AN EMPIRICAL ASSESSMENT OF POVERTY, FOOD SECURITY AND NUTRITIONAL STATUS OF FORMER ENCLAVE PEOPLE IN A SELECTED AREA OF BANGLADESH

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Abstract

This article empirically investigates poverty, food security and nutritional status of selected former enclave households. Binary logistic regression was carried out to find out the factors affecting food security of the households. Following simple random sampling technique, a sample of 80 households from two villages of Dibiganj upazila of Panchagarh district of Bangladesh was surveyed in January 2020. On an average, they consumed 20 food items of which their daily per capita intake was 1414.52 gm. Mean of daily per capita protein and calorie intake was 63.14 gm. and 1619.67 Kcal, respectively. Rice occupied the major contributing source of protein and calorie intake as per capita consumption of rice was highest among all other food items (609.35 gm.). Among the respondents, 61.25% belonged to ultra-poor following by hard core poor (20%) and absolute poor (7.5%). Based on FCS, 81.25% of them were in poor diet clusters but consequently 91.25% of them belonged to high dietary diversity as indicated by household dietary diversity score. Assessment of CSI and HFIAS indicated that most of the sample households were suffering from moderately to severely food insecure. But based on MAHFP, 20% of the respondents were found to be food insecure as they had food provisioning for 0-9 months out of 12 months. At the same time, 51.25% of the sample households were underweight based on their BMI. There was no household member whose physical feature was found to be obese based on BMI characterization. The result of the binary logistic regression shows that food security is positively correlated with total land size and family consumption of food. So, diversification of crop production and diversification of family consumption can be the recommended steps for the enclaves' households to upgrade their food and nutrition security status

Keywords: Enclave, poverty, food security, calorie intake, nutrition, Bangladesh.

Introduction

An enclave is a small geopolitical unit and fragmented piece of land of a sovereign country which is effectively surrounded by another sovereign country. Due to its smallness and minimum population, most of the world enclaves are in stateless situation (Schendal, 2002). Near about 80 % of the world's total

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enclaves however can be found in a small section of India and Bangladesh border since 1950's (Whyte, 2002). There was a total number of 162 territories within Bangladesh and India, which are commonly known as 'Chitmahal' in Bengali which means the land disconnected from the mainland. There were 111 Indian exclaves inside Bangladesh and 51 Bangladeshi ones in India. Maximum Indian exclaves are located in the north-west part of Bangladesh in the districts of Lalmonirhat, Panchagarh, Kurigram and Nilphamari (Anon., 2020). In 2015, India and Bangladesh ended one of the world's greatest geographical border oddities. The two countries formally exchanged 162 tracts of land totaling 24,270 acres where 60,000 people are living. A total number of 47,000 people on the Bangladeshi side and some 14,000 on the Indian side were finally given the right to make a choice: stay where they have lived for generations with official citizenship of the country that will absorb them or return to their country of origin (Duggleby, 2015).

The people of former enclaves are facing various types of problem including security, health, nutrition, education and communication also (Ria *et al.,* 2019). Before this exchange, they had no identity and official citizenship. They treat as most disadvantage community in both countries. Being detached from the mainland, thousands of innocent inhabitants perhaps had been among the most deprived people in the world (Rabbani, 2006). Food insecurity was one of the chronic dimensions in the overwhelming former enclave-economy and it was due to totally excluded from development activities of both government and non-government organizations. Moreover, the former enclaves' population was engaged only in subsistence farming with low agricultural productivity and restricted access to input technology (Rabbani, 2006). A number of studies have been conducted on different dimensions of food security that identified lack of economic and social access to food items to meet daily dietary need as the reason for food insecurity (Dash, 2005; GOB-WFP, 2005; Hossain, 1989; Kazal et al. 2010; 2017; Kundu, 2004; WFP-IFPRI-BBS, 2007). Ria *et al.* (2019) measured food and nutrition security of former enclave people of Kurigram district of Bangladesh where they found daily per capita calorie and protein intakes of the selected households were 1788 kcal and 55 gm, respectively. Zakaria *et al.* (2020) assessed livelihood status of the people living in unified enclaves in Bangladesh. They found that Agriculture was the main source of livelihoods in these areas (80%) including agricultural day labour. Non -farm activities (20%) are mainly limited to shop keeping or trading, rickshaw van pulling. As research on the life and livelihood, nutritional status and food security of the enclave households was very limited, so for making proper policy for former enclaves people overall development, it is very important to know their poverty, food security and nutritional status. On the basis of the above questions, this study was assessed the poverty, food security, nutritional status and factors influencing food security status of former enclave people in a selected area of Bangladesh.

Materials and Methods

Data

Out of former 111 Indian enclaves inside Bangladesh 11 largest enclaves were located in Panchagarh district. For this reason, Panchagarh district was selected purposively to collect primary data. Data were collected from two enclaves' village namely Panchayat Para and Maja Para under Debiganj upazila of Panchagarh district. Simple random sampling technique was applied to select the sample households. A pretested interview schedule with open and close ended questions was used to collect data and information. Number of sample households were 80 taking 40 from each selected villages. Data collection was done in January 2020.

Analytical techniques

Different measurement techniques of poverty, food security like Coping Strategy Index (CSI), Food Expenditure Method (FE), Comprehensive Food Security Vulnerability Analysis (CFSVA), Food Consumption Score (FCS), Direct Calorie Intake (DCI), Cost of Basic Needs (CBN) and Perception Analysis (PA) were found to use by several studies at home and abroad (Maxwell and Caldwell, 2008; Bickel et al., 2000; Nguyen and Winters, 2011; Karamba et al., 2011; Fengying et al., 2011; Hossain et al., 2014; BBS, 2017; Rahman and Noman, 2019; Rahman et al., 2019; Hossain, 2020). This study considers the following analytical techniques to fulfill the objectives. Descriptive statistics like average, percentages, standard deviation, tables, diagrams, charts were used to express the information. Binary logistic regression was carried out to know the determinants of food security of the selected sample households as done by Ria et al. (2019).

Poverty Measurement

Direct Calorie Intake (DCI)

DCI method was applied to know the poverty indices of the sample households. On the basis of the amount of food taken by the respondent and their family members per capita calorie intake was measured. Status of poverty was assessed by using the calorie intake from daily food consumption. For this, the consumption data of the sample households for seven days was quantified by standard value of 100 gm of each of the food item they consumed (Rahman et al., 2019). The family members were defined as one adult male and one adult female as 1:1 and the children whose age was below 5 years considered as zero and 5-10 years considered as half of the adult member (Rahman and Noman, 2019). Person whose daily intake is less than 1600 Kilo calorie is said to be in ultra-poverty line. If the calorie intake is above 1600 Kilo calorie but less than 1805 Kilo calorie than the person is termed as in hard core poverty line. Absolute poverty line is termed when a person's daily intake is above 1805 Kilo

calorie but less than 2122 Kilo calorie (BER, 2020; Saha *et al.,* 2021; Akter *et al.,* 2020).

Food Security Measurement

Food Consumption Score (FCS)

The FCS is a composite score based on dietary diversity, food frequency and relative nutritional importance of different food groups (WFP, 2008). FCS is used as because it is able to capture both dietary diversity and food frequency. In order to calculate all the food consumed by the sample households were grouped into 9 food groups i.e., main staples, vegetables, fruits, meat and fish, pulses, milk, oils, sugar and condiments. The guiding principal for determining the weight is the nutrient density of the food groups. WFP defined the weight of the food groups as main staples=2, vegetables=1, fruits=1, meat and fish=4, pulses=3, milk=4, oils=0.5 and condiments=0. In order to construct FCS at first a summation of the all the consumption frequencies of food items of the same group was done. A new weighted food group was formed by multiplying the value of each group by its weight. FCS was found by summing the weighted food group scores. Based on WFP (2008) the following typical threshold is used to interpret the FCS of the present study household:

FCS	Profiles
0-21	Poor
21.5-35	Borderline
>35	Acceptable

Household Dietary Diversity Score (HDDS)

HDDS is a qualitative free recall of all food items consumed by any member of a household during the last 24 hours (FAO, 2011a). It indicates the number of food groups and items that households consume in a 24-hour period of 7 days (Uraguchi, 2012; Mango *et at.,* 2014). The merit of applying HDDS is that it is highly correlated with the adequacy of household's intake of protein, calories and other nutrients. Evidence suggests that HDDS could be a useful indicator of food security as it is strongly associated with per-capita consumption and energy availability. The following set of 12 food groups is used to calculate the HDDS as indicated by Swindale and Bilinsky (2006).

A. Cereals	B. Fish and seafood
C. Root and tubers	D. Pulses / legumes / nuts
E. Vegetables	F. Milk and milk products
G. Fruits	H. Oil/fats
I. Meat	J. Sugar/honey
K. Eggs	L. Miscellaneous

HDDS calculation: First HDDS is calculated for each of the sample enclaves' household. The value of these variables ranges from 0 to 12. Then the following method is used to calculate HDDS for the present study (Swindale and Bilinsky, 2006):

$HDDS(0-12)$ Total number of food groups consumed by members of the household. Values for A through L will be either "0" or "1".

$$\text{Sum } (A + B + C + D + E + F + G + H + I + J + K + L)$$

The following typical threshold is used to present HDDS for the present study

HDDS	Profiles
≤ 3 food groups	Lowest dietary diversity
4 and 5 food groups	Medium dietary diversity
≥ 6 food groups	High dietary diversity

Household Food Insecurity Access Score (HFIAS)

HFIAS is a continuous measure of the level of insecurity (access) of a household. It has been done for the past 30 days. It indicates three universal domains of food insecurity: (i) anxiety about household food insecurity, (ii) insufficient quality of food supplies and (iii) insufficient quality of such supplies (Deitchler *et al.,* 2011). These indicators capture the household member's perception of their diet (Coates *et al.,* 2007). Following the guidelines by Coates *et al.* (2007) the calculation of HFIAS includes nine occurrence questions reflecting an increasing level of food insecurity. Each of the questions in the following table was asked with a recall period of four weeks (about 30 days) with a 'yes' answer being given a value of one and a 'no' answer given a value of zero. If the respondent answers "yes" to an occurrence question, a frequency-of-occurrence question is asked to determine whether the condition happened rarely (once or twice), sometimes (three to ten times) or often (more than ten times) in the past four weeks. The following guideline quoted by Coates *et al.* (2007) was used to measure HFIAS score for the present study:

$HFIAS(0-27)$ Sum of the frequency-of-occurrence during the past four weeks for the 9 food insecurity-related conditions

Sum frequency-of-occurrence question response code $(Q1 + Q2 + Q3 + Q4 + Q5 + Q6 + Q7 + Q8 + Q9)$

The nine occurrence questions were (1) anxiety about not having enough food in the household, (2) inability to eat preferred foods by any of the household member, (3) eat limited variety of food by any of the household member due to a lack of resources, (4) eat some foods that household member did not want to eat because of a lack of resources to obtain other types of food, (5) eat a smaller

meal than the requirement by any of the household member because there was not enough food, (6) reduced number of meals or cut one time meals of any day, (7) having no food to eat in the household or failed to collect food for the family, (8) any member of the household go to sleep at night without having eaten any food and (9) spending a whole day and night without eating anything because there was not enough food.

Inability to eat preferred foods by any of the household member The minimum HFIAS is zero and is obtained when a household responds 'no' to all of these questions. The maximum score is 27, which is obtained when a household responds 'yes' to an occurrence question and 'often' to the nine frequencies of-occurrence questions. The higher the score, the more food insecurity (access) the household experienced. The lower the score, the less food insecurity (access) a household experienced. The following Table 1 illustrates the categorization based on HFIAS score.

Table 1. Categorization of food insecurity (access)

Question	Frequency		
	Rarely 1	Sometimes 2	Often 3
Q1	🟩	🟧	🟧
Q2	🟧	🟧	🟧
Q3	🟧	🟦	🟦
Q4	🟧	🟦	🟦
Q5	🟦	🟦	🟥
Q6	🟦	🟦	🟥
Q7	🟥	🟥	🟥
Q8	🟥	🟥	🟥
Q9	🟥	🟥	🟥

🟩 Food secure   🟦 Moderately food insecure
🟧 Mildly food insecure   🟥 Severely food insecure

(Adopted from Coates *et al.,* 2007 and edited by the author)

Coping Strategy Index (CSI)

Most of the food insecurity measurement is costly and complicated exercise. Among these tools are needed which t are quick and easy to administer, straight-forward to analyze and provide real-time information to the researcher and policy maker. The CSI is one of such tools (Maxwell and Caldwell, 2008). It

was developed in Uganda, Ghana and Kenya but has now been used for early warning and food security monitoring and assessment in at least nine other African countries and several in the Middle East and Asia. The CSI measures behavior: the things that people do when they cannot access enough food. There are a number of fairly regular behavioral responses to food insecurity or coping strategies that people use to manage household food shortage. These coping strategies are easy to observe. In order to calculate CSI firstly it is necessary to identify the locally relevant coping strategies of the respective project area which should be fallen into four basic categories: (i) dietary change, (ii) short-term measures to increase the household food availability, (iii) short-term measures to decrease the numbers of people to feed and (iv) Rationing, or managing the shortfall. In the present study, the following list of coping strategies (Table 2) was identified:

Table 2. Coping strategies for the selected sample enclaves' households

a. Selling family asset for short-term	i. Gather wild food
b. Borrow food from a friend and relative	j. Harvest immature crops
c. Expensing the savings	k. Consume seed stock held for next season
d. Reducing the crop production	l. Send children to eat with neighbors or other families
e. Limit portion size at mealtimes	m. Restrict consumption by adults in order for small children to eat
f. Partial working	n. Reduce number of meals eaten in a day
g. Rely on less expensive food	o. Skip entire days without eating
h. Buying food without money (due)	p. Selling immature crops (fruits, vegetables, wood tree) or immature live stocks

The CSI tool relies on counting coping strategies that are not equal in severity. Different strategies are "weighted" differently, depending on how severe they are considered to be by the people who rely on them. The frequency answer is then multiplied by a weight that reflects the severity of individual behaviors. For the present study, the weights are developed from qualitative observation during the survey. Finally, summing all the responses provides a household coping strategy index. The following typical threshold is used to present CSI for the present study (Maxwell, 1996; Maxwell and Caldwell, 2008).

CSI	Profiles
0-2	No or low coping (food secure)
3-12	Mildly food insecure
≥ 13	High coping (Moderately/severely food insecure)

Months of Adequate Household Food Provisioning (MAHFP)

The MAHFP indicator can capture the changes in the household's ability to address vulnerability in such a way as to ensure that food is available above a minimum level round the year. This also captures the combined effects of a range of interventions and strategies that augments household purchasing power (Bilinsky and Swindale, 2010). The calculation is simple and easy to do by hand. The following ways were used to calculate MAHFP for the present study as defined by Bilinsky and Swindale, (2010)-

Calculate the MAHFP (0-12) for each household	Twelve months minus the total number of months out of the previous 12 months that the household was unable to meet their food needs. Values for A through L will be either "0" or "1."
	(12) - Sum (A + B + C + D + E + F + G + H + I + J + K + L)

The present study calculated the mean for all the sample households and follow the following thresholds to interpret the MAHFP

MAHFP	Profiles
10-12 months	Food secure
0-9 months	Food insecure

Body Mass Index (BMI)

In order to know the nutritional status of the selected households BMI was calculated. It was measured based on four different categories underweight (<18.5 kg/m^2), normal ($18.5–24.9$ kg/m^2), overweight ($25–29.9$ kg/m^2) and obese (≥ 30 kg/m^2) as done by Anon (2022). A digital weight machine and a metered scale were used to measure the weight and length of the selected households.

Determinants of Food Security

Binary logistic regression was also carried out to know the determinants of food security of the selected sample households as done by Ria *et al.* (2019).

Let Y be a dichotomous dependent variable. For the present study Y variable is termed as food security where Y= 1 food secured and Y=0 otherwise. If X is the independent variable than a logistic regression model based on Gujarati, 2007 is

$$F = p(Y = 1/X) = \frac{e^{\beta_0+\beta_1 X}}{1+e^{\beta_0+\beta_1 X}} \text{ and}$$

$$1 - p = p(Y = 0/X) = \frac{1}{1+e^{\beta_0+\beta_1 X}}$$

$$\text{So, } Logit \ L_1 = \log\left[\frac{p}{1-p}\right] = \beta_0 + \beta_1 X$$

Independent variables considered for this logistic regression were total land size (decimal), family size (number), monthly income (BDT) and daily family consumption (gm.) of the sample enclaves' households.

Results and Discussion

Sample characterization

Socio-economic and demographic profile of the selected enclaves' households has been presented in Table 3. It is evident that the average age of the family head was 44.56 year while the mean household size was 4.96. Household size was higher than the national average of Bangladesh which was 4.06 person in 2016 (HIES, 2016). Educational attainment of the family head was 3.73 years of schooling which is far below than the national mean years of schooling for male 6.8 (HDR, 2020). The average number of adult male and female members was 1.55 and 1.46. Beside this the mean of total employed and the unemployed member was 2.81 and 2.84, respectively. The age dependency ratio of sample households was 91.13% which is too higher than the national age dependency ratio of Bangladesh 47.92% in 2019 (Anon., 2019).

Table 3. Socio-economic and demographic profile of households

Variables	Mean	SD
Age of family head (years)	44.56	14.78
Family size (number)	4.96	2.00
Educational attainment (Year of schooling of family head)	3.73	4.85
Adult male member (Above 21 years)	1.55	0.88
Adult female member (Above 21 years)	1.46	0.72
Family member (12-21 years)	0.75	0.87
Family member (below 12 years)	1.20	1.10
Male employed member	1.50	0.87
Female employed member	1.31	0.70
Total employed member	2.81	1.42
Total unemployed member	2.84	1.64
Dependency ratio (%) *	91.13	94.5
Cropping experience (Family head)	19.86	15.60

Source: Field survey by the authors in 2020.

* Dependency ratio formula based on Bangladesh =

$$\frac{\text{Total number of children (0 to 15 years) + Total number of older population (16 to 60 years)}}{\text{Total number of working age population}} \times 100$$

Table 4. Sources of income

Sources	No. of households	Yearly income (Mean BDT)
Rice cultivation	72 (90)	42339 (9.68)
Wheat cultivation	11 (9)	996 (0.23)
Pulses cultivation	4 (3)	24666 (5.64)
Oilseed crop cultivation	55 (44)	28179 (6.44)
Potato cultivation	38 (30)	27989 (6.40)
Vegetables cultivation	13 (10)	6444 (1.47)
Selling of daily labour (Agricultural)	29 (23)	67576 (15.45)
Selling of daily labour (Non-agricultural)	9 (7)	82485 (18.86)
Income from working through migrating to capital city and other parts of Bangladesh	6 (5)	10000 (2.29)
Small business	20 (16)	110766 (25.32)
Livestock production	34 (27)	26416 (6.04)
Fishery	5 (4)	2325 (0.53)
Social safety net	14 (11)	7200 (1.65)
Total		437385 (100.00)

Source: Field survey by the authors in 2020

Note: Figures in the parenthesis indicates percentages of total.

Household income

The study found a number of sources where sample households earned their income. The sources that contributed mostly to their yearly income were crop production (Table 4). Some other secondary sources of income were selling of agricultural and non-agricultural labour, small business, and livestock rearing. Most part of the income from crop production came from rice (Aman and Boro rice) production. Table 6 shows that the 90% of the household's main sources of income was rice production. Beside this they also cultivated wheat, pulse crops (lentil, cowpea), oilseed crops (mustard, groundnut), maize, potato and vegetables. Out of the total surveyed households, 11% of them were found to be dependent on different social safety net program for their livelihood. This includes vulnerable group development (VGD),

vulnerable group feeding (VGF) and elderly allowance. As the sample district is not an industrial area so after the enclave exchange in 2015 some of the sample respondents were found to migrate to other parts of the country for their livelihood.This was one of the income source of 5% of the sample households. Mean annual income of the sample households was BDT 437385.02 in which the highest proportion came from small business (25.32%). Cultivation of crops like rice, pulses, oilseeds and potato cultivation contributed significant portion to the annual income which were accounted for 9.68, 5.64, 6.44, and 6.40%, respectively (Table 4). But rice production sector generated the highest annual income in the case of enclave household in Kurigram district of Bangladesh (Ria *et al.,* 2019).

Food consumption, calorie intake and protein intake of sample households

Daily per capita food consumption, calorie intake and protein intake of sample households have been presented in Table 10. On an average they consume 20 food items daily. Mean of daily per capita food intake was 1414.52 gm. of which 609.35 gm. came from rice consumption. Some other major food items include potato (285.55 gm.), green leafy vegetables (166.54 gm., fish (39.65 gm.), wheat (45.39 gm.), fruits (43.90 gm.), meat (28.71 gm.) etc. The average daily per capita protein intake was 63.14 gm. of which major part came from rice consumption (16.45 gm.) following by potato, wheat, green leafy vegetables, meat, fish, egg, milk etc. Heck *et al.* (2010) was found rural area mean protein intakes of male and female of Bangladesh were 67.5 and 78.2 gm./day. This protein intake was also lower than as reported by Rahman *et al.* (2007) in their research which was amounted to 54.64 gm. Among the food items per capita yearly rice, fish and meat consumption among the surveyed enclaves household members was 222.41 , 14.47 and 10.47 Kg which was far higher than the national average of 181.3 , 13.51 and 9.12 Kg (FAO, 2021b; Selvanathan *et al.,* 2020; Rahman, 2020; FAO, 2009).

Rice was the major part of the calorie supplier of the sample enclave's households (Table 10). It contributes 584.97 Kcal per day per capita out of total calorie intake of 1619.67 Kcal. The potato was the second highest food item which provides daily per capita 242.72 Kcal followed by wheat (157.06 Kcal), oil (136.21 Kcal), sugar (88.10 Kcal), meat (68.61 Kcal) etc. At least 2186 Kcal is required for an adult person every day but in the sample enclave's household daily per capita calorie intake was 1619.67 Kcal. This is also significantly lower than the national average of Bangladesh 2318.3 Kcal (HIES, 2016).

Table 10. Daily per capita food consumption, calorie and protein intakes of sample households

Food items	Food consumption (gm)		Protein intake (gm)		Calorie intake (Kcal)	
	Mean	SD	Mean	SD	Mean	SD
Rice	609.35	183.77	16.45	4.96	584.97	176.42
Wheat	45.39	225.38	5.63	27.95	157.06	779.81
Potato	285.55	119.06	6.28	2.62	242.72	101.20
Arum	5.80	18.39	0.15	0.46	10.85	34.39
Carrot	9.87	20.49	0.10	0.20	3.26	6.76
Radish	10.71	26.87	0.56	1.48	1.71	4.30
Green leafy vegetables	166.54	231.10	4.83	6.70	38.31	53.15
Dry fish	2.35	4.08	1.46	2.53	5.40	9.39
Fruits	43.90	70.01	0.53	0.84	37.76	60.21
Meat	28.71	25.67	7.75	6.93	68.61	61.36
Fish	39.65	31.17	9.12	7.17	64.23	50.49
Egg	25.14	24.61	3.27	3.20	59.09	57.83
Pulses	10.10	9.94	1.01	0.99	11.81	11.63
Oil	30.54	17.57	0	0	136.21	78.37
Peanut	10.02	15.42	2.60	4.01	56.80	87.44
Milk	47.34	88.78	2.84	5.33	30.30	56.82
Turmeric	3.44	1.47	0.21	0.09	12.17	5.20
Chili	10.63	7.87	0.21	0.16	4.25	3.15
Zinger	7.58	5.95	0.14	0.11	6.06	4.76
Sugar	21.91	15.47	0	0	88.10	62.19
All food items	1414.52	1143.07	63.14	75.73	1619.67	1704.87

Source: Authors estimation based on field survey 2020

Poverty measurement

Four different types of poverty level were found in the survey area (Table 6). The maximum portion of the sample households was in the situation of ultra-poor means whose daily per capita calorie intake was less than 1600 Kcal. About 61.25% of the households lies in ultra-poor whose average daily per capita calorie intake was 1282.33 Kcal. The 20% of the households were in hard core

poor whose average daily per capita calorie intake was 1694.77 Kcal which is less than the hard core poverty line 1805 Kcal. At the same time 11.25% of the sample households were found non-poor which implies that their daily average per capita calorie intake was more than 2122 Kcal (Table 6). But Hossain (2020) stated that 25.7% of the households covering 30 rural clusters of Sylhet division of Bangladesh lie in poverty alongside 15.24% in hardcore poverty and 31.78% in below absolute poverty. On the other hand, study conducted in tribal people of Sherpur district of Bangladesh was found highest proportion of respondents in hardcore poor category (36.67%) following by absolute poor (25%) and ultra-poor (21.67%) (Saha *et al.,* 2021).

Table 6. Status of poverty of the households in respect to calorie intake

Categories of poverty	% of sample households	Average daily per capita calorie intake (Kcal)
Ultra poor <1600	61.25	1282.33
Hard core poor 1600-1804	20	1694.77
Absolute poor 1805-2122	7.5	1944.89
Non-poor >2122	11.25	3105.96

Source: Field survey by the authors in 2020

Food security status of the sample household

Food Consumption Score (FCS)

In order to know the status of sample households in diet clusters food consumption score (FCS) was estimated (Table 7). It is evident from the Table 7 that sample households were in two categories of food insecurity out of three insecurity level. There was no household belongs to acceptable diet. The lion's share of the household's lies in poor diet clusters amounted to 81.25% of the sample households whose average FCS score was 14.8. The rest of the households were in borderline diet clusters whose average FCS score was 23.8. But 70.40% of the respondents of Sylhet division of Bangladesh belonged to acceptable diet as stated by Hossain (2020).

Table 7. Food consumption score (FCS) of the sample households

Categories of food insecurity	% of sample households	Average FCS score
Poor diet clusters (Score: 0-21)	81.25	14.8
Borderline diet (Score: 21.5-35)	18.75	23.8
Acceptable diet (Score: Above 35)	0	0

Source: Field survey by the authors in 2020

Coping Strategy Index (CSI)

Food security status of sample enclave households was categorized based on CSI. Among the categories, high coping means moderately to severely food insecure which include the maximum 70% of the sample households. This implies that most of the household under study were severely food insecure and the mean CSI score was 117.73. At the same time, 10% of the respondents fall under mildly food insecure with average CSI score 48.38. About 20% of the households were food secure (Table 8). But the highest 69% of the respondents of Sylhet division of Bangladesh belonged to no food insecurity status as reported by Hossain (2020).

Table 8. Food insecurity status of the sample households on the basis of coping strategy index (CSI)

Categories of food insecurity	% of sample households	Average CSI score
No or low coping (food secure) (CSI score less than 40)	20	9.47
Mildly food insecure (CSI score less than 60)	10	48.38
High coping (moderately/severely food insecure) (CSI score 61 and above)	70	117.73

Source: Field survey by the authors in 2020

Table 9. Percentage distribution of responses to the Household food insecurity access scale score (HFIAS) during the past four weeks

Indicator	% affirmative response
1. Anxiety about not having enough food in the household	62.50
2. Inability to eat preferred foods by any of the household member	90.00
3. Eat limited variety of food by any of the household member due to a lack of resources	88.75
4. Eat some foods that household member did not want to eat because of a lack of resources to obtain other types of food	85.00
5. Eat a smaller meal than the requirement by any of the household member because there was not enough food	62.50
6. Reduced number of meals or cut one time meals of any day	37.50
7. Having no food to eat in the household or failed to collect food for the family	21.25
8. Any member of the household go to sleep at night without having eaten any food	3.75
9. Spending a whole day and night without eating anything because there was not enough food	2.5

Source: Field survey by the authors in 2020

Household Food Insecurity Access Score (HFIAS)

Based on food experiences of the last four weeks Table 9 shows that a high proportion of sample households had been unable to eat their preferred foods (90%), eat a limited variety of food due to lack of resources (88.75%), eat some foods that household did not want to eat (85%), anxious about food availability (62.50%). Besides, only 3.75% of them went to sleep without having any food at night. However, only 2.5% of the sample respondents passed a whole day and night without eating anything because there was not enough food.

Based on the HFIAS score level of food insecurity of the sample household was assessed (Table 10). It is evident that 17.5% of the sample households were food secure based on question Q1 and the frequency of occurrence was rare. Under Q1 52.5% of the respondents were mildly food insecure which occurred sometimes and often. Most of the respondents were in moderately food insecure category which accounted for 85, 78.75, 52.5 and 28.75% under indicator Q3, Q4, Q5 and Q6, respectively. A significant portion of the sample households were severely food insecure based on indicator Q5, Q6, Q7, Q8 and Q9 which covers 17.5, 15, 31.25, 15 and 33.75%, respectively. Therefore, it can be concluded that most of the respondents of the present study were moderately food insecure.

Table 10. Level of food insecurity under HFIAS during the past four weeks

Indicator	Level of food insecurity (% of households)			
	Food Secure	Mildly food insecure	Moderately food insecure	Severely food insecure
Q1. Anxiety about not having enough food in the household	17.5 (Occurrence: rarely)	52.5 (Occurrence: sometimes and often)	0	0
Q2. Inability to eat preferred foods by any of the household members	0	91.25 (Occurrence: rarely, sometimes and often	0	0
Q3. Eat limited variety of food by any of the household members due to a lack of resources	0	7.5 (Occurrence: rarely)	85 (Occurrence: sometimes and often)	0
Q4. Eat some foods that household members did not want to eat because of a lack of resources to obtain other types of food	0	5.25 (Occurrence: rarely)	78.75 (Occurrence: sometimes and often)	0

Table 10. Cont'd

Indicator	Level of food insecurity (% of households)			
	Food Secure	Mildly food insecure	Moderately food insecure	Severely food insecure
Q5. Eat a smaller meal than the requirement by any of the household members because there was not enough food	0	0	52.5 (Occurrence: rarely and sometimes	17.5 (Occurrence: often)
Q6. Reduced number of meals or cut one time meals of any day	0	0	28.75 (Occurrence: rarely and sometimes	15 (Occurrence: often)
Q7. Having no food to eat in the household or failed to collect food for the family	0	0	0	31.25 (Occurrence: rarely, sometimes and often
Q8. Any member of the household goes to sleep at night without having eaten any food	0	0	0	15 (Occurrence: rarely, sometimes and often
Q9. Spending a whole day and night without eating anything because there was not enough food	0	0	0	33.75 (Occurrence: rarely and often

Source: Field survey by the authors in 2020

Dietary diversity based on Household Dietary Diversity Scores (HDDS)

The results in Table 11 show that the HDDS score for the sample households ranges from 5 to 13. The level 6 to 8 includes 48.75% of the households following by 9 to 13 and 2 to 5 by 42.5 and 8.75%, respectively. Based on HDDS score 91.25% of the sample households were grouped in high dietary diversity level following by 8.75% in medium dietary diversity level. It is also evident from the Table 11 that there were no lowest dietary diversity households in the sample enclave area.

Table 11. Level of dietary diversity of the sample households based on Household dietary diversity scores (HDDS)

HDDS level	Level of dietary diversity	% of households
HDDS terciles		
≤ 3 food groups	Lowest dietary diversity	0
4-5 food groups	Medium dietary diversity	8.75
≥ 6 food groups	High dietary diversity	91.25
HDDS Score		
Proportion of households with HDDS of 2 to 5		8.75
Proportion of households with HDDS of 6 to 8		48.75
Proportion of households with HDDS of 9 to 13		42.5

Source: Field survey by the authors in 2020

Food security based on months of adequate household food provisioning (MAHFP)

Table 12 provides another cluster of food security group in the survey area based on MAHFP. Among the sample households 80% of them were food secure as because they had the provision of managing household food for about 10-12 months whereas the rest 20% had no provisioning to manage the daily food for up to 12 months. These rest part managed the food requirement for 0-9 months of the year.

Table 12. Level of food security of the sample households based on Months of Adequate household Food Provisioning (MAHFP)

MAHFP level	Level of food security	% of households
10-12 months	Food secure	80
0-9 months	Food insecure	20

Source: Field survey by the authors in 2020

Body Mass Index (BMI)

Status of household held physical fitness largely introduces the full picture of a family. Body Mass Index (BMI) of the sample households head was calculated. It is evident from Table 13 that the maximum 51.25% of the sample household were underweight which implies their BMI was below 18.5 Kg/m^2. Beside this 45% of the respondents were the normal means that they were between 18.5 to 24.9 Kg/m^2 following by 3.75% overweight (between 25-29.9 Kg/m^2). There was no household head whose physical feature was found to be obese based on BMI characterization.

Table 13. Status of households head based on Body Mass Index (BMI)

Categories of BMI	Weight status	% of household head
<18.5 kg/m^2	Underweight	51.25
18.5–24.9 kg/m^2	Normal	45.00
25–29.9 kg/m^2	Overweight	3.75
≥30 kg/m^2	Obese	0

Source: Field survey by the authors in 2020

Determinants of Food Security

The effect of different determinants of food security was exposed by the binary logistic regression as shown in Table 14. The result shows that food security is positively correlated with total land size and daily family consumption. A unit increase in land size the likelihood of food security of the sample household could be increased by 4.940 times. At the same time a unit increase in daily family consumption will increase food security 10.031 times among the survey respondents. Beside this there was no significant relationship between food security and year of schooling, family size and monthly income of the households. So, it can be concluded that food security of the enclave's households depends on their land holdings and family consumption.

Table 14. Binary logistic regression of the effects of different determinants on food security

Variables	β	S.E.	Wald	Sig.	Odds Ratio (OR)
Year of schooling (Family head)	-0.061	0.159	0.147	0.701	0.689
Total land size (decimal)	4.940*	2.924	2.855	0.091	0.454
Family size	-3.688	2.920	1.596	0.206	0.025
Monthly income (BDT)	-0.023	2.235	0.000	0.992	0.012
Daily family consumption (g.)	10.031**	4.806	4.356	0.037	1.842
Constant	-128.580**	55.143	5.437	0.020	0.000

Source: Author's estimation

Conclusion and Policy Recommendations

The study empirically identified the status of poverty, household food security, nutritional status and determinants of food security among selected former enclave households in Panchagarh district of Bangladesh. Crop production was found to be the main sources of income of the enclaves' households while a significant number of them were involved in selling daily labor, small business and livestock production. Rice was their main consumable items following by

potato, leafy vegetables, milk, fruits, fish, meat etc. Rice was also the main supplier of protein and calorie intake of the surveyed enclaves' households. The highest proportion of the sample households belonged to ultra-poor whose average daily per capita calorie intake was 1282.33 Kcal. A number of food security scale measurement was applied to know the food security situations of the sample enclave households where in most cases they were found moderately to severely food insecure. Besides, level of food security of the sample households is positively correlated with total land size and daily family consumption (gm) of food. Therefore, diversification of crop production and diversification of family consumption can be recommended steps for the enclaves' households to upgrade their food and nutrition security status.

Conflict of Interest

The authors declare that there is no conflict of interest to publish this research article.

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