



## **Effect of Dietary Diversity and Dietary Behaviors on Nutritional Status of Selected Young Women from Dhaka City, Bangladesh**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. Authors MRA, MAHB and LCS had designed the study and wrote the first draft of the manuscript. Author SR helped with the correction of the draft manuscript and statistical analysis. Authors NN and RK supervised the data collection and helped with the literature review. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Aims:** A balanced diet includes a variety of foods from different food groups that are essential for healthy growth and development. The primary goal of this paper was to assess the outcome of dietary diversity and its related factors on nutritional status among young girls in Dhaka city.

**Study Design:** The study was a cross-sectional study.

**Methodology:** The total number of 100 young girls aged 18 to 25 from four selected areas of Dhaka city were interviewed by a structured questionnaire on dietary diversity, dietary behavior, socio-demographic status and different anthropometric assessment were done using standard technique.

**Results:** Our study revealed that more than half (55%) of the participants had normal nutritional status, and 12% of the young women were under-weight. The prevalence of overweight and obese

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were respectively 26% and 7%. The study exhibited a significant correlation between nutritional status with different dietary habits and various food groups. 45% of the study participants had an acceptable dietary diversity score and there was no significant association between dietary diversity score and BMI of young girls.

**Conclusion:** The nutritional status of the study participants depicted a portrait of the double burden of malnutrition, and the overall nutritional status is shifting more towards overweight and obesity. It also indicates that the dietary diversity score of the selected young girls of Dhaka city is satisfactory, although their knowledge about dietary behavior needs to be improved.

*Keywords: Dietary diversity; nutritional status; food habit; dietary behavior; young women.*

## ABBREVIATIONS

*IDDS* : Individual Dietary Diversity Score  
*BMI* : Body Mass Index  
*SD* : Standard Deviation

## 1. INTRODUCTION

Dietary diversity is defined as the consumption of an adequate variety of food groups. Human health and intake of sufficient quantity and quality of food are hermetically related [1]. Chronic diseases can be prevented by consuming a diet with adequate diversity [2]. It is exhibited that higher energy intake [3], as well as overweight and obesity, is associated with a dietary variety [4]. It is suggested that the risk of developing a deficiency or excess of any one nutrient is minimized by means of consumption of a varied diet; it may, therefore, somehow be attached to the dietary nutrient quality [5]. Food variety gives several dimensions to human health. The first is that it emboldens biodiversity and sustainability, the second, it accommodates for nutritional adequacy, the third is that it reduces the adverse consequences of food on health, and the fourth is that it provides for interest in food and the expectancy that it will be eaten. The fifth is that it minimizes the percentage of cancer, cardiovascular, and other chronic diseases [6]. Dietary diversity at the household or individual level is commonly measured by counting the number of food groups rather than the food items consumed. At the household level, dietary diversity is usually deliberated as a measure of access to food (e.g., of households' capacity to access costly food groups), while at the individual level, it ruminates dietary quality, mainly the micronutrient adequacy of the diet [3]. Human health is benefited from the consumption of a variety of foods from various food groups. The nutritional status of individuals is affected by dietary variety and nutritional adequacy with regard to the essential vitamins and minerals, distribution of food within the household. In addition, nutrition and, in turn, the health of an

individual is also influenced by the preparation of food and feeding practices [7].

Obesity is a medical condition in which excess body fat as deposited to the extent that it may have a nugatory effect on health. Obesity is destined by a body-mass index (weight divided by the square of the height) of 30 kg/m<sup>2</sup> or higher [8]. The rising burden of obesity is associated with globally changing motifs of food intake both in quality and quantity and an increase in physical inactivity due to the increasingly sedentary lifestyle, changing modes of transportation, and increasing urbanization. Premature death through increased risk of many chronic diseases, including type-2 diabetes (T2D), cardiovascular disease, and cancer.1 are related to overweight and obesity [9]. Obesity was identified as a global epidemic in the 21st century by The World Health Organization. In the year 2010, the organization evaluated that at about 300-400 million adults were obese [10]. Females have a higher percentage of obesity than males, and it has been revealed that this may be connected to gender differences in the brain's response to hunger and satiety [11]. Moreover, the prevalence of obesity among children is alarming in Bangladesh [12]. A decreased rates of breastfeeding initiation is a result of Pre-pregnancy obesity and excessive gestational weight gain [13]. Over-weight or obese before conception is responsible for lower prolactin response of women [14].

The aim of the present study was to evaluate the food consumption pattern, nutritional status, and dietary diversity of young girls aged 18 to 25 from Dhaka city in Bangladesh and receive the relationship between dietary diversity and the nutritional status in the region.

## 2. METHODOLOGY

### 2.1 Study Design

This study was a cross-sectional study.

## 2.2 Study Participants and Sampling Procedure

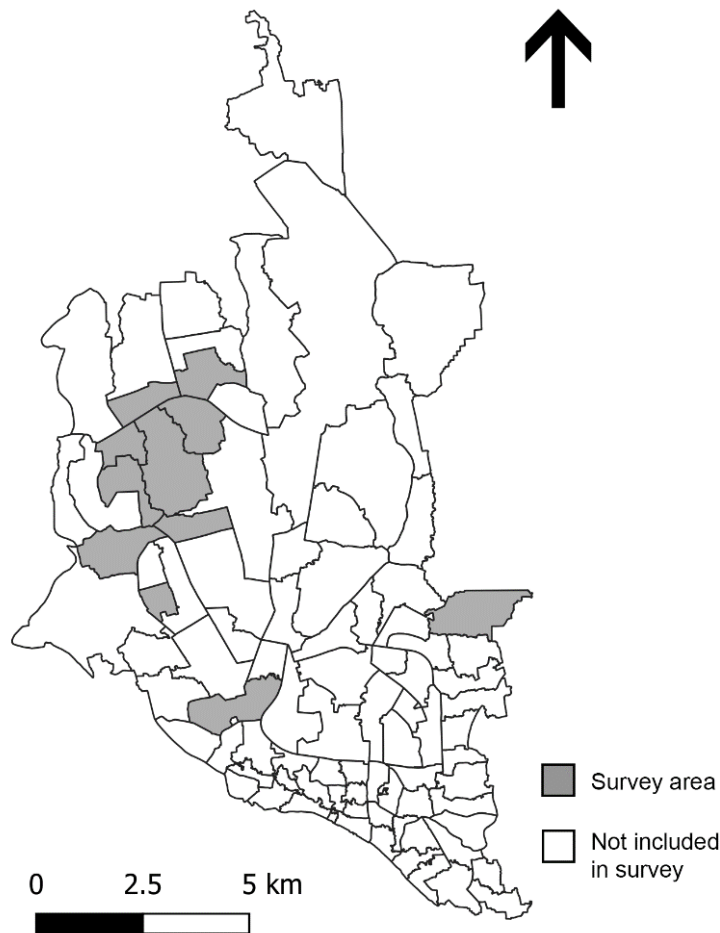
A total number of 100 women aged between 18 to 25 years were selected from four different areas (i.e., New market, Azimpur, Mirpur and Mohammadpur) this study (Fig. 1). Pregnant women and girls with edema were excluded from this study.

The sample population was selected by a multistage sampling method where the area for the study was selected by convenience sampling, and subjects were selected by a simple random sampling method. The study was designed as per the declaration of Helsinki. Since this study was an observational study, the necessity of ethical approval was waived by the

ethics committee of Noakhali Science and Technology University.

## 2.3 Data Collection Procedure

We interviewed the selected 100 students separately without influencing them in their responses. Height, weight, waist, and hip measurements of study subjects were measured with precision by standard techniques recommended by WHO. Following indices: BMI, Waist hip ratio were calculated. Demographic, socioeconomic, dietary data, and health behavior-related data were collected by a carefully formulated questionnaire. Dietary assessment was done by the food frequency questionnaire method. The questionnaire was pre-tested, and necessary adjustments were made prior to the study.



**Fig. 1. Outline of the survey area**

*The grey area on the map represents the areas included in the study and the white area represents areas excluded from the current study. This map was created using QGIS software (version 3.12.0)*

**2.4 Statistical Analysis**

Data were analyzed using SPSS software (version 23.0). Categorical data are presented as percentages, and continuous data are presented as mean and standard deviation. Association between two continuous variables was checked using the chi-square test. A p-value of less than 0.05 was denoted as statistically significant.

**3. RESULTS**

Among 100 females, most of the girls were students (98%). 87% are unmarried, only 13% are married. As our country is a Muslim country, so most of the girls (86%) were Muslim. Mean and standard deviation of weight and height were  $56.47 \pm 11.78$  and  $157.46 \pm 5.337$ , respectively. Mean waist circumference and mean hip circumference were  $82.37 \pm 11.314$  and  $94.92 \pm 12.755$ , respectively, in this study. The mean waist-hip ratio in this study was  $0.87 \pm .065$  (Table 1).

In this study, more than half (55%) participants had optimum nutritional status, while 12% of participants were under-weight. The prevalence of overweight and obesity was 26% and 7%, respectively.

In our present study, nearly half of the young girls (46%) had satisfactory dietary diversity

scores. The prevalence of medium and poor dietary diversity was 39% and 15%, respectively, among the young girls of Dhaka. Girls who had good dietary diversity scores amid them 11% were overweight and 4% were obese. There was no significant association between dietary diversity score and BMI (Table 2).

The cross-tabulation between BMI status and skipping breakfast per day shows that 14% of girls who always skipped breakfast 6% of them were overweight. 24% of girls were skipped breakfast sometimes (2-3 times/week); among them, 3% of samples were obese, and 2 3% were never skipped breakfast. 11% were consumed fast food usually amid them, 5% were overweight and 2% were obese. Only 8% of participants were consumed fast food regularly. Nearly half of girls (45%) did not check the label of food when purchasing food amid them, 11% were overweight, and 4% were obese. Solely 11% were checked labels when buying food, among them 5% were overweight. 31% of girls who had parents among one were obese, 11% among them are overweight. The convention between skipping breakfast and nutritional status was significant ( $p= 0.05$ ). However, in this study, the nutritional status of study participants did not exhibit significant relation with other dietary behaviors (eating fast food and buying food with checking food level) (Table 3).

**Table 1. Demographic information of the study participants**

| <b>Variables</b>         | <b>Percentage (%)/ Mean±SD</b> |
|--------------------------|--------------------------------|
| <b>Profession</b>        |                                |
| Private Service          | 1                              |
| Student                  | 98                             |
| Others                   | 1                              |
| <b>Marital Status</b>    |                                |
| Married                  | 13                             |
| Unmarried                | 87                             |
| <b>Religion</b>          |                                |
| Muslim                   | 86                             |
| Hindu                    | 12                             |
| Christian                | 1                              |
| Buddhist                 | 1                              |
| Weight                   | $56.47 \pm 11.78$              |
| Height (cm)              | $157.46 \pm 5.337$             |
| Waist Circumference (cm) | $82.37 \pm 11.314$             |
| Hip circumference (cm)   | $94.92 \pm 12.755$             |
| Waist Hip Ratio          | $0.87 \pm .065$                |

*Categorical data are presented as percentages, and continuous data are presented as the mean and standard deviation SD, Standard deviation*

**Table 2. Association between nutritional status and dietary diversity**

| Category of IDDS | Underweight | Normal | Overweight | Obese | p-value |
|------------------|-------------|--------|------------|-------|---------|
| Good             | 3           | 27     | 11         | 4     | 0.127   |
| Medium           | 4           | 22     | 12         | 1     |         |
| Poor             | 5           | 6      | 3          | 2     |         |

*IDDS, Individual Dietary Diversity Score*

**Table 3. Association between dietary behaviors and nutritional status**

| Variables  | Statement                       | Percent (%) | Underweight | Normal | Overweight | Obese | P value |
|--|---------------------------------|-------------|-------------|--------|------------|-------|---------|
| Skipping breakfast                                       | Never                           | 23.0        | 6           | 10     | 5          | 2     | 0.052   |
|  | Few times (<2 in a week)        | 31.0        | 1           | 19     | 9          | 2     |         |
|  | Sometimes (2-3 times in a week) | 24.0        | -           | 16     | 5          | 3     |         |
|  | Usually (4-6 times in a week)   | 8.0         | 1           | 6      | 1          | -     |         |
|  | Always                          | 14.0        | 4           | 4      | 6          | -     |         |
| Fast food consumption                                    | Never                           | 4.0         | 2           | 2      | -          | -     | 0.396   |
|  | Few times (<2 in a week)        | 39.0        | 4           | 23     | 10         | 2     |         |
|  | Sometimes (2-3 times in a week) | 38.0        | 4           | 22     | 9          | 3     |         |
|  | Usually (4-6 times in a week)   | 11.0        | 1           | 3      | 5          | 2     |         |
|  | Always                          | 8.0         | 1           | 5      | 2          | -     |         |
| Checking label for nutrition facts while purchasing food | Never                           | 45.0        | 4           | 26     | 11         | 4     | 0.949   |
|  | Few times (<2 in a week)        | 23.0        | 4           | 12     | 5          | 2     |         |
|  | Sometimes (2-3 times in a week) | 20.0        | 3           | 11     | 5          | 1     |         |
|  | Usually (4-6 times in a week)   | 1.0         | -           | 1      | 0          | -     |         |
|  | Always                          | 11.0        | 1           | 5      | 5          | -     |         |

The cross-tabulation between BMI status and skipping breakfast per day shows that 14% of girls who always skipped breakfast 6% of them were overweight. 24% of girls were skipped breakfast sometimes (2-3 times/week); among them, 3% of samples were obese, and 2 3% were never skipped breakfast. 11% were consumed fast food usually amid them, 5% were overweight, and 2% were obese. Only 8% of participants were consumed fast food regularly. Nearly half of girls (45%) did not check the label of food when purchasing food amid them, 11% were overweight, and 4% were obese. The association between skipping breakfast and nutritional status was significant (p= 0.05). However, in this study, the nutritional status of the study participants did not exhibit any significant association with other dietary behaviors (eating fast food and buying food with checking food level).

The correlation between BMI status & rice intake showed that 76% of girls who ate rice 2-3 times/day, among them 12% underweight, 45% normal, 15% overweight, and 4% obese. There was a significant association between them (p=

0.05). The percentage of overweight and obese girls were increased with increasing the consuming times of bread (0.01). There was a significant association between eating behavior of protein-rich food (milk and fish product) (p= 0.04) and dried fruit (p= 0.016) with the nutritional status of study participants.

#### 4. DISCUSSION

According to our study, 12% of the study population were undernourished, while one-third of the population was suffering from over nutrition. Among them, 26% were overweight, and 7% were obese, which corresponds to the literature [15]. The current study showed a clear picture of the double burden of malnutrition [16], which means that both under nutrition and over nutrition are prevalent in the same population. It was evident that although the mean waist circumference was higher in overweight cases, the mean waist-hip ratio was higher in obese cases. Therefore, the obese participant was mainly suffering from gynoid obesity rather than android obesity [17].

This study showed that 45% of girls had good, and 15% had poor dietary diversity scores. We found no significant relationship between the IDDS and BMI. The lack of association of the IDDS with the BMI may also reflect the limited ability of a simple IDDS to represent changes in the energy balance because as it does not take portion size or amount of food into consideration. In our present study, 14% were always skipped breakfast; among them, 6% were overweight. Like our studies, several other studies [18,19] have demonstrated that there was a significant relation between inconsistent or irregular breakfast eating and overweight. Totally 77% of young girls were eaten fast food at least one time in a week between 24% young girls were consumed fast food twice or more weekly in Dhaka city; among them, 5% were suffered by overweight. Our result revealed that girls who purchase food without checking the label of food had more possibility of becoming obese than girls who purchase food by checking the label of the food. A similar study had appeared that these associations were insignificant in girls but significant in boys [20].

Our study exhibited a significant correlation between weight gain and consuming cereals/staple foods. Although green leafy vegetables, sweet fruits, pulse soft drinks consumption are insignificantly related to nutritional status, dried fruits consumption is positively associated with improved nutritional status among young girls in Dhaka city. A study conducted in India explained that the mean score for cereal consumption was high for an overweight child, and the score increased twice for underweight children. In Iran, overweight children had the highest mean score for cereals, and lower scores were viewed among moderately underweight children. In India, weight gain was positively correlated with increasing pulses, vegetables, fruits, nuts, beverages, and fat consumption, whereas in Iran, there was an insignificant relation between these associations. In Iran, the increasing weight attached to increasing mean scores for vegetables, beverages, sweets, and fats consumption. In Iran, overweight children had the highest score for fruit consumption and the lowest score among moderately underweight children [21].

Fish is an available source of protein in Bangladesh. That is why almost all young girls in Bangladesh consumed fish at least one time in a week as their protein source to improve their nutritional status. Milk is another rice source of protein. In our study, girls who consumed milk six

times in a week the number of well-nourished girls are high among them. 29.7% and 24.4% of the adolescent girls never eat the meat of low-income families in the urban and rural areas, respectively and meat  $\leq$ one time/week was consumed by 71.1% of the rural adolescent girls (50.4% in an urban area). Fish never/less than one time per week was eaten by 11.4% of adolescent girls in the urban area (6.8% in the rural area) and eat fish more than one time per day was consumed by 10.5% of the adolescence girls in the rural area (only 1.9% in the urban area) [22]. There were a few limitations to the study. For example, the sample size was small to establish a causal relationship between dietary diversity and nutritional status. Finally, most of the data were collected by a questionnaire survey, which is prone to overestimation or underestimation. Therefore a further study is needed with a larger sample size and detailed dietary assessment like weighted dietary records.

## **5. CONCLUSION**

The nutritional status of the study participants depicted a portrait of the double burden of malnutrition, and the nutritional status is shifting towards overweight and obesity. There was no clear association between nutritional status. Although the dietary diversity score of young girls of Dhaka city in Bangladesh was satisfactory, dietary behavior was below par. In order to better the nutritional status, a balanced diet and improved dietary behavior should be practiced.

## **CONSENT**

Written and informed consent was obtained from each participant.

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## **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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