RESEARCH PAPER

Exploring Household Food Security and Dietary Pattern: A cross-sectional study of primary school children in Bangladesh

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ARTICLE HISTORY

ABSTRACT

The goal of the current study was to determine how socioeconomic factors effect food security, and food consumption pattern of primary school children in Barishal district. Convenience sampling was applied to gather a total of 300 data that were retained as the final sample size of our study and a pre-structured questionnaire was used. It was found that 64.8% of respondents in rural areas and 74.0% in urban areas were food secure, while 21.0% in rural areas and 15.1% in urban areas were food insecure. It was also observed that 53.20% and 78.75% of respondents purchase food from the market in rural and urban areas, respectively. Food security was significantly correlated with socio-economic status, including education level, household income, housing condition. However, household size, the difference between boys and girls, and BMI showed negative association. In addition, the consumption of oil, meat, fish, and vegetables was observed more among urban people except for rice, consumed 3 times a day by 84% of the rural people. On the other hand, 22.86% and 35.63% of the participants took their meals with all family members in rural and urban location respectively. According to this study, policy makers may use the features of food security and the associated influencing factors as well as food consumption patterns as scientific references when determining how to meet local food needs, cut down on food waste, and conserve natural resources in order to achieve sustainable development.

Keywords: Dietary-Pattern, Food insecurity, Consumption, Food diversity, Schooling children

Introduction

All people around the world consider food to be a basic human right. For the sake of everyone's health and welfare, this is crucial. Insufficient or nonexistent food intake can have detrimental effects on a one's physical and mental development, as well as future productivity. (Von Grebmer et al., 2016). As stated by the FAO (2007), food security exists when people are assured of adequate physical and economic access to safe and nutritious food meeting the dietary needs for a healthy life. Availability, access, and consumption are important components of food security. The household qualifies as food secure where members can consume an adequate quantity of food; otherwise, it is labeled as food insecure. Identifying vulnerable households is an important aspect of food security programs. Vulnerability is associated with the exposure to risks as well as the ability to cope with the stressors, mainly health and well-being of children, which are crucial for economic sustainable development (Zachary et al., 2014). However, Bangladesh faces significant challenges in maintaining

food security at the national and household levels. In addition to poverty, high access barriers, natural disasters, political unrest, and the effects of climate change have made food insecurity in the nation even more severe (Wheeler and von Braun, 2013). A cooperative approach to agriculture, policy-making, and social programs is necessary to address Bangladesh's food security issue and increase their efficacy in boosting food distribution, enhancing nutrition quality, and ensuring long-term sustainability (Wheeler and von Braun, 2013). Food consumption patterns are important because they have a big impact on a lot of different parts of health, happiness, and the environment. A person's nutritional intake is directly impacted by the kinds and amounts of meals they eat. Essential nutrients that promote growth, repair, and body functioning are provided by a balanced diet that is high in fruits, vegetables, whole grains, lean meats, and healthy fats. In Bangladesh, socioeconomic shifts during the past ten years have had an impact on the growth of the food system and the patterns of food consumption. In a poor agrarian nation like Bangladesh, agricultural productivity is the primary factor influencing the amount and quality of food produced. As a result, trends in the gross output and gross per capita availability of foods that are frequently consumed were reviewed. Food production increased significantly throughout the 1990s, especially in the second half of the decade for rice, as well as for other foods like wheat, potatoes, vegetables, fish, meat, and milk. Protein (53 g), energy (2,112) Kcal, and quantity (892 g/capita/day) increased in the average national diet in 2000 as a result. But the nation has not yet reached the appropriate levels of nutrition. The diet remains severely unbalanced, with fruits and vegetables accounting for only 3% of total energy and rice and other cereals for about 80%. As a result, the diet is lacking in vitamins and minerals. The poor also eat a very unbalanced diet, with 85% of their energy coming from rice alone and over 90% from cereals, which inevitably leads to malnutrition (Halder and Urey, 2003). Malnutrition in children is a severe public health concern in Bangladesh. Moreover, it impedes the country's overall development. Socioeconomic disparity is the most important of the many causes of child malnutrition, according to a large body of research. Socioeconomic status is by far the most important factor influencing malnutrition. Instead of being a general construct, the latter is made up of a variety of indicators that frequently measure one or more aspects of the circumstances of a specific household (Cassedy et al., 2013). Furthermore, a negative development of body composition during the primary school years may be related to patterns of dietary modification during this time (Wolters et al., 2018). In contrast, certain families in Bangladesh continue to suffer from malnutrition as a result of their unequal access to these resources. On the other hand, Cambodia is known for its unequal and adult-biased food distribution in homes, which exacerbates childhood undernutrition. Significant variations in food security and nutrition among households are largely caused by variations in government nutrition programs and increased nutrition awareness. A food application still threatens the long-term sustainability of food, despite improvements in food affordability and accessibility. For

people to have a balanced diet, it means that in addition to having access to food, they also need to be knowledgeable and able to consume. There have been more government programs to combat malnutrition, and up until now, people have made significant progress in gaining access to food and health care. A global commitment established at the World Health Assembly to cut childhood stunting by 40% by 2025 is being defied by Bangladesh. It is one of the signs that the country is dedicated to enhancing the nutrition and health of children nationwide (BSS, 2022). Although there have been gains, there are already prospects for more, including ways to improve safety nets and other child-supporting socioeconomic structures. While child malnutrition was a problem in every administrative division, the Barishal division was found to be a greater risk zone due to significant variations in the incidence of the three anthropometric markers. Therefore, considering the above facts, this study was conducted to explore the household food security level and describe dietary patterns at the primary school period both rural and urban area of Barishal district.

Materials and methods

Description of the Study Area

This survey was conducted in Barisal, a district in southern Bangladesh, situated along the banks of the Kertankhala River. It measures an area of 13,225 square km and has a population of more than 9.1 million people (BBS, 2022). Barisal is characterized by its riverside landscape, with agriculture, especially rice, and fishing being the major livelihoods. Although the city of Barisal is the administrative center, the rural areas experience flood problems, food insecurity, and a lack of proper healthcare and education. With the recent improvements in general socio-economic problems, it is still high in rural communities, which make the district a focal point in studies of child malnutrition and food security.

Study Design

The present cross-sectional study is aimed to evaluate the food security, eating behavior, and anthropometric measurements of school-going children. Ten primary schools were selected randomly from both the rural and urban areas of Barishal district. Students from school were included using convenience sampling techniques. The inclusion criteria are students belonging to classes 1 to 5, which were present in the school during the time of the study. This assures they are representation of samples of children from all diversities for measures of food security and other factors that may impinge on their health and nutritional status.

Study Population

According to the cross-sectional study sample formula, a sample size of 384 was required. We gathered a total of 400 data from 5 urban school and 5 rural school in category-I: class 1, category- II: class 2 and category-III: class 3, category- IV: class 4, category- V: class 5 and their household. The convenience sampling method was used to select the study population. After data wrangling, 300 data were retained which was the final sample of this study.

Study Materials

A well-organized survey questionnaire was used to gather data. The questionnaire was drafted in English and translated into Benglai by bilingual expert. The information

segmented in questionnaire as demographic information, food security level, and consumption pattern of the household, information about the children, class activity, and child nutrition status. Data was collected from those households where children were in class one to five, and parental education was not considered as a factor for exclusion. The demographic information includes gender, age, location, educational level, profession, and family income. Information related to children includes age, gender, study class, attendance, results, extracurricular activities, etc. Other sections consider children's height, weight, MUAC, and BMI.

Data Collection

The data was collected from the family heads or mothers of the child from 300 rural and urban households in one-on-one structured interviews to administer the questionnaire. The survey gathered qualitative and quantitative data pertaining to the nutritional status of primary children, socio-economic condition of their parents, and the food security level in their household. Food insecurity in households was assessed using a scale that included most food and never experiencing it, occasionally experiencing it, frequently experiencing it, and always experiencing it, indicating chronic hunger. Questions about the frequency of general meal consumption and the types of foods included in the meals were posed to the subjects. Food frequency categories used were more than once a day, once a day, 4-7 times a week, 1-3 times a week, at least once a month, less than once a month. The six-item short form of food security scale was developed in the form described by Blumberg *et al.* (1999). The interview took place in the participants' homes, and informed consent was acquired. Household heads or elderly people were asked the questions. Few households were absent during the survey, whereas in some instances, the head of a household or caretakers refused to participate in the interview. Also, a few questionnaires had blanks and were unavailable and unsuitable for an analysis. Of the original 330 target households, only 300 fully completed questionnaires were therefore accepted for analysis. The rest was due to non-response and incomplete data-the two factors sufficed to ensure that the final sample accurately represented the households with complete and reliable information for the study.

Measurement

To measure food insecurity among the elderly, the six-item short form was used. Questions covered aspects such as eating cheaper or much-inadequate food, eating less than the normal amount, fewer meals than usual, not eating at all, hunger from lack of food, and food deprivation for an entire day because of finances. Each question had four response options: never, sometimes, and often coded from 0 to 3 based on frequency. To be considered food insecure, an elder would need to report experiencing any of these conditions (rarely, sometimes, or often) during the recall period. Those who answered "never" to all questions were classified as food secure. This was the way that the most

clear-cut measure of food insecurity might be derived from the self-reported experiences of the elderly regarding issues of food accessibility.

BMI and MUAC measurement

The primary-school children's Body Mass Index (BMI) was computed by BMI = Weight (kg)/Height(m)². The WHO classified the various categories of BMI as underweight (<18.5), normal weight (18.5-24.9), overweight (25-29.9), and obese (30-34.9). Apart from BMI measurement, Mid Upper Arm Circumference (MUAC) was measured using standard MUAC tape as another method of an indicator for nutritional status. MUAC is a very important parameter to assess under-nutrition, especially in children, because it measures muscle mass and fat stores. Overall, these two measures would assess nutritional health in children regarding the future risks of malnutrition and obesity, which is essential for planning interventions.

Ethical Considerations

The researcher explained the purpose of the study to the participants, made it clear that participation was entirely voluntary and not coerced, and informed participants that they had the right to refuse or withdraw at any time. The researcher also declared that all information would be treated in a strictly confidential manner and be used only for research purposes.

Statistical analysis

Data were analyzed by the statistical package SPSS 16 and SAS version 9.3. Descriptive statistics such as mean, standard deviation, frequency, and percentages were computed to provide an overall idea about the data set. Next, the child's nutritional status was categorized according to the WHO recommendation, and their given thresholds were used such BMI and MUAC. After that, a chi-square test was deployed to observe the categorical differences. Fisher's exact test was applied where the case percentage of a category was observed less than 5%. All tests were two-sided and applied with 95% level of confidence intervals. A p-value less than 0.05 was considered statistically significant.

Results and discussion

Socio economic characteristic of the respondents

Age distribution varied with regard to place of residence between rural and urban respondents. Among rural respondents, majority (53.58%) were aged 20-29, while in the urban respondents, the proportion was 44.35%. Respondents aged 30 to 39 years constituted 42.14% in the rural area and 51.25% in the urban area. Very little variation was there on marital status: 97.85% of rural respondents and 98.12% of urban respondents were married. In rural areas, 1.43% were divorced and 0.72% widowed, while in urban areas, 1.25% were divorced and 0.63% were widowed. Most respondents had family responsibilities.

Table 1: Socio economic characteristic of the respondents

Characteristics	Rural			Urban		
	Frequency	%	*P* value	Frequency	%	*P* value
Age	N=140		0.17	N=160		0.22
20-29	75	53.58		71	44.38	
30-39	59	42.14		82	51.25	

	N / n	%		N / n	%	
40-49	3	2.14		4	2.50	
50-59	3	2.14		3	1.88	
Marital status	N=140		0.10	N=160		0.11
Married	137	97.85		157	98.12	
Divorced	2	1.43		2	1.25	
Widow	1	0.72		1	0.63	
Occupation	N=140		0.24	N=160		0.19
House wife	139	99.29		154	95.00	
Job holder	1	0.72		4	2.50	
Business	0	0.00		2	1.25	
Education	N=140		0.02*	N=160		0.04*
Illiterate	3	2.15		3	1.87	
Under primary	42	30.00		27	16.87	
Primary	65	46.43		50	31.25	
Up to secondary	22	15.71		34	21.25	
Up to higher secondary	5	3.57		21	13.12	
graduate and above	3	2.14		25	15.64	
Religion	N=140		0.44	N=160		0.52
Muslim	134	95.71		152	95	
Hindu	6	4.29		8	5	
Christian						
Buddhist						
Gender	N=140		0.06	N=160		0.07
Male	0	0		1	0.63	
Female	140	100		159	99.37	
Household size	N=140		5.22	N=160		4.47
3-5	88	62.86		138	86.25	
6-8	48	34.28		17	10.62	
9-11	4	2.85		2	1.25	
12-14				3	1.88	
Family income	N=140		0.02			0.02
Ultra poor (> 9,615tk)	11	7.86		19	11.87	
Poor (< 9,615tk)	121	86.43		81	50.62	
Middle (< 37,323tk)	8	5.71		49	30.63	
Rich (< 86,612tk)				11	6.88	

*significant at 5% level

In this survey, the majority of respondents were housewives, 99.29% in rural areas and 95.00% in urban areas. In rural areas, 0.72% of respondents were service workers, while in urban areas, 2.50% worked in service jobs and 1.25% were business women (Table 1).

Table 1 indicates that, respectively in rural and urban population, around 2.15% and 1.87% of respondents were illiterate, about 30.00% and 16.87% of respondents belonged to the education level under primary, nearly 46.43% and 31.25% of the selected respondents were completed primary education, about 15.71% and 21.25% were educated up to secondary, and just about 3.57% and 13.12% belong to the level up to higher secondary. In addition, around 2.14% and 15.64% of respondents were graduate and above, in rural and urban areas, respectively. This showed that the majority of respondents were literate which might enhance the food security status literate while might enhance the food security status adoption of improved family care practices. The results indicate that, in the rural area a vast majority, 95.71% of respondents were Muslim while it was 95.00% in urban location.

Household size was relatively different among the study area, which is classified as the total number of people living and eating together under one head of the family. The sizes varied from around 3 to 14 members. The average family size stood at 5.22 in rural areas as opposed to 4.47 in urban areas. Monthly family income, which is another factor that influences food security, was also normally not alike for the rural and urban areas-the average monthly income in rural areas was 15,882 BDT and 26,798 BDT in urban areas. The majority of respondents, 86.43% in the rural and 50.62% in the urban area, fell under the low-income category (9615-

30000 BDT). On the contrary, 5.71% of rural respondents and 30.63% of urban respondents were in the middle-income category. Moreover, there, 6.88% of urban respondents considered to be rich as their earning was above 86,612 BDT. The difference is very important since it reflects the different standards of household income, between traditional household rural and urban houses.

Source of household income
Table 2 represents the primary source of household income in the rural area was farming (41.43%). On the other hand, in urban areas very few (5.00%) households were engaged with farming. Maximum 43.12% of the households in urban area lead their lives through services, whereas in rural area 14.29% of respondents lead their lives through services. In addition, 19.29% and 30% of households were engaged with business in rural and urban areas, respectively. Household income encompasses all these sources and provides a comprehensive view of a family's financial situation. It's an essential measure for evaluating economic health and comparing living conditions across different regions.

Table 2: Source of household income& categories of house of the respondents

Category	Rural		Urban	
	Frequency	%	Frequency	%
Income sources	N=140		N=160	
Farming	58	41.43	8	5.00
Service	20	14.29	69	43.12
Business	27	19.29	48	30
Others	13	9.29	11	6.87
Farming + Service	4	2.86	9	5.63
Farming + Business	10	7.13	13	8.13
farming + Others	8	5.71	2	1.25
Categories of house				
Building house	24	17.14	107	66.88
Non- building house	85	60.71	46	28.75
Semi-tilled house	31	22.15	7	4.37

Nutritional security of children
In this study, children's nutrition status was decided by body mass index (BMI) and mid-upper arm circumference (MUAC). In the present study area, 40.00% and 50.71%of sample respondent's children were underweight in urban and rural areas, respectively. On the other hand, 42.50% and 42.14% of sample respondent's children were in the normal weight group, 15.00% and 5.71% in the overweight group and 2.5% and 1.42% in the obese group in urban and rural areas, respectively (Table 3). On the other hand, MUAC is also used for the assessment of the nutritional status of primary school going children. Results in Table 3 indicate that 32.50 % and 35.72% of the children were in the risk group, Around 44.37% and 41.42% of children belonged to the normal category, 6.87% and 13.57% of the selected children were under nutrition in urban and rural areas, respectively. In addition, very low percentage (0.62% and 2.14%) of children belonged to the severe malnutrition in urban and rural area, respectively.

Table 3: Nutritional security of children

Characteristics	Urban		Rural	
	Frequency	%	Frequency	%
BMI	N=160		N=140	
Underweight (<18.5)	64	40.00	71	50.71
Normal weight (18.5-24.9)	68	42.50	59	42.14
Overweight (25-29.9)	24	15.00	8	5.71
Obese (30-34.9)	4	2.50	2	1.42
MUAC (cm)				
Normal (>13.5)	71	44.37	58	41.42
Risk (12.5-13.4)	52	32.50	50	35.72
Under nutrition (11.5-12.4)	11	6.87	19	13.57
Severe malnutrition (<11.5)	1	0.62	3	2.14

Household food security status
The Present study revealed that 64.8% and 74.0% of the respondents were food secure in rural and urban respectively. 21.0% and 15.1% were food insecure; 12.1% and 9.10% were moderate food insecure, 2.10% and 1.90% were severe food insecure in rural and urban respectively.

A food secures household experiences none of the food insecurity conditions. A moderately food secure household sacrifices more frequently by eating a monotonous diet but does not experience any of the three most severe conditions. A severe food-insecure

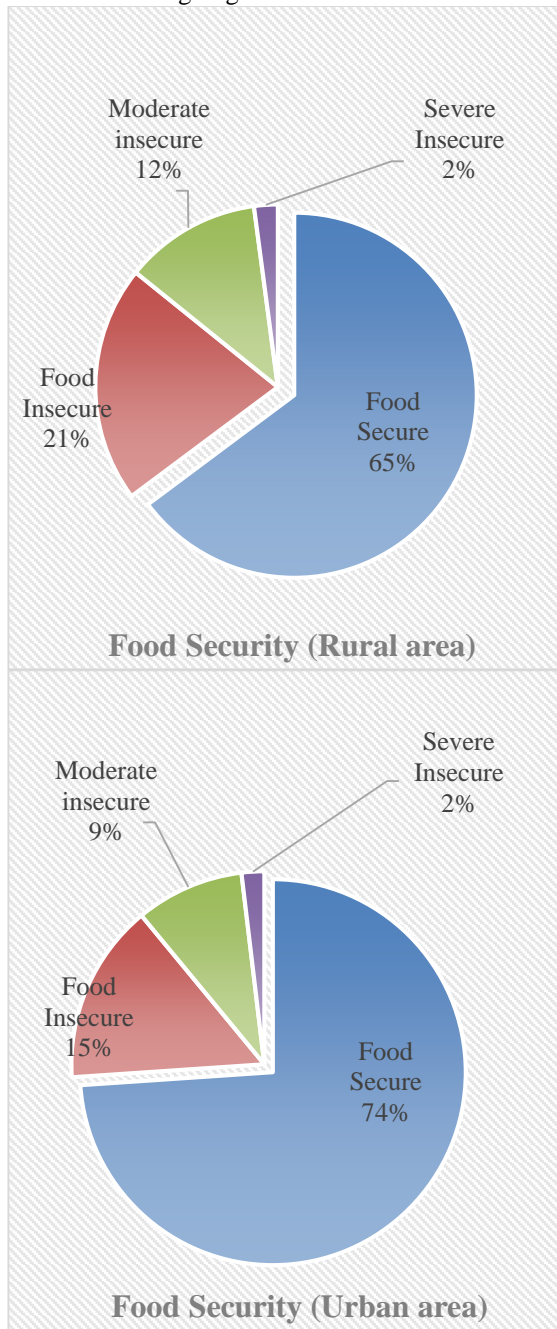household has started cutting back on meal size, running out of food and going to bed.

and urban households were food insecure. The results of this study are in congruent with the findings of Babatunde *et al.* (2007) with 62.8% food insecure and 37.2% food secure in farming households in Nigeria, Arene and Anyaeji (2010) with 60% food insecure and 40% food secure in Enugu State of Nigeria and Kuwenyi *et al.* (2014) which came up with result that had 51.7% food insecure and 48.3% food secure households in rural households in Swaziland. Yadegari *et al.* (2017) found that, 30.9% and 69.1% had food insecurity and complete food security, respectively in Italian pregnant women. Payab *et al.* (2012) estimated that the prevalence of food insecurity among families of primary school students in Shahrerei to be 50.2% in 2010. Another study reported the prevalence of food insecurity as 32.4% and food security as 76.6% among women in Bangladesh (Rahman & Karim, 2013).

Factors associated with food security status

The result of logistic regression showed that the model was suitable for explaining the determinants of the food security status of farm household. Socio-economic status, including education, household income, housing condition were positively associated with food security while, household size, difference between boys and girls, and BMI were negatively associated with food security.

Table 4: Estimates of the Logistic Regression of Determinants of Food Security Status

Variable	Coefficient	Level of Significance	Exponential of coefficient or odds ratio
Household size	-0.480	0.007**	1.614
Education	0.002	0.01**	0.999
Family income	0.002	0.036*	1.014
Housing condition	0.002	0.02*	1.002
Difference between boys and girls	-0.470	0.02*	1.671
BMI	-0.314	0.028*	0.730

*Note: ** indicates significant at 1% level, * indicates significant at 5% level.*

In the present study, household size was negatively associated with food security level. That means a unit increase in household size will reduce the probability of household food security. Hence, the increase in household size would lead to a decrease in the food security status of the household. This result is expected because the increase in the member of household means more people are eating from the same resources, hence, the household members may not be able to take enough food when compared to a situation with smaller household size, thus increasing the probability of the household to be food insecure. The Similar result observed by Babatunde *et al.* (2007), Frehiwot (2007) and Oluyole *et al.* (2009). Another study found that higher family size was strongly associated with food insecurity in rural Bangladesh (Quddus and Bauer, 2014). On the other hand, Yadegari *et al.* (2017) found no

Figure 1: Food security status of rural and urban areas

Several studies found different level of food security. Based on HFIAS, Jakaria *et al.* (2015) found that only 12.50% households were food secure, 17.50% households were mildly food insecure, 19.17% households were moderately food insecure and 50.83% households were severely food insecure in the slums of Rajshahi City Corporation in Bangladesh. Mannaf and Uddin (2012) found that, 20 (33.33%) households were found to be food in secured while the rest 40 (66.67%) households were food secured households among the maize growing rural households of Bogra district which was much lower than the present study. Similar result observed by Okwoche and Benjamin (2012) with 67.5% food secure and 32.5% food insecure in Nigerian rural farmers, and Iorlamen *et al.* (2013), 67.3% food secure and 32.7% food insecure. Abu and Soom (2016) found that majority of the rural households (53.3%) and urban (62.2%) households. Only 46.7% and 37.8% of the rural

significant correlation was obtained between food security and family size of the participants. The result implies that families with small household size are more food secure than those with large household size. This is because the increase in members of the household added more responsibilities to household heads especially when many of the family members depend totally on the household head.

In the present study, the education level was positively associated with food security. A general trend of decrease in food insecurity as the education level of household is increasing observed by Faridi & Wadood (2010), Quddus and Bauer (2014) in rural Bangladesh. Rahman *et al*. (2012) found that education affects food security status of a household through two distinct routes: through its positive effect on income, it raises food accessibility, and through the improvement of knowledge about the requirements of various types of food. Njoku (1991) observed that formal education has a positive impact on food security. This is because education enhances understanding and adoption of improved technology which will rapidly increase food production and increase the probability of a household being food secure. This study also agrees with the findings of Ribar & Hamrick (2003) which revealed that an increase in the number of years in educational attainment will increase the probability of households being food secure. Moreover, poor education level leads to reduced nutrition literacy and affects all stages of basket table process (purchase, preparation, cooking, and consumption), and this causes household food insecurity. The socioeconomic status of the household is the most important determinant of food insecurity. In the present study, it was found that the income of households has a marginally positive coefficient. The income is expected to boost the household's food production and also access to more quantity and quality food. This indicates that the higher the household income, the higher is the probability that the household would be food secure. This could be expected because increased income, other things being equal, means increasing access to food. The finding was supported by the research results of Babatunde *et al*. (2007) and Frehiwot (2007). Low income was strongly associated with food insecurity in rural Bangladesh (Quddus and Bauer, 2014). Household income is an important determinant of numerous health outcomes as it can represent access to resources and recreational and physical activity opportunities for families, and is also a key factor in food security (Bhawra *et al.,* 2017). Another study reported a significant correlation between income and food insecurity. Food insecurity and family income are closely related such that poor families are 3 times more prone to have food insecurity compared to others (Nord and Hopwood, 2008). In this study, it was found that housing condition has a low but positive coefficient that was significant at 95% level. Quality of housing and food security level are closely related in Bangladesh, established by earlier works (Narayan *et al.,* 2007). Specifically households which are living in non-building houses were the poorest segment of the population. Households living in houses which non-building, food insecurity are the most prevalent. On the other extreme, building houses seem to be the most food secure. These

two observations show that household infrastructure is a strong indicator of wealth and consequentially, the food security situation Faridi & Wadood (2010). It was found that, difference between boys and girls has a negative coefficient which was significant at 10 percent level. Many countries in Asia pervasively and unambiguously practice boy preference. For instance, in India, son preference has been found to be practiced in many different facets of life including healthcare, feeding patterns with girls more likely to be malnourished (Pande, 2003). Son preference reflected in fertility behavior has also been found in Vietnam (Haughton & Haughton, 1995); and in Bangladesh as reflected in parental care, feeding patterns, intra-family food distribution and treatment of illness (D'Souza & Chen, 1980). Boys were found to have an advantage in the allocation of nutrients in the Philippines (Senauer *et al.* 1988) and in the distribution of food resources in India (Behrman, 1988a) and Nepal (Gittelsohn *et al.* 1997). However, Chaudhury (1988) findings in Bangladesh were mixed for different outcomes.

It was found that, BMI has a negative coefficient with food security. Numerous authors have reported that food insecure individuals often consume a diet that contributes to the development of overweight and obesity (WHO, 2012; Gooding *et al*. 2011) due to the fact that more affordable food options have a higher energy density (kilojoule content) and a low nutrient density, while foods such as fruit and vegetables with a higher nutrient density are often more expensive (Oldewage-Theron & Egal 2010; Temple *et al*. 2006). Results from this study confirm these findings.

Household food consumption pattern

Household food consumption of respondents depends on their income, social status, food preferences, living place, etc. In the present study consumption of different food items is shown by the following table. Food consumption in Bangladesh is dominated by cereal of which rice is the dominant item followed by wheat. Other preferred consumed food items are fish, meat, milk, pulses, eggs, oil and vegetables etc. White rice has become more popular in Bangladesh and red rice is also gaining popularity due to its relatively high nutritional properties. It reveals that per capita overall rice consumption was 57.85 kg/ month and 53.80 kg/month in rural and urban families, respectively. This was revealed by the Household Income and Expenditure Survey of 2000. Rice was the source of the most eaten carbohydrate found in this study which was similar to the study of Basak (2022). Other studies showed a historical analysis of per capita food consumption shows that rice consumption in Asian countries like Bangladesh has declined and in contrast, wheat flour consumption has increased (FAO, 2016; Mottaleb *et al.,* 2017). Oil or fat consumption was 5.40 liter/month in the rural area and that is slightly high 5.81 liter/month in the urban area. Basak (2022) observed that most households (81.09 per cent) used soybean oil for cooking. Meat is a rich source of micronutrients and contains protein, vitamins, and minerals that are essential for human growth and development (Jung *et al.,* 2015). With the increase in income, global meat consumption has continued to increase compared to the consumption of other agricultural commodities (Devine, 2003). Rural

respondents had consumed average of 6.80 kg meat per month and 17.30 kg fish per month as protein source. On the other hand, in the urban area, the average consumption of meat 10.55kg and fish 20.64kg had slightly higher than the rural area. This was maybe due to their income, life style. On the other hand, Basak (2022) observed that proteins were consumed four days a week by the most number of respondents (32.44%), 27.03% of respondents consumed protein three days a week, and only 8.11% consumed protein one and two days a week. Green leafy vegetables play an important role in the diet, as these are rich in vitamins, minerals,

dietary fiber, and anti-oxidants. All families tried to take vegetables in their dishes every day both in rural and urban area. The average cost of vegetables per week was also noticeable. Their household average expenditure for vegetables was 162.11 BDT in rural areas and 277.90 BDT in urban area in a week. A study was conducted in Srilanka and observed that consumption of green leafy vegetables has been on the rise in urban society in recent years (Sharma *et al.,* 2009) probably due to increased health concerns of the public.

Table 5: Average consumption of various food items (per month)

Categories	Rural				Urban			
	Frequency	%	*P* value	*mean*	Frequency	%	*P* value	*Mean*
Rice (Kg/month)			0.00				0.01	
30-50	54	38.58		57.85 (±16.94)	83	52.87		53.80 (±15.56)
51-70	61	43.58			62	38.74		
71-90	21	15.00			12	7.50		
91-110	1	0.71			0	0.00		
111-130	3	2.14			3	1.87		
Oil consumption (liter/month)			0.02				0.01	
3-5	83	59.28		5.40 (±1.31)	78	48.75		5.81 (± 1.55)
6-8	55	39.28			74	46.25		
9-11	1	0.72			7	4.37		
12-14	1	0.72			1	0.63		
Meat consumption (Kg/month)			0.10				0.09	
1-5	58	41.43		6.82 (±3.43)	24	15.00		10.55 (±5.68)
6-10	67	47.86			72	45.00		
11-15	13	9.28			42	26.25		
16-20	2	1.43			14	8.75		
21-25					6	3.75		
26-30					2	1.25		
Fish consumption (Kg/month)			0.11				0.02	
1-5	3	2.15		17.30 (±6.58)	2	1.25		20.64 (± 6.7)
6-10	25	17.86			11	6.88		
11-15	44	31.42			21	13.12		
16-20	28	20.00			64	40.00		
21-25	23	16.42			29	18.12		
26-30	17	12.15			33	20.63		
Vegetables consumption (tk/week)			162.11				277.90	
50-150	88	62.86			22	13.75		
160-250	40	28.56			72	45.00		

260-350	10	7.15	38	23.75
360-450	2	1.43	19	11.88
460-550			9	5.63
560-650			10	6.25

Number of meals in a day

There was variation in the number of meals had taken by respondents household of the present study. In rural area 84.40% of the respondents had taken meals in 3 times (Table 6). Similar result was observed by Basak (2022) that, most participants took three meals per day (72.97 %) in rural Bangladesh. On the other hand, in urban 70.0% of the respondents had taken meals in 3 times. In rural area, 14.90% of the participants took four meals as an extra meal but urban participants took more than double (29.60%) of the rural respondents. Only 7% and 6% of the respondents took meals in 2 times in rural and urban area respectively which was similar (5.41) to the study of Basak (2022). Aheeyar (2013) observed that the energy consumption of the estate sector is very/considerably high whereas most households consume three meals a day and the quality of food is poor in terms of nutritional balance. Individual dietary habits can vary widely, and factors like income, culture, and personal preferences influence meal patterns.

Take meals with family members

Eating meals together with family members offers numerous benefits. Regular family meals increase overall intake of calcium-rich foods, fiber, vitamins, and other essential nutrients, positive family interactions during meals. It can be seen from Table 6 that, maximum respondents did not take meals with all members of the family. In rural area 77.30% of the respondents did not take meals with all members of the family. On the other hand, 64.20% of respondents in metropolitan areas reported eating their meals without the entire family. A similar phenomenon was observed by Mottaleb *et al.,* (2017) in Bangladesh that 64% of the households consumed food away from home. However, it was observed that families with a spouse working outside the home, in the non-farm sector, for instance, are more likely to consume food away from home. Family dinners don't have to be elaborate feasts, simple meals can still create meaningful connections.

Table 6: Household meal consumption pattern

Characteristics	Rural		Urban	
	Frequency	%	Frequency	%
No. of meals in a day				
2 times	1	0.71	1	0.63
3 times	118	84.29	112	70.00
4 times	21	15.00	47	29.37
Take meals with family members				
Yes	32	22.86	57	35.63
No	108	77.14	103	64.37

Expenditure for household food consumption

The average monthly expenditure for food items was 8106.38 BDT and 10427.67 BDT in rural and urban areas respectably. Around 70.8% and 63.5% household expenditure in different food items were from 6000 BDT to 10000 BDT in rural and urban areas respectably. Spending (11000-15000) BDT for food items was 12.1 and 21.5%. The table indicates that the maximum cost of food items was 30,000 BDT in the urban area and 20,000 BDT in rural areas. Another study was conducted in Bangladesh and found that, on average, households spent BDT 11.27 thousand per capita on food (Mottaleb *et al.,* 2017) which was similar to the average cost of the present study.

Table 7: Food consumption expenditures for family

Characteristics	Rural			Urban		
	Frequency	%	Mean	Frequency	%	Mean
Cost for food items BDT						
3000-5000	23	16.3	8106.38 (±2700.40)	8	13.8	10427.67 (±4316.89)
6000-10000	99	70.89		101	63.50	
11000-15000	17	12.11		34	21.50	
16000-20000	1	.70		13	8.20	
21000-25000				2	1.20	
26000-30000				1	.60	

The variation in household food consumption expenditure between rural and urban areas can be attributed to several factors. Like income levels, cost of living, food preferences and availability, infrastructure and access, cultural and social factors. Overall, the variation in household food expenditure reflects a complex interplay of economic, social, and cultural factors. It's essential to consider these dynamics when analyzing rural-urban differences in food consumption.

Conclusion

The analysis's empirical data leads to the conclusion that household food security rises as household education, monthly income, and home quality all rise. Food security analysis showed that household food security decreases with the increase in household size, difference between boys and girls, and BMI. Food consumption patterns were varying significantly between urban and rural areas, with implications for health, nutrition, and overall well-being. Maintaining access to reasonably priced, wholesome food is still a top concern for those living in rural and urban areas. The government should develop comprehensive strategies on sustainable agricultural practices, raising awareness about healthy eating habits, measures to reduce food loss and wastage, innovative and improved food systems to enhance the eating habits and food security of primary school students.

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