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Original Research Article

Study on Nutritional Status of the Adolescent Relationship with their Socio-Economic Status in Bagha, Rajshahi

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Abstract: *Background:* Adolescents' nutritional status is crucial to their overall health and development. Various socio-economic factors play significant roles in influencing this status, especially in rural areas. *Objective:* The study aimed to identify the factors contributing to adolescents' nutritional status and to examine the relationship between these factors and the adolescents' socio-economic characteristics in Bagha, Rajshahi. *Method:* Data were collected from 250 adolescents using structured interview schedules. Key variables studied included the adolescents' education, mothers' education, family income, food intake, and nutritional knowledge. Correlation and multiple linear regression analyses were conducted to evaluate the associations between these variables and the adolescents' BMI and nutritional status. *Result:* The study revealed that adolescents' BMI had significant positive correlations with their education, mothers' education, family income, food intake, and nutritional knowledge. An inverse correlation was found between nutritional status and disease information. Other factors, such as gender, religion, family size, fathers' education, and hygiene practices, showed positive but non-significant associations. Negative, non-significant correlations were observed with age, physical activity, transportation, leisure activities, and participation in nutrition programs. A substantial majority (89.6%) of respondents were inactive in calorie intake, with only 2.4% being active. Most adolescents (79.6%) were underweight, while 20% had normal weight. Most mothers (63.3%) and fathers (55%) had primary-level education. Multiple linear regression analysis indicated that annual family income, food intake, and nutritional awareness were positively correlated with nutritional status, whereas disease information had a significant negative correlation. *Conclusions:* The findings highlight the critical impact of socio-economic factors on adolescents' nutritional status. Improving educational and economic conditions and enhancing nutritional awareness are essential for better health outcomes among adolescents.

Keywords: Adolescent, Nutritional Status, Rural Area, BMI, MUAC, Hygiene.

INTRODUCTION

Nutrition during adolescence is essential for future longevity [1]. About 20% of the world's population are adolescents, ranging between 10 to 19 years, and 23% of Bangladeshi inhabitants. Transitioning from childhood to adulthood can cause major physiological, psychological, and other body changes. Adolescents' health depends on several factors, including age, gender, knowledge, families, physical and biological environment, social values, etc. Sex, age, and fathers' occupation substantially affect nutritional status. Adolescent's nutritional status is significantly impacted by their mothers' literacy and professional position [2].

Nutritional information and associated factors regarding this larger group may back the achievement of the health goal of the Bangladesh government. Unfortunately, the global adolescent population has been suffering from malnutrition and obesity. These are, in particular, major public health concerns in developing

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regions, especially in Asia. Almost 1200 million adolescents and 19% of the total population in the developing world suffer from malnutrition [3]. In Bangladesh, specific to gender, 32% of the adolescent girls were underweight.

With a population of over 150 million and one of the world's densest populations (881/sq km), Bangladesh was one of the poorest nations, with 60 million residents (40%) living below the poverty line. A critical period in their lives is adolescence. Adolescents gain up to 50% of their adult weight at this time, 20% or more of adult height, and 50% of adult bone mass [4]. Maximum calorie and protein requirements and rising demands for other nutrients including iron, calcium, and vitamins, are also present. In average, adolescents did not seem to increase their caloric consumption as they got older, according to a US study. 16% of the global population is made up of adolescents, and 85% of them live in poor nations. Adolescents make up about 22% of the population in Bangladesh. Teenagers from Low- and Middle-Income Countries (LMCs) are more likely to be undernourished, not with increased nutrition in recent years. The term "individual-level double burden of malnutrition" (IDBM) refers to the simultaneous development of two types of malnutrition [5].

Nutrition plays a crucial role in the advancement of human life. Unfortunately, most of the adolescent boys and girls especially from rural areas in Bangladesh, are greatly suffering from chronic malnutrition. Due to rapid growth in the adolescent period, they must satisfy the additional nutritional demands. Undernutrition is more prevalent in Bangladesh due to inadequate intake of nutrient-rich foods. Factors regarding reproduction also make girls adolescents more vulnerable than boys [6].

The teenage years are considered one of the most important times for physical growth and development. In general, an individual goes through various distinct changes during this time. Except for the brain and the skull, almost every system and organ of the body experiences growth during adolescence, including the skeleton, muscles, and nearly all other organs. The requirement for energy, protein, and other nutrients rises during adolescence because of the faster pace of growth. It's been established that a protein shortage slows adolescent growth. Teenagers constitute the next generation of any nation, and it is widely acknowledged that they represent a crucial moment in life for societal well-being. The dietary needs of adolescents are extremely important and crucial in most poor nations, yet they are also neglected more than other population groups like children and women. Meeting the nutritional needs of adolescents could be a crucial step in ending the cycle of poverty, chronic disease, and intergenerational malnutrition [7].

Bangladesh has seen a significant decline in under-nutrition prevalence and is likely to meet the MDG for nutrition. The incidence of micronutrient deficiency remains quite high and is regarded as a serious public health issue even though numerous efforts have been made over the years to address the issue. The study and discussions around creating a strategy to address micronutrient deficiencies have provided an opportunity to analyze the achievements and difficulties of current interventions and the current micronutrient status among children and women in the nation [8].

Chronic malnutrition also lowers physical power and productivity since it is linked to lean body mass. Therefore, it is important to concentrate on the causes of adolescent malnutrition to avoid its negative effects. Previous studies suggested that various environmental factors influence adolescents' nutritional status, including family, socio-economic level, and socio-demographic characteristics. Age, sex, and the mother's educational level are specific factors adolescents have. Adolescents' nutritional condition was also related to their lack of understanding about nutrition and meal skipping [9]. They are considering the high prevalence of adolescent malnutrition and several setting-specific factors. The same measurer was used for each anthropometric measurement to reduce variability. Awareness of the factors that lead to malnutrition in adolescent boys and girls may help create strategies for improving their nutritional status.

OBJECTIVES
General Objective
- To assess the nutritional status of adolescents and identify the socio-economic factors influencing their nutritional health in Bagha, Rajshahi.

Specific Objectives
- To identify variables that affect the nutritional health of adolescents in the study area.
- To determine the factors influencing the nutritional status and incidence of malnutrition among adolescents in the research area.

MATERIAL AND METHODS
Study Design
This cross-sectional study was conducted in the rural area of Bagha, Rajshahi, to assess the nutritional status of adolescents and identify the socio-economic factors influencing their health. A total of 250 adolescents were selected using a stratified random sampling technique. Data were collected through structured interviews using a validated questionnaire translated into Bangla. The study design included both quantitative and qualitative methods to capture a comprehensive view of the factors affecting adolescent nutrition. The collected data were analyzed using correlation and multiple linear regression analyses to

determine the relationships between socio-economic variables and nutritional status.

Inclusion Criteria
- Adolescents aged between 12 and 18 years.
- Residents of the rural area of Bagha, Rajshahi.
- Adolescents who provided informed consent to participate in the study.
- Adolescents whose parents or guardians also provided consent for their participation.
- Willingness to participate in the interview and provide accurate information.
- Availability during the data collection period.

Exclusion Criteria
- Adolescents outside the age range of 12 to 18 years.
- Non-residents of the rural area of Bagha, Rajshahi.
- Adolescents or parents/guardians who did not provide informed consent.
- Adolescents with any medical conditions or disabilities that could affect nutritional status and skew results.
- Adolescents who were unwilling or unavailable to participate in the study.
- Adolescents who provided incomplete or unreliable responses during the interviews.

Data Collection

Data were collected from 250 adolescents in Bagha, Rajshahi. A validated questionnaire was translated into Bangla to gather information on socio-economic factors, nutritional knowledge, and dietary habits. After obtaining informed consent, the interviews were conducted with both adolescents and their parents. Multiple visits were made to ensure data completeness and accuracy. The collected data included variables such as education, family income, food intake, and nutritional awareness, all crucial for analyzing the nutritional status of the respondents.

Data Analysis

The collected data were analyzed using SPSS version 26. Descriptive statistics were used to summarize the demographic and socio-economic characteristics of the respondents. Correlation analysis examined the relationships between socio-economic factors and nutritional status, measured by BMI. Multiple linear regression analyses were conducted to identify the key predictors of adolescent nutritional status. Statistical significance was set at $p < 0.05$. The results provided insights into the factors influencing malnutrition and guided the development of targeted interventions to improve adolescent health in the study area.

Ethical Considerations

Ethical approval was obtained from the relevant institutional review board of Varendra University, Rajshahi. Informed consent was secured from both adolescents and their parents or guardians. Confidentiality and anonymity of the respondents were maintained throughout the study. Participants were informed about the study's purpose, procedures, and their right to withdraw at any time without any consequences. Data were stored securely and used solely for research purposes, ensuring compliance with ethical standards in human subject research.

RESULTS

Various characteristics of adolescents might influence their nutritional status. In the present study, sixteen characteristics of adolescents were selected, including age, gender, religion, family size, and number of children. Provides a summary of the key traits of the respondents' characteristics.

Table 1: Selected personal characteristics of adolescents (n=250)

Determinants	Frequency	Percentage (%)	Mean	SD
Age (Years)				
10.00	48	17.5		
11.00	67	26.8		
12.00	64	25.6	11.7	1.18
13.00	57	22.8		
14.00	14	5.6		
Gender				
Male	179	71.6	1.28	0.45
Female	71	28.4		
Religion				
Muslim	111	92.5	1.13	0.34
Hindu	9	7.5		
Family size				
Small (<4)	2	1.7		
Medium (4-6)	114	95.0	4.9	0.84
Large (>6)	4	3.3		
Number of child				
No child	115	46		
One child	87	34.8	0.73	0.76
Two child	48	19.2		
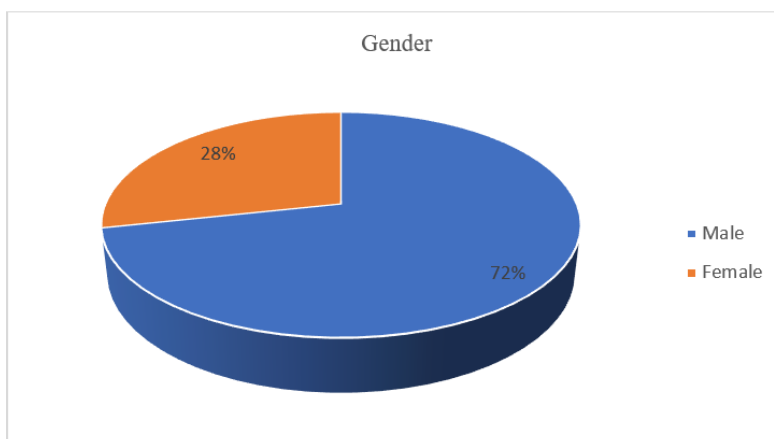
Figure 1: Demographic Characteristics According to Age

The table provides demographic details of the adolescents studied. The majority (26.8%) were 11 years old, with a mean age of 11.7 years (SD = 1.18). Gender distribution shows 71.6% male and 28.4% female. Most respondents were Muslim (92.5%), with a small Hindu minority (7.5%). Family size was predominantly medium (95%), with an average size of 4.9 members (SD = 0.84). Regarding the number of children in the family, 46% of families had no children, 34.8% had one child, and 19.2% had two children, with a mean of 0.73 children per family (SD = 0.76). This data highlights the socio-demographic background of the sample, crucial for understanding the study's findings on nutritional status.

**Table 2: Socio-economic status of adolescents (n=250)**

Determinants	Frequency	Percentage	Mean	SD
Annual family income (000'TK)				
Poor (<70)	50	20		
Normal (70-150)	177	70.8	99.66	38.43
Fair (>150)	23	9.2		
Respondent education				
Primary	86	34.4	1.66	0.48
Secondary	164	65.6		
Mothers' education				
Illiterate	60	24.0		
Primary	126	50.4	1.02	0.71
Secondary	64	25.6		
Father's education				
Illiterate	66	26.4		
Primary	103	41.2	1.06	0.77
Secondary	81	32.4		

The table outlines the socio-economic status of 250 adolescents. Annual family income shows that 70.8% of families fall in the "normal" income range (70-150k TK), with an average income of 99.66k TK (SD = 38.43). In terms of education, 65.6% of respondents had secondary education, while 34.4% had primary education. Mothers' education levels were primarily at the primary level (50.4%), with 24% being illiterate and 25.6% having secondary education. Fathers' education showed 41.2% with primary education, 32.4% with secondary education, and 26.4% illiterate. This data highlights that most adolescents come from families with moderate income and parents with basic education levels, influencing their nutritional status and overall well-being.

Table 3: Distribution of respondents based on their BMI

Categories	Frequency	Percentage	Mean	SD
Underweight (<18.49)	199	79.6		
Normal (18.5-24.99)	50	20.0		
Overweight (25-29.99)	1	0.4		
Obesity grade 1 (30.0-34.99)	0	0	16.73	2.24
Obesity grade 2 (35.0-39.99)	0	0		
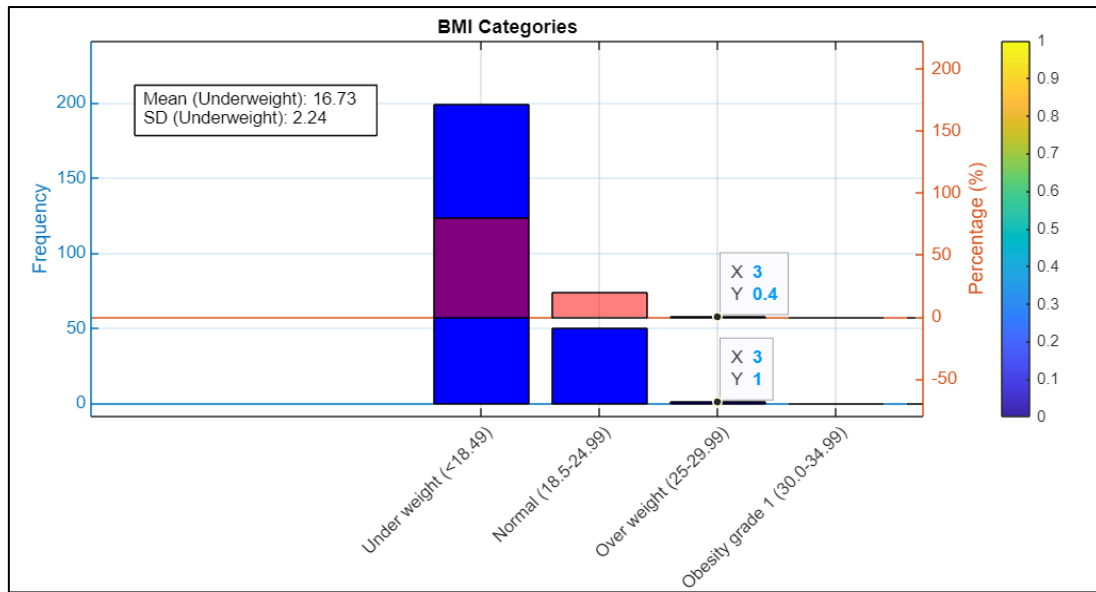
Figure 2: Distribution of Respondents According to BMI Categories

The BMI distribution of the 250 adolescent respondents. A significant majority, 79.6%, were underweight with a BMI below 18.49, having a mean BMI of 16.73 (SD = 2.24). Normal BMI (18.5-24.99) was observed in 20% of the respondents. Only 0.4% were overweight (BMI 25-29.99), and no respondents fell into obesity grades 1 or 2 (BMI 30.0-34.99 and 35.0-39.99, respectively). This indicates a high prevalence of undernutrition among the adolescents studied, highlighting the need for targeted nutritional interventions to address this public health concern in rural areas.

Table 4: Hygiene practice and disease information of adolescent

| Characteristic	Minimum	Maximum	Mean	SD
Hygiene practice	15.00	18	16.64	1.07
Disease information	1.00	9.00	5.17	1.52

The table highlights the hygiene practices and disease information among adolescents. Hygiene practice scores ranged from 15 to 18, with a mean of 16.64 (SD = 1.07), indicating good hygiene habits. Disease information scores ranged from 1 to 9, with a mean of 5.17 (SD = 1.52), suggesting moderate awareness of disease-related information. These findings imply that while adolescents maintain relatively good hygiene, there is variability in their knowledge about diseases, which could impact their overall health and nutritional status. Enhanced health education could improve disease awareness and further support adolescent health.

Table 5: Relationship between the selected characteristics of adolescents BMI

Adolescent BMI	Correlation co-efficient (r)	Remarks
Age	0.14*	Moderate Relation
Gender	-0.02	No Relation
Religion	0.09	No Relation
MUAC	0.30**	Strong Relation
Child	0.10	No Relation
Family Size	0.06	No Relation
Respondents Education	-0.01	No Relation
Mother Education	0.09	No Relation
Father's Education	0.04	No Relation
Income	0.15*	Moderate Relation
Physical Activity	-0.01	No Relation
Participation Nutrition Program	-0.08	No Relation
Hygiene Practice	-0.05	No Relation
Food Intake	0.22**	Strong Relation
Disease Information	-0.06	No Relation
Nutritional Knowledge	0.20*	Moderate Relation
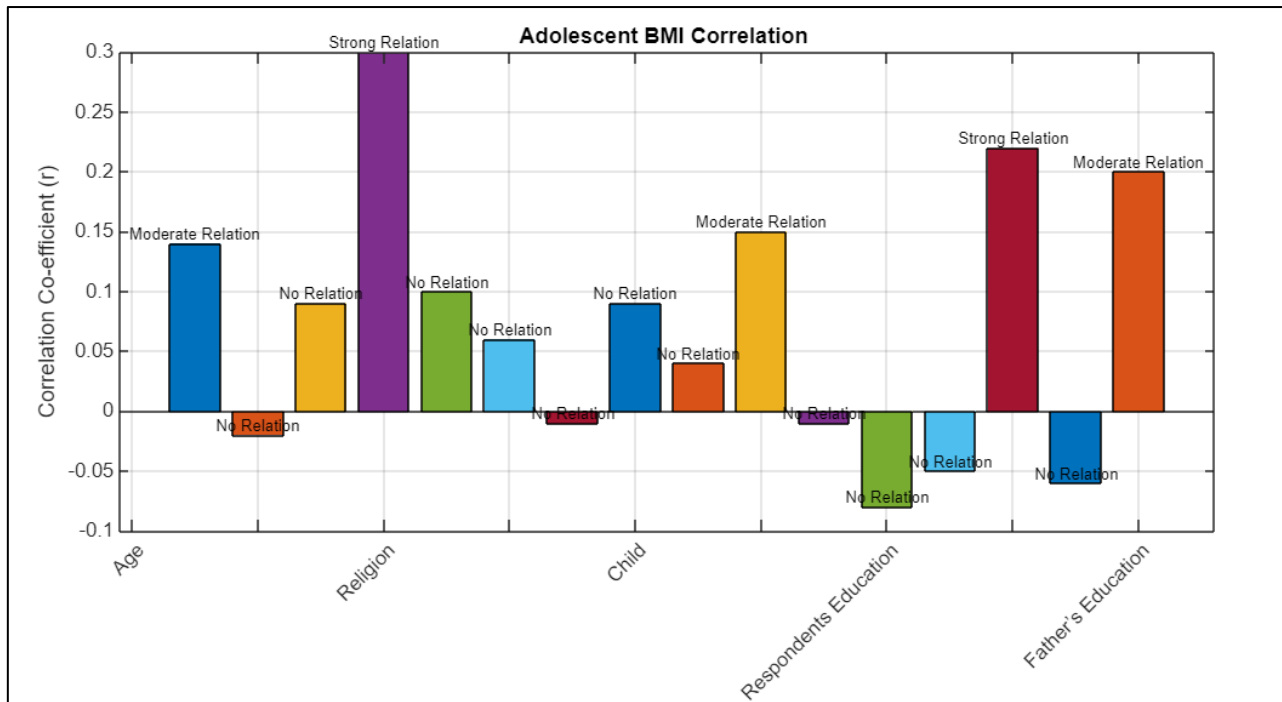
Figure 3: Correlation Between Selected Characteristics and Adolescent BMI

The relationship between selected characteristics of adolescents and their BMI using correlation coefficients. Age (r = 0.14*) and income (r = 0.15*) have a moderate positive relationship with BMI. MUAC (Mid-Upper Arm Circumference) (r = 0.30**) and food intake (r = 0.22**) show a strong positive correlation, indicating significant influences on BMI. Nutritional knowledge (r = 0.20*) also has a moderate positive relationship. No significant relationships were found with gender, religion, family size, respondents' education, mothers' education, fathers' education, physical activity, participation in nutrition programs, hygiene practice, or disease information. These findings suggest that food intake, MUAC, income, and nutritional knowledge are key factors affecting adolescents' BMI in the studied population.

DISCUSSION

The respondents who were in their early adolescent years ranged in age from 10 to 14. The mean and standard deviation were 11.76 and 1.26, respectively. A score of one was assigned for each year of their age [10]. The respondents were (71.6%) male and (28.4%) female. The religion of the respondent was (92.5%) Muslim and (7.5%) Hindu. The respondents ' BMI ranged from 12.33 to 28.67, with a mean of 16.73. According to BMI values, (79.6%) of the population was underweight, (20%) was of normal weight, and (0.4%) was overweight. The majority of respondents were underweight. They had a terrible nutritional state. In Bangladesh, up to 31 percent of adolescent girls (15–19 years old) were undernourished (body mass index (BMI) <18.5) [11].

The annual family income of the respondents ranged from (000'TK) 50 to (000' TK) 200. The mean and standard deviation of data distribution were 99.66 and 38.43, respectively. Low-income family income was (20%), normal family income was (70.8%), and fair family income was (9.2%). The majority of the respondents had normal family income. A similar result was found by [12]. Respondent's physical activity ranged from 1 hour to 5 hours. The mean and standard deviation of data distribution were found to be 3.13 and 0.78, respectively. The majority of the respondents were physically active. All respondents were active in physical activity, a positive sign of nutritional status [13]. Respondent participated in the nutrition program for a maximum of 1 time. The mean and standard deviation of data distribution were found to be 0.05 and 0.22, respectively. Not participation (91.7%) and one-time participation (8.3%). The majority of the respondents did not participate in the nutrition program.

Respondents' nutritional knowledge ranged from 2 to 8, and they answered nutrition-related questions out of 10. The mean and standard deviation of data distribution were 4.78 and 1.38, respectively. The majority of the respondents did not have good nutritional knowledge. Respondent disease information score ranged from 1 to 9. The mean and standard deviation of data distribution were 5.52 and 1.55, respectively. The majority of the respondents were affected by various diseases. A similar result was found by [14,15]. Non-staple foods, including eggs, beef, fish, dal, milk, paratha, bread, puris, and ice cream, were not often consumed in the research region. The average respondent's food consumption was puri 0.67%, milk 10.14%, ice cream 0.93%, paratha 1.44%, bread 1.12%,

rice 47.04%, egg 2.67%, fish 9.24%, meat 6.96%, dal 14.71%, dried fish 0.91%, and biscuits 2.72%. The respondents consumed a high percentage of carbohydrates and low percentage of protein. A similar result was found [16-18].

CONCLUSION

Based on the findings, discussion, and logical interpretation, the researcher drew the following conclusions: Most respondents were inactive due to low-calorie intake. About 89.6% of respondents were low active and only 2.4% were active in calorie intake. Again, most of the respondent's family income was normal but not fair. About 95% of respondents' family size was medium. Respondents' food intake and family income had a positive and significant relationship with their BMI, and calorie levels were correlated with their nutritional status. The findings indicate that most respondents were underweight about 79.6%, only 20% were normal weight.

Conflict of interest: None declared

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