***

Values are expressed as mean ± SD and number (%), P<0.05 was considered as statistically significant

Table 3. The relationship between knowledge with their attitude and practice among the study subjects (n=500)

Attitude and Practice		Knowledge						Significance test p value	
		Poor Knowledge (n= 20)		Moderate Knowledge (n= 298)		Good Knowledge (n= 182)			
		Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr
Attitude	Negative (n= 1)	-	-	-	1	-	-	X^2 = 24.027 *P =<0.001*	X^2 =16.482 *P =0.002*
	Indifference (n= 59)	7	3	28	14	4	3		
	Positive (n=440)	7	3	149	106	93	82		
Practice	Poor (n= 76)	3	1	13	38	2	19	X^2 = 14.714 *P =0.005*	X^2 =4.703 P =0.319
	Moderate (n=339)	11	5	131	72	67	53		
	Good (n= 85)	-	-	33	11	28	13		

Values are expressed as number (n), P<0.05 was considered as statistically significant

Table 4. Daily Dietary intake of the study subjects (n=500)

Variable	Mean±SD		t/p value
	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	
Total Calorie (kcal/day)	1447.53±285.07	1550.33±326.35	-3.746/ ***<0.001***
Carbohydrate (g/day)	202.67±54.19	227.29±66.36	-4.561/< ***0.001***
Protein (g/day)	58.63±19.67	55.05±17.35	2.114/ ***0.035***
Fat (g/day)	43.19±12.54	45.06±12.91	-1.627/0.104

Values are expressed as mean ± SD, P<0.05 was considered as statistically significant

Table 5. Daily Dietary intake of the study subjects in relation to RDA* (n=500)

Variable	Total intake	RDA	Percentage of RDA
Total Calorie (kcal/day)	1491.10±307.18	1968.00+	75.77
Protein (g/day)	57.11±18.79	44.00	129.80
Carbohydrate (g/day)	213.11±60.83	369.00	57.72
Fat (g/day)	43.98±12.72	32.80	134.00

*RDA: Recommended Dietary Allowances.

+Calculated using factor for activity level with a multiple of BMR based on body weight of the individuals according to FAO/WHO/UNU11. ++Calculated using factors recommended by IVACG. RE: Retinol equivalents. [10]

Table 6. Pattern of intake of selected food items among the study subjects (n=500)

Food items	Number (%)									
	2-3 times/day		1 time/day		3-6 time/week		1-2 time/week		Never	
	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr	Early Adolescent (10-14) yr	Late Adolescent (15-19) yr
Cereals										
Rice	100 (100%)	100 (100%)								
Roti	16 (5.6)	11 (5.2)	160 (55.6)	83 (39.2)	29 (10.1)	28 (13.2)	82 (28.5)	89 (42.0)	1 (0.3)	1 (0.5)
Muri	5 (1.7)	5 (2.4)	24 (8.3)	29 (13.7)	43 (14.9)	26 (12.3)	138 (47.9)	115 (54.2)	78 (27.1)	37 (17.5)
Parata	8 (2.8)	2 (0.9)	54 (18.8)	37 (17.5)	36 (12.5)	23 (10.8)	146 (50.7)	127 (59.9)	44 (15.3)	23 (10.8)
Snack & Beverage										
Singara	5 (1.7)	2 (0.9)	26 (9.0)	31 (14.6)	34 (11.8)	40 (18.9)	148 (51.4)	98 (46.2)	75 (26.0)	41 (19.3)
Somucha	2 (0.7)	2 (0.9)	28 (9.7)	33 (15.6)	44 (15.3)	36 (17.0)	131 (45.5)	105 (49.5)	83 (28.8)	36 (17.0)
Puri	5 (1.7)	2 (0.9)	25 (8.7)	16 (7.5)	37 (12.8)	25 (11.8)	151 (52.4)	121 (57.1)	70 (24.3)	48 (22.6)
Noodules	8 (2.8)	3 (1.4)	25 (8.7)	12 (5.7)	112 (38.9)	66 (31.1)	129 (44.9)	113 (53.3)	14 (4.9)	18 (8.5)
Berger	4 (1.4)	1 (0.5)	4 (1.4)	5 (2.4)	28 (9.7)	11 (5.2)	164 (56.9)	134 (63.2)	88 (30.6)	61 (28.8)
Fuska	18 (6.2)	18 (8.5)	18 (6.2)	44 (20.8)	56 (19.4)	45 (21.2)	161 (55.9)	88 (41.5)	35 (12.2)	17 (8.0)
Cold drinks	4 (1.4)	3 (1.4)	14 (4.9)	25 (11.8)	36 (12.5)	38 (17.9)	164 (56.9)	117 (55.2)	70 (24.3)	29 (13.7)
Tea	18 (6.2)	19 (9.0)	55 (19.1)	64 (30.2)	41 (14.2)	23 (10.8)	79 (27.4)	50 (23.6)	95 (33.0)	56 (26.4)
Meat & Fish										
Beef	10 (3.5)	1 (0.5)	16 (5.6)	6 (2.8)	40 (13.9)	21 (9.9)	153 (53.1)	138 (65.1)	69 (24.0)	46 (21.7)
Chicken	25 (8.7)	9 (4.2)	38 (13.2)	27 (12.7)	116 (40.3)	102 (48.1)	101 (35.1)	67 (31.6)	8 (2.8)	7 (3.3)
Big fish	16 (5.6)	34 (16.0)	128 (44.4)	67 (31.6)	83 (28.8)	20 (9.4)	45 (15.6)	56 (26.4)	16 (5.6)	35 (16.5)
Small fish	1 (0.3)	-	-	1 (0.5)	15 (5.2)	2 (0.9)	120 (41.7)	91 (42.9)	152 (52.8)	118 (55.7)
Egg and Milk										
Egg	15 (5.2)	6 (2.8)	118 (41.0)	50 (23.6)	80 (27.8)	68 (32.1)	63 (21.9)	80 (37.7)	12 (4.2)	8 (3.8)
Milk	11 (3.8)	12 (5.7)	62 (21.5)	23 (10.8)	66 (22.9)	24 (11.3)	115 (39.9)	114 (53.8)	34 (11.8)	39 (18.4)
Curd	4 (1.4)	1 (0.5)	10 (3.5)	4 (1.9)	24 (8.3)	5 (2.4)	191 (66.3)	141 (66.5)	59 (20.5)	61 (28.8)

Pulse and legume										
Lentil (Musur)	78 (27.1)	58 (27.4)	85 (29.5)	51 (24.1)	66 (22.9)	34 (16.0)	35 (12.2)	55 (25.9)	24 (8.3)	14 (6.6)
Bengal gram (Mug)	13 (4.5)	4 (1.96)	21 (7.3)	6 (2.8)	30 (10.4)	13 (6.1)	108 (37.5)	100 (47.2)	116 (40.3)	89 (42.0)
Vegeta-bles										
Green leafy veg-etables	2 (0.7)	-	18 (6.2)	5 (2.4)	24 (8.3)	14 (6.6)	142 (49.3)	145 (68.4)	102 (35.4)	48 (22.6)
Other vegeta-bles	2 (0.7)	1 (0.5)	3 (1.0)	4 (1.9)	18 (6.2)	10 (4.7)	196 (68.1)	158 (74.5)	69 (24.0)	39 (18.4)
Fruits										
Sweet fruits	1 (0.3)	1 (0.5)	14 (4.9)	11 (5.2)	58 (20.1)	15 (7.1)	198 (68.8)	157 (74.1)	17 (5.9)	28 (13.2)
Sour fruits	10 (3.5)	3 (1.4)	35 (12.2)	12 (5.7)	62 (21.5)	31 (14.6)	165 (57.3)	132 (62.3)	16 (5.6)	34 (16.0)
Sweet items										
Sweet	5 (1.7)	4 (1.9)	28 (9.7)	8 (3.8)	39 (13.5)	19 (9.0)	173 (60.1)	145 (68.4)	43 (14.9)	36 (17.0)
Pudding	8 (2.8)	-	6 (2.1)	2 (0.9)	17 (5.9)	8 (3.8)	173 (60.1)	126 (59.4)	84 (29)	76 (35.8)
Samai	5 (1.7)	1 (0.5)	4 (1.4)	2 (0.9)	21 (7.3)	8 (3.8)	161 (55.9)	139 (65.6)	97 (33.7)	62 (29.2)

Values are expressed as number (%)

Undernutrition among adolescent girls is a serious public health problem internationally, especially in developing countries [23].

The present study shows that 31% of early adolescent girls were underweight according to different BMI categories (adapted from WHO guidelines-2004) [14]. Early adolescents are at higher risk of undernutrition than late adolescents. Similar to this study's findings, two studies among adolescent girls also stated that nutritional status improves with age and education status. [9,24]. According to BDHS-2014, 31% of the age 15-19 was undernourished (BMI <18.5) [1]. Mean BMI and MUAC were significantly higher in late adolescent girls compare to early adolescent girls (p=0.009; p=0.065). Mean WHR was significantly higher in early adolescent girls compere to late-adolescent girls (p=0.037).

In the present study, it is encouraging to note that the majority of respondents had basic nutrition knowledge. According to the scoring system of knowledge, attitude, and practices (KAP). Among the early adolescent girls was showed a significant association of nutritional knowledge with attitude and practices (p=<0.001, p=0.005). Nevertheless, in late adolescent girls, there was a significant association of nutritional knowledge and attitude (p=0.002). No other study according to literature has addressed the scoring system of knowledge, attitude, and practices (KAP) regarding nutrition among adolescent girls in our country.

The present study represents the dietary intakes during a 24-h period preceding the interview, which only included school/college days. The intake on school/college days may differ from that on weekends and other holidays; this is also taken into account by the use of the food frequency questionnaire. The dietary pattern of many adolescent girls exposes them to the risk of specific nutrient problems. Food consumption data revealed that the daily energy intake by the adolescent girls of the present study almost conformed

to the studies by Kabir et al [10] and Ahmed et al [11]. The energy intake was not sufficient; fulfilled only 76% of RDA, much lower than the energy intake of the rural areas. [25].

For the proper fulfillment of the daily requirement, it is necessary to consume 55 g/day protein and 63.80 g/day protein consumption was reported in national data [26]. Protein intake of the adolescent girls was 57 g/day that was 129.80% of RDA, indicating adequate intake of protein. Meat and eggs, which are rich sources of protein, are the preferred food items of adolescent girls. Although protein (g/day) intake was significantly higher in early adolescent girls compere to late-adolescent girls (p=<0.035). Accordingly, a high intake of protein by adolescent girls of the present study was expected and quite rational.

The intake of carbohydrates by the participants was 213 g/day, representing about 57.72% of RDA. Nevertheless, the mean (±SD) Carbohydrate (g/day) intake of the early adolescent girls and late adolescent girls was 202.67±54.19; 227.29±66.36 respectively which is lower Carbohydrate intake in urban adolescent school girls of Bangladesh [11], and urban adolescent college girls of Bangladesh [10]. Although urban adolescent girls were deficient in Carbohydrate intake, it provided the highest percentage of energy (60-70%) of the total. The intake of fat by the adolescent girls was high in the RDA due to preference for fast food and consumption of cooking oil that is the major contributor to fat intake.

The seven-day food frequency questionnaire revealed very wide differences in the pattern of foods taken by the adolescent girls, to the extent that it would be difficult to characterize a representative diet [11]. Consumption of staple food (rice or wheat) in the last seven days was universal with no difference. Nonetheless, consumptions of non-staple food items, such as meat, eggs, dal (lentils), fruits, and leafy vegetables, were not frequent among the adolescent girls. Eggs, milk, meat, and fish were the major sources of protein, calcium, and preformed vitamin A. Although the consumption of chicken was higher than beef in both groups. They preferred big fish compared to small fish. As well as providing provitamin A, dark green leafy vegetables and fruits are major sources of vitamin C and minerals, especially iron. Although, it was also observed that considerable proportions of the adolescent girls did not consume vegetables in both groups. They chose sour fruits over sweet fruits. Adequate micronutrients are essential for growth and development during adolescence.

More than 50% of adolescent girls were preferred to consume fast food 1-2 times per week. Research also showed that those who ate fast food at home and those students who attended school close to fast-food restaurants were more probable to be overweight [27] and leading to malnutrition and many common teenage problems. These include acne, obesity, mental and behavioral problems. Addressing proper nutrition for girls is equally essential to the special needs of pregnant women and children, and because they also experience a high burden of malnutrition. However, there are financial, sociocultural, and infrastructural challenges to modifying adolescent diets, and identification of bottlenecks is required.

Conclusions

The nutritional status of Bangladeshi adolescent girls was found inadequate in terms of dietary intake. Although the study subjects were mostly from the higher class of urban dwellers, their dietary intake was not balanced as evidenced by the daily intake of the diversity of food indicating a lack of awareness regarding a healthy diet. Repeated reinforcement of nutrition-related education and strong motivation is bound to bring about positive changes in dietary patterns concerning good health. Further studies need to be elucidated by considering a follow-up study with larger sample size.

Competing Interests

The authors declare that they have no competing interests.

Authors' Contributions

FRB: contributed her intellectual ability to conception and design of the research, analysis and interpretation of data; drafting the article, revising it critically for important intellectual content, and final approval of the version to be published. JLB: contributed his intellectual skill in the revision of the

manuscript. KAK: Revision of manuscript for important intellectual content. All of the above authors read and approved the final manuscript.

Acknowledgments

We highly acknowledge to respected Dr Khaleda Islam, Professor, Institute of Nutrition and Food Science (INFS), Dhaka University, and Mr Mahfuz Ali, Ex- Senior colleague of Bangladesh Institute of Research and Training on Applied Nutrition (BIRTAN), for their guidance during conduct the research. We also thank to the adolescent girls who participated in the study.

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