



**NUTRITIONAL STATUS OF ADOLESCENT GIRLS IN SELECTED
URBAN AREAS OF DHAKA CITY IN BANGLADESH**

A PROJECT REPORT BY

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Submitted to the Department of Nutrition and Food Engineering in the partial fulfillment
of B.Sc. in Nutrition and Food Engineering

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**FACULTY OF HEALTH AND LIFE SCIENCES DAFFODIL
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APPROVAL

This project titled “**Nutritional status of adolescent girls in selected urban areas of Dhaka city in Bangladesh**”, submitted by **Syada Husnun** to the Department of Nutrition and Food Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Nutrition and Food Engineering and approved as to its style and contents.

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DECLARATION

I hereby declare that, this project report has been done by me under the supervision of **Ms. Nasima Akter Mukta, Assistant Professor**, Department of Nutrition and Food Engineering, Daffodil International University. I also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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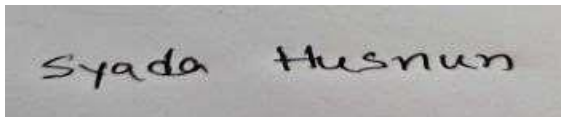
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ABSTRACT

This study aims to evaluate the nutritional status of adolescent girls in selected urban areas of Dhaka City, Bangladesh, and to identify the socio-demographic, dietary, and healthrelated factors influencing their nutritional outcomes. A cross-sectional study was conducted among 100 adolescent girls aged 10-19 years. Data were collected through structured questionnaires covering socio-demographic characteristics, food intake patterns, nutritional knowledge, hygiene practices, and disease prevalence. Nutritional status was assessed using Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC).

Statistical analyses, including chi-square tests, were performed to determine associations between nutritional status and various factors. The study reveals significant differences in nutritional status across age groups, with older adolescents (15-19 years) signifying better nutritional outcomes compared to younger adolescents (10-14 years) ($p = 0.030$). Despite a majority having regular menstrual cycles, 40% reported irregular cycles, potentially impacting their nutritional health. A substantial prevalence of underweight (38%) and malnutrition (31%) was observed. Socio-demographic factors such as religion, living area, family size, educational status, and parental education did not show statistically significant associations with nutritional status. The findings emphasize the necessity for age-specific nutritional interventions and health education programs to address the diverse needs of adolescent girls in urban Dhaka. Policymakers and health practitioners should prioritize improving dietary intake and access to nutrition to mitigate the high prevalence of underweight and malnutrition.

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CHAPTER 1

INTRODUCTION

1.1 Introduction

Nutrition in adolescence time plays an important role for future lifespan (Tamanna et al., 2013; WHO, 2005). Adolescents, belong to age 10-19 years, makes up 20% of world population (WHO, 2005) and, 23 % of Bangladesh inhabitants (BBS, 2001). Nutritional information and associated factors regarding this larger group may back the achievement of health goal of Bangladesh government. Unfortunately, global adolescent population has been suffering from malnutrition and obesity (Cole et al., 2007). These are, in particular, major public health concerns in developing regions, especially in Asia (FAO, 1999). Almost 1200 million adolescents and 19% of the total population in developing world suffer from malnutrition (Akhter and Sondhiya, 2013). Research showed the low body mass index (BMI) was 53% in India and 36% in Nepal (Bhandari et al., 2014). In Bangladesh, specific to gender, 32% of the adolescent girls were underweight (Alam et al., 2010). Rates of both types of malnutrition need to know as obesity also considered a risk morbidity among young girls. Malnourished adolescent girl may enter in poor pregnancy and subsequently give birth of low weight babies (Kumar, 2012). In addition, chronic malnutrition, associated with lean body mass and, reduces muscular strength and work capacity (WHO, 1995). So, determinants of malnutrition in adolescent girls should be focused to prevent its bad outcome.

According to Onis et al. (2007), the World Health Organization (WHO) provides a definition for adolescents as individuals who fall within the age range of 10 to 19 years. Currently, the global population consists of approximately 1.2 billion individuals in the adolescent age group. Approximately 90% of the global population resides in developing nations, such as Bangladesh (Cappa et al., 2012). During this developmental phase, adolescents experience a significant increase in their overall body weight, amounting to approximately 50% of their eventual adult weight. Additionally, they undergo a substantial growth spurt, with their height increasing by 20% or more compared to their eventual adult height.

Furthermore, their skeletal mass reaches approximately 50% of their eventual adult skeletal mass (Meier et al., 2003). The growth experienced during adolescence is notable and ranks second only to the growth observed in the first year of life. This physical growth coincides with significant cognitive and psychosocial transformations (Cordeiro et al., 2006). In addition, this is the phase during which sexual development takes place. Consequently, it generates heightened requirements for energy and nutrition. The demand for calories and protein is at its peak during this period. The nutritional demands for other essential nutrients, such as iron, calcium, and vitamins, are also significantly elevated during this period. Insufficient dietary intake during this specific period may lead to a delay in sexual maturation and can impede or decelerate linear growth (Story et al., 2005).

According to a study conducted by Ahmed et al. in 1998, it was found that over 60% of adolescents between the ages of 10 and 16 in Dhaka city have an intake of protein, iron, and calcium that is below 75% of the Recommended Dietary Allowance (RDA) for their

respective age groups. The nutritional status of adolescents has a significant impact on their health and well-being in subsequent stages of life. The direct correlation between the quality of the next generation and the current high prevalence of chronic energy and micronutrient deficiencies among adolescents is evident. The perpetuation of the vicious cycle of intergenerational undernutrition, chronic diseases, and poverty persists when these deficiencies are not adequately addressed (Alam et al., 2010).

The long-term consequences of malnutrition during adolescence in girls have a detrimental impact on various aspects, including overall growth, morbidity, cognitive development, educational achievement, and adult productivity (Ahmed et al., 1998). According to Alam et al. (2010), adolescent girls who experience undernutrition are at a higher risk of developing into young women who continue to experience undernutrition. Consequently, these young women are more prone to giving birth to infants who also suffer from undernutrition. The poor nutrition of adolescents can be attributed to various factors, including poverty, intermittent food scarcity, child labor, high prevalence of diseases, insufficient infrastructure, limited awareness, inadequate understanding of the long-term effects of undernutrition in adolescents, substandard housing conditions, insufficient quantity and quality of food, and limited access to health and nutrition services (Alam et al., 2010).

1.2 Background

Previous research indicated that several environmental factors, including family, socio economic status, socio demographic factors are connected to nutritional status of adolescents (Kamble, 2003). Specifically, age, sex, mother educational status, also contributes in the nutritional status of the adolescents (Elena and Luminita, 2007; Doustmohammadian et al., 2009). Also, poor knowledge on nutrition, skipping meal were associated with nutritional status of the adolescents (Wolde et al., 2014). Given the high prevalence of adolescent malnutrition and different factor across setting. The same measurer was employed for a given anthropometric measurement to avoid variability (FAO, 1999, Kambal, 2003). Adolescents residing in developing nations have been confronted with a multitude of nutritional challenges, notably under-nutrition, which has the potential to impede their growth spurt and compromise their overall well-being (Mulugeta et al., 2009).

The nutritional status of adolescents in numerous African countries is influenced by chronic under-nutrition, which is linked to deficiencies in muscular strength and working capacity (Lob et al., 2007). While the occurrence of undernutrition is currently on the decline, there is a growing prevalence of overweight and obesity among adolescents (Lob et al., 2007). Overweight and obesity, as significant determinants in adulthood, have been found to be linked with a range of serious health conditions, including diabetes mellitus, hypertension, cerebrovascular disease, coronary heart disease, colorectal cancer, all-cause mortality, and lower levels of educational achievement (Stray et al., 2009). A research investigation carried out in the southern region of Nigeria documented a prevalence rate of underweight at 13.0%, as reported by Ene et al. (2012). The study revealed that this condition was influenced by factors such as place of residence and income levels. A comparable investigation was carried out in both rural and urban regions of Enugu, yielding a prevalence rate of 13.9% for thinness (Adienbo et al., 2012). Moreover, a research conducted in Kano revealed a prevailing prevalence of underweight, amounting to 60.6% in the studied population.

Notably, the prevalence was found to be higher among boys (63.0%) compared to girls (58.7%) (Ani et al., 2014). According to Ene et al. (2012), the prevalence of underweight is higher among boys due to their increased participation in physically demanding activities. According to Menezes et al. (2009), the prevalence of overweight among adolescents worldwide is approximately 10.0%, with variations observed across different regions. Specifically, Africa and Asia exhibit a prevalence rate of 10.0%, while the United States and Europe have a higher prevalence rate exceeding 20.0%.

In a separate study conducted in southern Nigeria, Ene et al. (2012) reported a prevalence rate of 11.4% for overweight and 2.8% for obesity. A separate investigation conducted in the southern region of Nigeria revealed that 22.0% and 49.3% of the population were classified as overweight and obese, respectively (Adienbo et al., 2012). This study undertakes to know the nutritional status and causes of malnutrition in selective areas. Achieving the knowledge on predictors of malnutrition of adolescent girl may give an idea to frame the strategies to improve the nutritional condition of adolescent girls.

1.3 Objectives

The primary objective of this study was to assess the nutritional status of adolescent girls in selected urban areas of Dhaka City in Bangladesh. The study also had two specific objectives, which are:

- To know the rates of underweight and obesity among the adolescents; and
- To determine the associated factors of malnutrition of adolescent girls in the study area

CHAPTER 2 LITERATURE REVIEW

Alam et al. (2018) conducted a study to assess the dietary diversity and nutritional status of adolescent girls aged 10-19 years living in selected slum areas of Dhaka city. Researchers conducted this study as a cross-sectional study with 150 participants, the research utilized structured questionnaires to gather socio-demographic data, anthropometric measurements, and dietary diversity information. The age distribution of the participants revealed that 50% were in early adolescence (10-13 years), 30% in middle adolescence (14-16 years), and 19.3% in late adolescence (17-19 years). A significant portion of the respondents (72.7%) were students, while 24% worked in garment factories, with a mean household income of approximately 19,650 BDT per month. In terms of dietary diversity, 61.3% of the girls consumed medium dietary diversified food, 30% consumed low dietary diversified food, and only 8.7% consumed highly diversified food. Nutritional status assessments showed that 3.3% of the girls were severely thin, 10% were moderately thin, 6.7% were overweight, and 80% had normal weight. Additionally, 10% of the girls were severely stunted, 24% were mildly to moderately stunted, and 65.3% had normal height. The study found a positive correlation between nutritional status and individual dietary diversity, suggesting that improving dietary variety could enhance the nutritional health of these adolescent girls

(Alam et al., 2018). The research highlights the diverse nutritional statuses and dietary habits in this population, with notable instances of both undernutrition (thinness and stunting) and overnutrition (overweight). This underscores the need for targeted nutritional programs and policies to improve dietary diversity and overall nutritional status among adolescent girls in slum areas, which could significantly enhance their health and wellbeing, contributing to their growth, development, and future health prospects (Alam et al., 2018).

According to Hossen et al. (2016) poverty, large population, socio-economic inequalities, and inadequate access to proper health care facilities are the key causes of undernutrition in Bangladesh. Adolescents are particularly vulnerable to undernutrition, which has significant implications since they will become parents in the future. While studies on the nutritional status of adolescent girls are limited, they are crucial for developing effective interventions. Hossen et al. (2016) conducted a study aimed to assess the nutritional status and predisposing factors of undernutrition among adolescent girls in Bangladesh through a community-based cross-sectional survey conducted from July to December 2013. They collected data via face-to-face interviews at the household level. Using the Gomez Classification (weight for age), malnutrition prevalence was categorized as 48.2% mild, 23.5% moderate, and 2.8% severe. The Waterlow Classification indicated wasting in 16.6% mild, 3.5% moderate, and 0.2% severe categories, while stunting was found in 39.6% mild, 9.2% moderate, and 2.3% severe categories. Undernutrition was significantly higher (82.3%) among the younger age group (<12 years). The prevalence of undernutrition was also higher among functionally illiterate adolescent girls, at 75.8% compared to 51.3% among literate girls, with this difference being statistically significant ($p < 0.001$). Additionally, the prevalence of illness in the last two weeks was higher among underweight adolescent girls compared to their healthy counterparts, in both rural and urban settings, also showing a statistically significant difference ($p < 0.001$). Overall, undernutrition was more prevalent among younger and less literate girls, with higher incidences of other symptoms observed in these groups (Hossen et al., 2016).

The study by Akhter and Sondhya (2013) aimed to estimate the nutritional status and severe thinness rates among adolescent girls from low-income families in both urban and rural areas of Bangladesh, as defined by the World Health Organization (WHO). The study focused on assessing the nutritional and severe thinness status of adolescent girls aged 14-17 years from low-income families in urban and rural Bangladesh. The research aimed to identify differences in nutritional status between these two groups. This cross-sectional study used standard procedures to measure height, weight, and mid-upper arm circumference (MUAC) to calculate body mass index (BMI) according to WHO standards. A 2-day, 24-hour food recall and food frequency questionnaire were used to estimate food frequency, energy intake, and macronutrient consumption (protein and carbohydrate). The study utilized a multistage, multiphase stratified cluster sampling method to select participants from two locations: Dhaka city (urban) and Trishal in the Mymensingh district (rural). The sample included 214 adolescent girls, with 107 from each group. The study found that economic status significantly affected the nutritional status of the adolescent girls. Both urban and rural adolescents from low-income families showed poor nutritional status, but the rate of severe thinness was significantly higher among urban adolescents (22.4%) compared to rural adolescents (10.3%) (chi-square = 4.9, p -value = 0.01). This

disparity was also evident from an early age. The food intake distribution showed similar trends, with a higher percentage of urban girls reporting never eating meat and fish (29.7% and 11.4%, respectively) compared to their rural counterparts (24.4% and 6.8%, respectively). Urban adolescents also consumed significantly less rice daily than rural adolescents. Additionally, the intake of energy, protein, carbohydrate, and fat was significantly different between urban and rural girls, with urban adolescents meeting only 53% of the recommended daily energy intake (Akhter & Sondhya, 2013). The study concluded that malnutrition is prevalent among adolescent girls from low-income families in Bangladesh, with urban adolescents experiencing a higher rate of severe thinness compared to rural adolescents. This trend was evident from an early age. The findings underscore the need for targeted nutritional interventions to address the disparities between urban and rural adolescent girls in low-income families (Akhter & Sondhya, 2013).

CHAPTER 3

MATERIALS AND METHODS

3.1 Study design

A cross-sectional study design was conducted to assess the nutritional status of adolescent girls in selected urban areas of Dhaka City, Bangladesh.

3.1.1 Study location

The study location took place in urban areas of Dhaka city. Urban areas are categorized into 3 sections; 1) Commercial and Business areas: Mohakhali, Banani, Farmgate, Tejgaon, Elephant Road, Rajarbag. 2) Residential Areas: Mirpur (1, 2, 6), Dhanmondi (8, 27, 32), Mohammadpur. Sobhanbag, Adabar, Indira Road, Kalabagan, Kollanpur, Hajaribagh, Bosila, Taltola Khilgaon, Jatrabari, Zinzira and Keraniganj. 3) Mixed-use Areas (Residential and Commercial): Sukrabad, Kathalbagan, Tolatola and Shagkar.

Study locations	Responses	Percentages
Commercial and Business areas	17	17.0%
Residential Areas	78	78.0%
Mixed-use Areas (Residential and Commercial)	5	5.0%

3.2 Sampling method

A systemic random sampling method was used to ensure a representative sample of 100 adolescent girls aged 10-19 years. The sample size was determined using the following formula:

$$z \sqrt{\frac{pq}{n}}$$

Here,

Sample size = $\frac{z^2 \times p \times q}{e^2}$

e= margin of error

p= proportion of success

$$= \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{0.098^2}$$

3. q= 1-p

$$= \frac{8 \times 0.5 \times 0.5}{0.0096}$$

z= z-score

=

= 100

3.3 Data collection

Data was collected through a structured questionnaire. The questionnaire was divided into socio-demographic characteristics, dietary habits, nutritional knowledge, hygiene practices, and health status. 1) socio-demographic characteristics includes age, marital status, family size and place of residence; education of respondent, mother education, father education etc.; 2) anthropometric measurements includes height, weight, body mass index (BMI), and mid-upper arm circumference (MUAC). 3) other variables were menstruation status, knowledge on nutrition, meal frequency, food intake(FFQ), source of drinking water, and hygiene practice.

3.4 Mid-upper arm circumference (MUAC)

MUAC was measured by marking midway between acromion (shoulder) and the olecranon (elbow) on the vertical axis of the upper arm with the arm bent at right angle and between the lateral and medial surface of the arm. MUAC was assessed according to age.

According to (WHO 2008) MUAC distribution was as follows:

Table 1: Nutritional Status according to Mid-upper arm circumference (MUAC)

Category	MUAC according to age	
	10-14.9 years	15-19 years
Severe acute malnutrition (SAM)	< 16cm	< 18cm
Moderate acute malnutrition (MAM)	16-18cm	18-21cm
Normal	> 18cm	> 21cm

3.5 Data analysis

Descriptive analysis of mean, standard deviation, percentage, frequency was used. Chisquare test was done to see the association between factors. All analysis was done using the statistical package IBM SPSS 22 and 5% level of significance was considered.

3.6 Ethical considerations

Obtained written informed consent from participants or their guardians. Ensured all data are anonymized and stored securely.

CHAPTER 4

RESULTS AND DISCUSSION

4.1 Results

The sample consists of adolescent girls primarily in the 15-19 age group (60%), with the remaining 40% in the 10-14 age group. A substantial majority of the sample identify as Muslim (83%), followed by Hindus (16%) and a very small fraction belonging to other religions (1%). The result indicates that half of the families (50%) have a medium size (57 members), with small families (≤ 4 members) making up 46% and large families (≥ 8 members) only 4%. A notable 62% of the adolescent girls are in secondary education, while 28% have reached higher secondary education, and only a small fraction is in primary (9%) or above higher secondary (1%). A substantial proportion of mothers have higher secondary education (41%) or above (31%), with only a small percentage having no education (2%) or primary education (9%). Fathers show an even higher level of education, with 50% having education above higher secondary and 25% with higher secondary education. Only 1% have no education. A majority of the mothers (68%) are housewives, with the remaining 32% being job holders. Fathers are the primary income earners in 83% of the families, while mothers are the main earners in 9% of the cases, and in 8% of the families, both parents contribute to the income.

Table 2: Socio-demographic characteristics of adolescent girls (n=100)

Variables	Frequency	Percentages
Age group		
10-14 yrs. old	40	40.0%
15-19 yrs. old	60	60.0%
Religion		
Islam	83	83.0%
Hindu	16	16.0%
Others	1	1.0%
Family Size		
Small (≤ 4)	46	46.0%
Medium (5-7)	50	50.0%

Large (≥ 8)	4	4.0%
Educational Status		
Primary	9	9.0%
Secondary	62	62.0%
Higher secondary	28	28.0%
Above	1	1.0%
Mother's Education		
No Education	2	2.0%
Primary	9	9.0%
Secondary	17	17.0%
Higher secondary	41	41.0%
Above	31	31.0%
Father's Education		
No Education	1	1.0%
Primary	13	13.0%
Secondary	11	11.0%
Higher secondary	25	25.0%
Above	50	50.0%
Mother's Occupation		
Housewife	68	68.0%
Job holder	32	32.0%
Main Incoming Person		
Mother	9	9.0%

Father	83	83.0%
Both	8	8.0%

An overwhelming majority (93%) of the respondents consume rice daily, indicating it is the primary staple food in their diet. Only 6% consume it 3-4 days per week, and a mere 1% consume it 4-6 days per week. Another staple, potatoes, are consumed daily by 74% of the respondents. Fish is consumed 3-4 days per week by 72% of the respondents, indicating it is a frequent part of their diet, while only 15% consume it daily. Eggs are consumed 3-4 days per week by 52% and daily by 27%. Meat consumption is more sporadic, with 35% consuming it 3-4 days per week and 32% once per month. Only 10% consume it daily, indicating it is a less frequent part of their diet compared to fish and eggs. Pulses are consumed 3-4 days per week by 38% and daily by 27%. Vegetables are consumed daily by 66% of the respondents. Milk and milk products are consumed 3-4 days per week by 40% and daily by 26%. Only 5% consume sweets daily, while 43% have them 3-4 days per week and 35% once per month. Snacks are consumed daily by 43%, 3-4 days per week by 29%, and 21% consume them 4-6 days per weeks. Soft drinks and beverages are consumed once per month by 54% respondents.

Table 3: Food Intake patterns of the respondents

Variables	Daily	3-4 days per week	4-6 days per Week	Once per Month
Rice	93(93.0%)	6(6.0%)	1(1.0%)	--
Fish	15(15.0%)	72(72.0%)	10(10.0%)	3(3.0%)
Egg	27(27.0%)	52(52.0%)	16(16.0%)	5(5.0%)
Meat	10(10.0%)	35(35.0%)	23(23.0%)	32(32.0%)
Potato	74(74.0%)	15(15.0%)	8(8.0%)	3(3.0%)
Pulses	27(27.0%)	38(38.0%)	18(18.0%)	17(17.0%)
Vegetables	66(66.0%)	18(18.0%)	13(13.0%)	3(3.0%)
Milk and Milk Products	26(26.0%)	40(40.0%)	20(20.0%)	14(14.0%)
Sweets	5(5.0%)	43(43.0%)	17(17.0%)	35(35.0%)

Snacks	43(43.0%)	29(29.0%)	21(21.0%)	7(7.0%)
Soft Drinks Beverages	10(10.0%)	23(23.0%)	13(13.0%)	54(54.0%)

A significant 92% of respondents are aware of the six-food groups and their sources, indicating a strong foundational knowledge of basic nutrition. 79% correctly identified that bread, pasta, potatoes, and rice mainly contain carbohydrates, reflecting a good understanding of macronutrients. Surprisingly, 84% of respondents believe that eating a lot of sugar is good for one's health, which is a misconception. This indicates a critical area for nutritional education improvement. Only 50% correctly responded that consuming a lot of animal products daily is beneficial, suggesting mixed perceptions about protein intake and its health impacts. 72% believe that a heavier body equates to better health, another common misconception that highlights the need for education on healthy body weight and its relation to overall health. Only 43% correctly responded that refined grains contain fewer vitamins and minerals compared to unrefined grains, indicating a gap in understanding the nutritional value of different types of grains. Only 38% recognize the health benefits of consuming milk and dairy products, showing a significant area where knowledge is lacking. An overwhelming 96% know the importance of consuming a diet rich in fresh fruits and vegetables, indicating strong awareness of the benefits of plantbased foods. Similarly, 92% are aware of the role of vitamins in maintaining good health, showing a good grasp of micronutrient importance.

Table 4: Nutritional knowledge of the respondents

	Correct response
Questions	
Do you know the six-food group and their sources?	92(92.0%)
Bread, pasta, potatoes and rice contain mainly carbohydrates?	79(79.0%)
Eating a lot of sugar is good for one's health?	84(84.0%)
Consuming a lot of animal products daily (fish, poultry, eggs and 50(50.0%) lean meat) is good for one's health?	
Refined grains (rice and wheat flour) contain more vitamins and 43(43.0%) materials than unrefined grains?	
Choosing a diet with a lot of fresh fruits and vegetables is good for 96(96.0%) one's health?	
The heavier one's body is, the healthier he or she is?	72(72.0%)
Consuming milk and dairy products are good for one's health?	38(38.0%)

Are you aware of the role of vitamins in maintaining good health? 92(92.0%)

A large majority of the respondents (85%) obtain their drinking water from WASA (Water Supply and Sewerage Authority), while the remaining 15% use other sources such as tubewells, supply lines, or deep tubewells. This indicates a high reliance on a centralized water supply system. 78% of the respondents filter their water before drinking, demonstrating good awareness and practice of ensuring safe drinking water. However, 22% do not filter their water, which could expose them to waterborne diseases. A significant 94% of respondents wash their hands with soap before eating, highlighting strong hygiene practices. An even higher percentage (97%) wash their hands with soap after using the toilet, indicating very good compliance with essential hygiene practices. Despite the generally good hygiene practices, 69% of the respondents experienced diseases in the last two weeks. This suggests that there might be other factors contributing to health issues, such as environmental conditions, quality of water, or food safety practices that need further investigation.

Table 5: Hygiene practice of adolescent girls.

Variables	Frequency	Percentages
Drinking water source		
Wasa	85	85.0%
Others(tubewell/Supply/Deep tubewell etc.)	15	15.0%
Filter water before drinking		
Yes	78	78.0%
No	22	22.0%

Wash hand with soap before eating

Yes	94	94.0%
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Experienced diseases in last two weeks

Yes	69	69.0%
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No	31	31.0%
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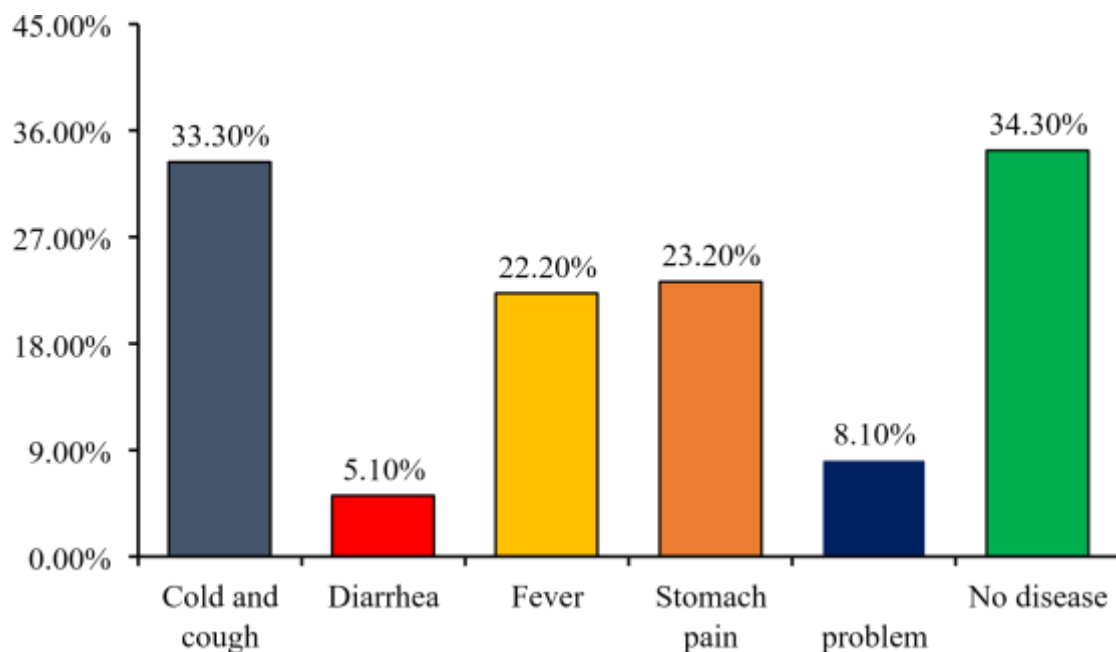
No	6	6.0%
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Wash hand after using toilet

Yes	97	97.0%
-----	----	-------

No	3	3.0%
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The most prevalent condition is cold and cough, affecting 33.3% of the respondents. Fever is reported by 22.2% of the respondents. Stomach pain affects 23.2% of the respondents. 5.1% of the respondents experienced diarrhea. 8.1% reported eye problems. 34.3% of the respondents reported no disease within the last two weeks, indicating that a significant portion of the population remains healthy despite the prevalent health issues among the rest.



Eye Figure 1: Disease prevalence of adolescent girls within last two weeks

38% of the respondents are underweight, indicating a significant portion of adolescent girls may be suffering from malnutrition or inadequate dietary intake. 50% have a normal BMI, suggesting that half of the respondents have a healthy weight status. 10% are overweight, and 2% are obese. Although these percentages are relatively low, they highlight the presence of both undernutrition and overnutrition within the same population.

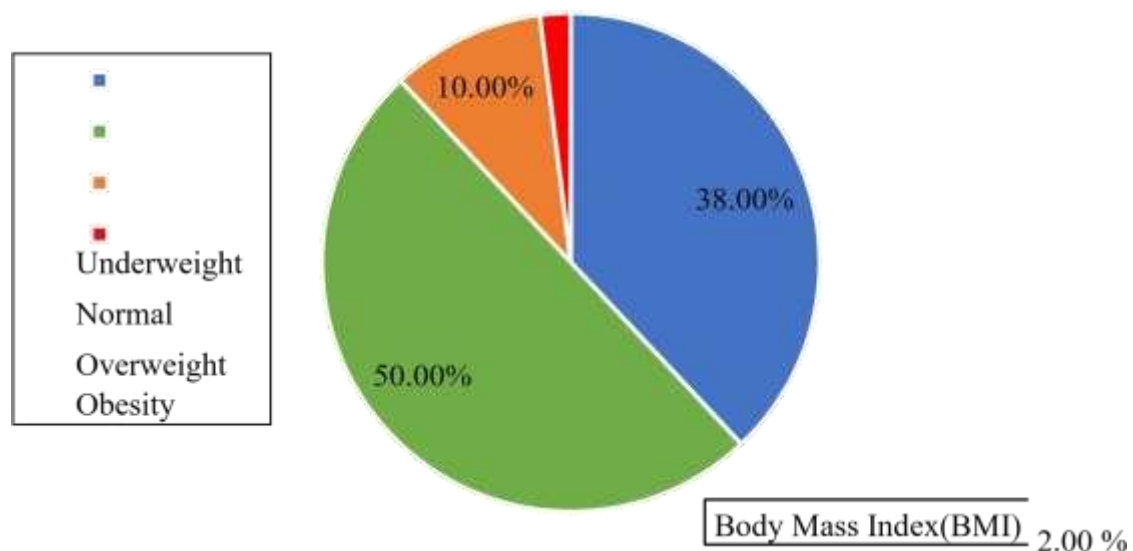


Figure 2: Nutrition status of adolescent girls.

17% of respondents fall into this category, indicating severe nutritional deficiencies that could significantly impact health and development. 14% are classified as having moderate acute malnutrition, showing a substantial portion with notable nutritional deficiencies. 69% of the respondents have a normal MUAC, suggesting that the majority are within a healthy range, although there is still a significant minority with malnutrition.



Figure 3: Mid Upper Arm Circumference(MUAC) of adolescent girls.

64% of the respondents have experienced menstruation and 36% have not experienced menstruation. 60% of respondents reported having a regular menstrual cycle and 40% reported having an irregular menstrual cycle.

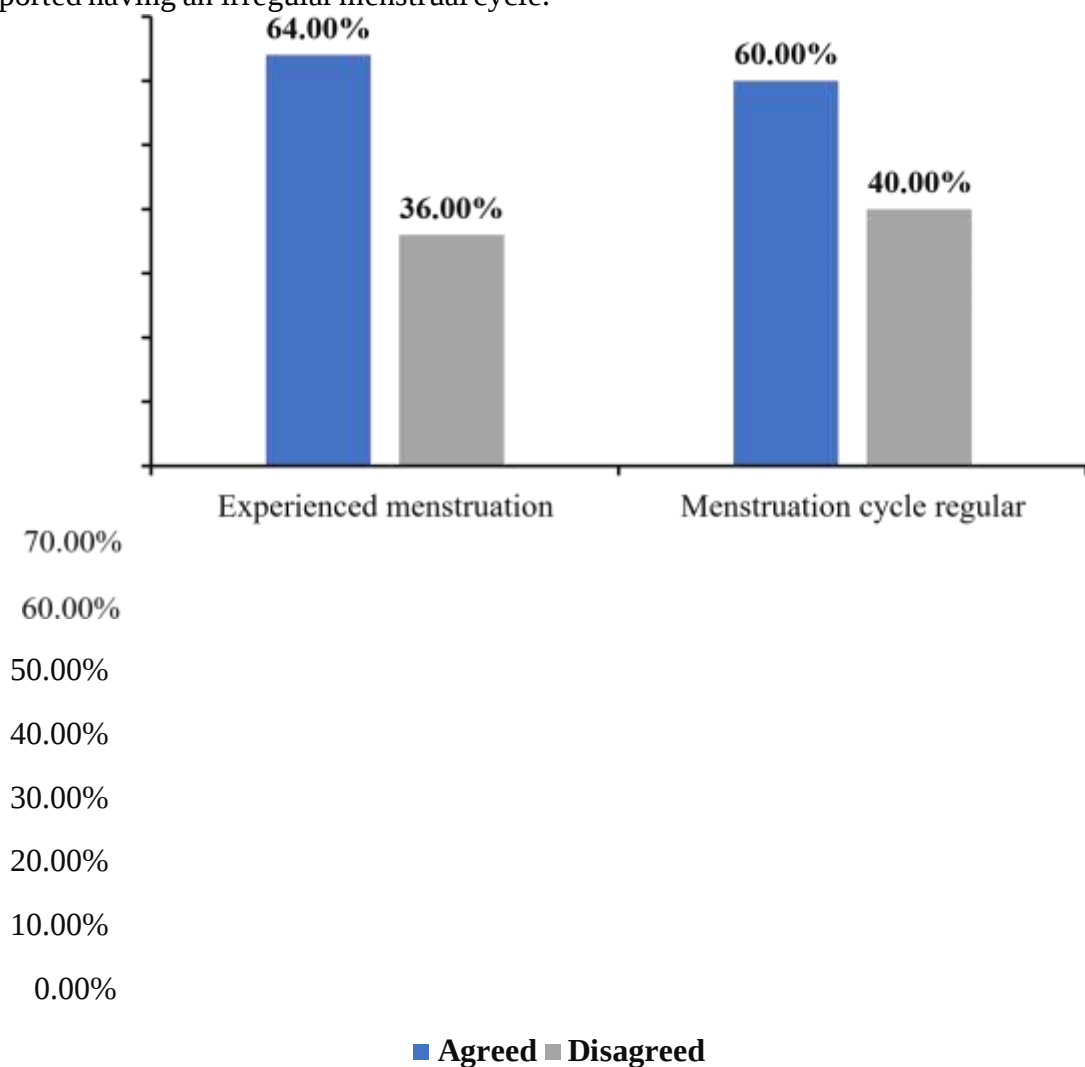


Figure 4: Menstruation related responses of the adolescent girls.

The result reveals that age group is the only variable significantly associated ($P < 0.05$) with nutritional status, with older adolescents (15-19 years) showing a higher percentage of normal BMI and lower percentages of underweight and overweight compared to younger adolescents (10-14 years). Other variables, including religion, family size, educational status, parental education, main income person, and menstruation factors, do not show statistically significant associations with nutritional status ($P > 0.05$). This suggests that age is a critical factor in the nutritional health of adolescent girls, while other sociodemographic factors may not have as strong an impact.

Table 6: Association between nutritional status and different variables among the adolescent girls(n=100).

	Nutritional Status by BMI in kg/m ²				<i>P</i> value
	Underweight	Normal	Overweight	Obesity	
Age Group					0.030*
10-14 yrs. old	20.0 %	14.0 %	6.0 %	0.0 %	
15-19 yrs. old	18.0 %	36.0 %	4.0 %	2.0 %	
Total	38.0 %	50.0 %	10.0 %	2.0 %	
Religion					0.616
Islam	31.0 %	42.0 %	9.0 %	1.0 %	
Hindu	7.0 %	7.0 %	1.0 %	1.0 %	
Others	0.0 %	1.0 %	0.0 %	0.0 %	
Family Member					0.153
Small (≤ 4)	17.0 %	23.0 %	6.0 %	0.0 %	

Medium (5-7)	18.0 %	27.0 %	3.0 %	2.0 %
Large (≥ 8)	3.0 %	0.0 %	1.0 %	0.0 %

Educational status	0.055			
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Primary	2.0 %	5.0 %	2.0 %	0.0 %
Secondary	31.0 %	25.0 %	5.0 %	1.0 %
Higher secondary	5.0 %	19.0 %	3.0 %	1.0 %
Above	0.0 %	1.0 %	0.0 %	0.0 %

Mothers Education	0.374			
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No Education	1.0 %	1.0 %	0.0 %	0.0 %
Primary	4.0 %	3.0 %	1.0 %	1.0 %
Secondary	3.0 %	11.0 %	2.0 %	1.0 %
Higher secondary	19.0 %	18.0 %	4.0 %	0.0 %
Above	11.0 %	17.0 %	3.0 %	0.0 %

Father Education	0.105			
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No Education	0.0 %	1.0 %	0.0 %	0.0 %
Primary	4.0 %	5.0 %	3.0 %	1.0 %
Secondary	2.0 %	8.0 %	0.0 %	1.0 %
Higher secondary	11.0 %	10.0 %	4.0 %	0.0 %
Above	21.0 %	26.0 %	3.0 %	0.0 %

Main Incoming Person	0.183			
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Mother	3.0 %	4.0 %	1.0 %	1.0 %
Father	34.0 %	41.0 %	7.0 %	1.0 %
Both	1.0 %	5.0 %	2.0 %	0.0 %

Experienced menstruation					0.380
Agreed	26.0	33.0	4.0	1.0	
Disagreed	12.0	17.0	6.0	1.0	
Menstruation cycle regular					0.161
Agreed	24.0	32.0	4.0	0.0	
Disagreed	14.0	18.0	6.0	2.0	

* Significant at $p < 0.05$

4.2 Discussion

This study was performed to find out the nutritional status of the adolescent girls, their Food Intake patterns, Nutritional knowledge and Hygiene practice among the adolescent. The overall underweight prevalence was found 38.0%. This finding is higher 10% than the study of Wolde et al. (2014) who found 28.0% underweight prevalence rate. The prevalence of overweight found in this study was 10.%, which is also higher, Wolde et al. (2014), who found obesity rate was 5.2%, which was higher than our findings. Ahmed et al (2010) found that the prevalence of malnutrition among the adolescent in Bangladesh was 16%. In our study we found the rate higher than this.

Disease burden was measured by self-reported morbidity within last two weeks. Prevalence of disease was found overall 33.30% cold and cough among the respondents within two weeks of the study which was higher (27.0%) than the findings obtain by the study by Alam et al. (2010). In our study, age was found to be associated with nutritional status of the adolescent girls. Undernutrition was found more among the younger age group than the older age group. Similar association with the nutritional status was also revealed in the study of Joshi et al. (2014). Other findings also found in Sarkar et al. (2015) and stated undernutrition prevalence was higher among the younger age girls then the older one.

Education had a significant effect on the nutritional status. In this study, we observed that with the increase level of education, the status of the nutritional health of the participants are tends to be increase. This result shows the similarities with the observation of the study carried out by Mulugeta et al. (2009). This could be due to the understanding of knowledge obtained about nutrition and implementing it in their practical life. This observation also represented that receiving a minimal education makes the adolescent more aware than those who have received no education. Overweight prevalence was higher among the adolescent girls whose parents received higher secondary education. The result of the study of Roba et al. (2016) also agreed with this finding.

Eating habit of adolescent studies has come to the spotlight and several studies have claimed that adolescent girls have poor dietary habit (Wolde et al., 2015). Knowledge on nutrition is one of the important predictors that contribute in the status of the nutrition. Girls having good knowledge on nutrition are more likely to have normal weight than the girls possess

less knowledge (Melaku et al., 2017). But the finding of the study conducted by Alam et al. (2010) showed negative association between the nutritional knowledge and status.

CHAPTER 5

CONCLUSION

This study sample was composed of predominantly Muslim population with balanced family sizes and a strong focus on secondary education. Despite high parental education levels, mothers mainly serve as housewives, with fathers as primary income earners. Dietary patterns reveal a reliance on staples like rice and potatoes, frequent fish and egg consumption, and irregular meat intake. Although basic nutritional awareness is high, misconceptions about sugar intake and the benefits of animal products and dairy persist. Hygiene practices are commendable, but the high incidence of illness suggests underlying environmental and food safety issues. Nutritional assessments show a significant prevalence of underweight conditions and malnutrition, particularly among younger adolescents. Age is the only variable significantly associated ($p < 0.05$) with nutritional status, highlighting the unique nutritional needs of older adolescents. These findings address the need for nutritional education and improved environmental and food safety measures. Future research should explore underlying health issues and nutritional deficiencies to inform more effective interventions aimed at enhancing the well-being of adolescent girls in the urban areas of Dhaka city.

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APPENDICES

Appendix 1: Questionnaire

Nutritional Status of Adolescent Girls in Selected Urban Areas of Dhaka City in Bangladesh

Questionnaire

Date: ____/____/2023

Serial no:

1. Name of the respondent: _____

2. Religion: ☐Islam(1) ☐Hindu(2) ☐Others(3)

3. Height in ft inch: _____

4. Weight in kg: _____

5. BMI in kg/m² : _____

6. MUAC in cm: _____

Demographic Data 7.

Age of the respondent:

☐ 10	☐ 11	☐ 12	☐ 13	☐ 14	☐ 15	☐ 16	☐ 17	☐ 18	☐ 19
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8. Living area: _____

9. Family member: _____

Socio-economic conditions

10. Educational qualifications

Academic literacy					
	No Education(1)	Primary(2)	Secondary(3)	Higher secondary(4)	Above(5)
Respondent's	☐	☐	☐	☐	☐
Mother's education	☐	☐	☐	☐	☐
Father's education	☐	☐	☐	☐	☐

11. Who is the main incoming person of the family?

12. What is the mothers' occupation? ☐Housewife(1) ☐Job holder(2) ☐Others(3)

13. Food intake Pattern(Akter et al., 2017)

Food Items	Daily(1)	3-4 days per week(2)	4-6 days per Week(3)	Once per Month(4)
Rice	☐	☐	☐	☐
Fish	☐	☐	☐	☐
Egg	☐	☐	☐	☐
Meat	☐	☐	☐	☐
Potato	☐	☐	☐	☐
Pulses	☐	☐	☐	☐
Vegetables	☐	☐	☐	☐
Milk and milk products	☐	☐	☐	☐
Sweets	☐	☐	☐	☐
Snacks	☐	☐	☐	☐
Soft drinks/Beverages	☐	☐	☐	☐

Nutritional knowledge (Yu et al., 2020)

14. Do you know the six-food group and their sources? ☐ Yes(1) ☐ No(2)

15. Bread, pasta, potatoes and rice contain mainly carbohydrates? ☐ Agree(1) ☐ Disagree(2)

16. Eating a lot of sugar is good for one's health? ☐ Agree(1) ☐ Disagree(2)

17. Consuming a lot of animal products daily (fish, poultry, eggs and lean meat) is good for one's health? ☐ Agree(1) ☐ Disagree(2)

18. Refined grains (rice and wheat flour) contain more vitamins and materials than unrefined grains? ☐ Agree(1) ☐ Disagree(2)

19. Choosing a diet with a lot of fresh fruits and vegetables is good for one's health?

☐ Agree(1) ☐ Disagree(2)

20. The heavier one's body is, the healthier he or she is? ☐ Agree(1) ☐ Disagree(2)

21. Consuming milk and dairy products is good for one's health? ☐ Agree(1) ☐ Disagree(2)

22. Are you aware of the role of vitamins in maintaining good health? ☐ Yes(1) ☐ No(2)

Hygiene practice

23. What is the source of your drinking water? ☐Tubewell(1) ☐Wasa(2) ☐Others(3)

24. Do you filter water before drinking? ☐Yes(1) ☐No(2)

25. Do you wash your hand regularly with soap before eating? ☐Yes(1) ☐No(2)

26. Do you wash your hand regularly after toilet? ☐Yes(1) ☐No(2)

Morbidity related information

27. Did you experience any diseases in last two weeks? ☐Yes(1) ☐No(2)

28. If yes then, which disease was that?

☐ Cold & cough	☐ Respiratory problem	☐ Eye problem
☐ Diarrhea	☐ Stomach pain	
☐ Fever	☐ No Disease	

29. Have you experienced menstruation? ☐Yes(1) ☐No(2)

30. Is your menstruation cycle regular? ☐Yes(1) ☐No(2)

I willingly gave answers to all these questions.

Respondent's Sign: _____

Appendix 2: Synopsis Daffodil International University Department of Nutrition and Food Engineering (NFE) Faculty of Health and Life Sciences Daffodil International University Daffodil Smart City, Birulia, Savar, Dhaka – 1216, Bangladesh

1. Student's Name: Syada Husnun

2. ID: 193-34-1012

1. Title: Nutritional Status of Adolescent Girls in Selected Urban Areas of Dhaka City in Bangladesh.

2.Introduction

Adolescent girls represent a critical demographic in Bangladesh, particularly in urban areas where rapid urbanization and socio-economic disparities can significantly impact health

outcomes (Akter et al., 2017). Understanding their nutritional status is essential as it influences their growth, development, and future health, as well as the health of future generations (Yu et al., 2020).

3.Objectives

The primary objective of this study is to evaluate the nutritional status of adolescent girls aged 10-19 years in selected urban areas of Dhaka City. The study aims to identify the prevalence of undernutrition, including SAM, MAM and examine associated factors such as socio-economic status, and educational levels, FFQ etc.

4.Methodology

This cross-sectional study involves a representative sample of adolescent girls from lowincome families in various urban neighborhoods of Dhaka City. Data collection includes:

- **Anthropometric Measurements:** Height, weight, and mid-upper arm circumference (MUAC) are measured using standard procedures to calculate body mass index (BMI) according to WHO standards.
- **Dietary Assessment:** A food frequency questionnaire will be used to estimate food consumption patterns.
- **Socio-Demographic Survey:** Information on socio-economic status, educational background, and household income is gathered through structured questionnaires.

5.Sample size

The sample size was determined using the following formula:

Here, e= margin of error; p= proportion of success; q= 1-p; z= z-score

$$\begin{aligned} \text{Sample size} &= \frac{z^2 pq}{e^2} \\ &= \frac{(1.96)^2 \times 0.5 \times (1 - 0.5)}{0.098^2} \\ &= \frac{3.8 \times 0.5 \times 0.5}{0.0096} \\ &= 100 \end{aligned}$$

5.Data analysis

Data will be analyzed using SPSS version 22 manufactured by IBM. Descriptive statistics and Chi-square test will be analyzed at significance level of 0.05.

6.Expected outcome

The study will reveal that several characteristics of the adolescent girls in these urban areas suffer from various forms of undernutrition. The study will reveal prevalence of

undernutrition, overweight and obesity, also SAM, MAM. Food consumption pattern will be revealed along with nutritional knowledge and hygiene practice.

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Signature of Supervisor	Signature of fellow

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