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Protein Intake Category of Households and Its Influencing Variables: A Case Study from Rajshahi District of Bangladesh

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Abstract

Any deviation of getting the optimum protein intake may influence healthcare of households. Verifying whether the peoples of the country receiving the optimum protein or not is now a priority to meet specific challenges of the SDGs. As such the present study was carried out with an aim to identify the relevant factors influencing the protein intake of the respondent of Rajshahi district of Bangladesh. Hence, a field study was conducted in order to find out the influencing factors of protein intake using sampling methodology. The factor analysis was used to extract the factors with allied variables followed by authors developed protein index categories LSG, SG and MSG. The result of the study revealed that four factors explained about 68.63% of total variation for LSG, three factors explained about 63.68% of total variation by SG and four factors explained about 73.64% of the total variation by MSG. Since in recent years the Government of Bangladesh is giving emphasis on healthcare of the inhabitant, protein intake and its status examined by the developed index categories with its influential factors/variables may have certain implications for what policies should be implemented in order to improve protein efficiency of the country.

Keywords: Protein intake, Food Security Index (FSI), Factor analysis, Rotated component matrix, SDGs.
JEL Classification: C02; C42; C80; C81; C93 ; I11, I12.

Introduction

The food grain requirement in a country depends on the dietary pattern, which also changes over time. Food grain and animals are the principal sources of food calorie and protein which comes from the daily diet. Food secured households are they who get the protein, carbohydrate, fat, vitamin and other nutritional ingredients regularly. Food availability and consumption situation are major things for the protein intake of the households. Such status can be examined by the total calorie intake, daily carbohydrate intake, daily protein intake and daily fat intake. As

therefore, we have been collected inforamtion of households following the appropriate research methodology (see section *Study Area and Sampling Design*) of Rajshahi district of Bangladesh.

Food is a mixture of nutrients that produce energy for the body, stimulate growth, and maintain life. Protein helps to improve immune response and it is the source of energy of human body. Fish, meat, egg and pulses are the sources of protein and that are essential for the human body function. FAO of the World Health Organization suggested 0.8 gm/kg protein of body weight with a desired range of 37.5–60 g/day for men and 30–56 g/day for women (World Health Organization, 1985). The intake of nutrients and overall energy intake improved between the 1980's and 1990's in Bangladesh and it is possible that intakes may have continued to increase since that time (Hels et al. 2003). Further a study conducted by BBS in 2016 have been noticed in protein aspects where the per capita protein intake is found to be lower than all previous HIES (BBS., 2016). In developing countries it is seen the concept that the greater intake of protein is associated with better health regardless of SES (Ayele et al. 2003). According to Household Income Expenditure Survey (HIES) 2000 the calorie and protein intake from food grain was 78 and 58.5 percent respectively in 1995-1996. But it was come down to 75.4 and 58.3 percent in 2000. The nutritions can be found from Protein, Carbohydrates, Fats, Vitamins, Minerals, Water etc.

A number of studies have been found in the literature where the researchers are concentrated with the protein intake. Among them Begum et al. (2013) studied the present status and trend of food security in Bangladesh. They studied the prevalence of child malnutrition and found that Bangladesh is not currently food secured in the sense of share of the total energy coming from protein and fat. Haque et al. (2014) studied on the diet intake pattern and nutritional status of rural population in Bangladesh. They showed that the overall dietary intake pattern of rural population in Bangladesh is poor. Therefore they urge to perform a large scale to explore the real scenario of dietary pattern and nutritional status of rural population of the country. In 2010 Heck et al. studied on the protein and amino acid intakes in a rural area of Bangladesh and they found a high prevalence of underweight among the respondents. They identified inadequate protein intake according to FAO standards for body weights of the respondents. High prevalence of chronic malnutrition was recorded by Muhammad *et al*. in 2015 for the under 5 years children of the Monga affected area of the Northern part of Bangladesh. Although they observed satisfactory average per capita energy and food intake for the children, the intra family food distribution was not in proper balance. An empirical study was conducted by Das and Gulshan in 2017. They investigated the extent of malnutrition and factors associated with malnutrition amid children aged 0-59 months in Bangladesh. They advised to give special attention to the most vulnerable groups including the children from poorest socio-economic group or children in the urban area of Bangladesh. In the above studies the authors confined on the status of the protein and energy using specific data sets both from primary and secondary sources no such studies have been found to discriminate the influencing relevent factors on the protein intake of the households. As such a field study have been done by herewith and the data of protein intake together with some allied variables influencing such intake have collected on basis of 350 households from the study region. The well structured questionnaire have been used to collect the data from the daily consumption pattern of the respondents. The daily calorie intakes were calculated from protein intake considering 1 gram of protein into 4 calories. We then developed a Food Security Index (FSI) on the basis of the recommended calorie intake from protein. First of all the data have been classified into three different groups namely Less Secured Group (LSG), Secured Group (SG) and More Secured Group (MSG). As such categorized protein influential observations have

been identified following the data reduction technique, Factor Analysis.

Study Area and Sampling Design

The study was carried out in Rajshahi district of mid-western region, Bangladesh. The total area of the district is 2,425.37 sq. km. administratively the district consists of one City Corporation including 4 metropoliton thana and 9 administrative thana. The metropoliton thanas are Boalia, Rajpara, Motihar and Shah Makhdum and the administrative thanas are Bagha, Bagmara, Charghat, Durgapur, Godagari, Mohanpur, Paba, Puthia and Tanore. According to the Population Census 2011, total number of households of Rajshahi district was 633758 and total enumerated population was 2595197.

Two stage-sampling techniques were employed in designing the survey. In the first stage, five thanas were selected randomly, namely, Bagha, Matihar, Paba, Puthia and Tanore from 13 units. At the second stage, 5 villages are randomly selected from each thana for 1 village. Thus from the selected 5 villages a total number of 350 households have been selected randomly and were investigated with the help of a pre-tested structured interview schedule.

Factor Analysis

A way of condensing the information contained in a number of original variables into a smaller set of dimensions (factors) with a minimum loss of information in comparison to the whole data sets is known as factor analysis. Basically factor analysis is used to identify factors that statistically explain the patterns of variations among multiple values of the variables. It reduces a large number of variables that often overlap to a smaller number of factors. Hair *et al*. stated as factor analysis is a statistical approach to analyze interrelationships among a large number of variables and to explain these variables in terms of their common underlying dimensions (factors). Application of factor analysis in a study measures the sampling adequacy by a statistical test which quantifies the inter-correlations among the variables of considerations (Hair *et al*., 1992 and 1998).

When the correlation among the variables is relatively higher and the number of factors is relatively lower than the number of variables factor analysis could be used. But if when the correlation among the variables is relatively lower and when number of factors is relatively higher than the number of variables factor analysis could not be used.

Discussion of the Results

The values of Kaiser-Meyer-Olkin (KMO) statistics and Bartlett's test of Sphericity of Daily Protein Intake in gram for three groups LSG, SG and MSG of the respondent in study area parameterized by the food security status are presented in Table 1.

Table 1. KMO and Bartlett's Test of Daily Protein Intake

Category	Statistics		Value
LSG	KMO		0.594
	Bartlett's Test of Sphericity	Approx. Chi-Square	911.592
		df	66
		Sig.	0.000
SG	KMO		0.750
	Bartlett's Test of Sphericity	Approx. Chi-Square	1145.234
		df	66
		Sig.	0.000
MSG	KMO		0.587
	Bartlett's Test of Sphericity	Approx. Chi-Square	567.009
		df	66
		Sig.	0.000

It is noticed from Table 1 that the KMO statistics of sampling adequacy measure for the factor influencing protein intake categories are 0.594, 0.750 and 0.587. Since the KMO values of LSG and MSG are near about 0.60 thus the data used in this test is suitable for factor analysis by Tabachnick and Fidell (1996). The value of SG equals to 0.75 indicating the certainty of using the factor analysis by the KMO values.

The Bartlett's test of Sphericity of factor influencing protein intake categories of daily protein intakes are found to be 911.592, 1145.234 and 567.009 respectively for LSG, SG and MSG. Since the approximate chi-square values are significant at 1% level the KMO obtained by this test is characterized by Norussis as "Mediocre" and the highly significant level of the test of Sphericity are both very comfortable indications that the given data sets are adequate for factor analysis. Factor wise Eigen values, percentages of variance accounted for the factors and cumulative percentages of variance explained by the factors selected for daily protein intake (in gm) by food consumption are given in Table 2 for three groups.

Table 2. Factor wise Explained Variation of Daily Protein Intake

Protein Intake Factors	Eigen Value	Accounted Percentage of Variation	Cumulative Percentage of Variation
LSG			
1	4.076	33.971	33.971
2	1.793	14.942	48.913
3	1.285	10.706	59.618
4	1.082	9.013	68.632
SG			
1	4.703	39.194	39.194
2	1.510	12.581	51.775
3	1.429	11.905	63.680
MSG			
1	4.084	34.036	34.036
2	2.048	17.067	51.104
3	1.544	12.863	63.967
4	1.161	9.677	73.644

Table 2 revealed that for LSG, Factor-1 explained about 33.97% of variation; Factor-2 explained 14.94% and the two factors together with explained 48.91%. Factor-3 explained 10.71% and together with previous two factors explained 59.62% of variation. The fourth factor explained 9.01% of variation and finally the above table shows that Factor 1, Factor 2, Factor 3 and Factor 4 jointly explained about 68.63% of total variation. It is evident that for SG the first factor explained about 39.19% of variation, second factor explained 12.58% and together with 51.78% of variation. The third factor explained 11.90% of variation and Factor 1, Factor 2 and Factor 3 jointly explained about 63.68% of total variation. The explained variation by MSG shows that the first factor can explained about 34.04% of variation, second factor explained 17.07% and together with 51.10% of variation. The third factor explained 12.86% of variation and Factor 1, Factor 2 and Factor 3 jointly explained about 63.97% of total variation. The fourth factor can explain about 9.68% of variation while all four factors can explain about 73.64% of the total variation.

Rotated Component Matrix of daily protein intake (in gm) for the groups are given in the Tables 3-5.

Table 3. Rotated Component Matrix of Daily Protein Intake of LSG

Variables Name	Component			
	1	2	3	4
Age of Respondent	-0.039	0.011	0.759	0.043
Total Family Member	0.259	0.903	0.238	0.046
Earning Member	0.207	0.380	0.652	0.040
Dependent Member	0.199	0.896	0.027	0.054
Child Member	0.373	0.512	-0.061	-0.423
Aged Member	-0.316	0.570	0.395	-0.017
Monthly Income	0.881	0.061	0.074	0.013
Monthly Expenditure	0.890	0.119	0.112	0.136
Additional Income	0.581	0.125	0.560	0.070
Weekly Food Expenditure	0.446	0.223	-0.205	0.047
Agricultural Income	0.162	0.083	0.088	0.877
Amount of Loan	0.616	0.137	0.370	-0.397

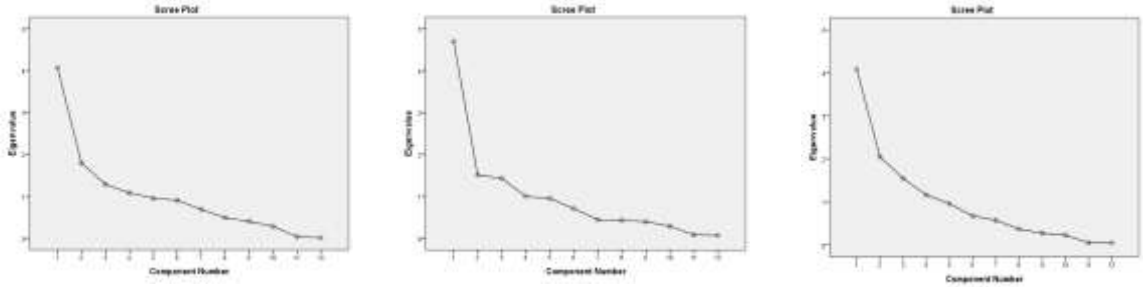
Table 4. Rotated Component Matrix of Daily Protein Intake of SG

Variables Name	Component		
	1	2	3
Age of Respondent	0.203	-0.036	0.668
Total Family Member	0.212	0.821	0.426
Earning Member	0.333	0.339	0.645
Dependent Member	0.152	0.847	0.191
Child Member	0.062	0.825	-0.117
Aged Member	-0.054	0.093	0.846
Monthly Income	0.885	0.167	0.031
Monthly Expenditure	0.860	0.265	0.184
Additional Income	0.562	0.026	0.315
Weekly Food Expenditure	0.778	0.331	0.124
Agricultural Income	-0.245	0.115	-0.038
Amount of Loan	0.590	0.428	0.006

Table 5. Rotated Component Matrix of Daily Protein Intake of MSG

Variables Name	Component			
	1	2	3	4
Age of Respondent	0.071	-0.241	0.091	0.788
Total Family Member	0.164	0.756	0.396	-0.185
Earning Member	0.251	0.215	0.843	0.083
Dependent Member	0.012	0.923	-0.127	0.084
Child Member	0.167	0.808	0.215	-0.007
Aged Member	-0.170	0.030	0.588	0.530
Monthly Income	0.851	0.196	0.237	-0.039
Monthly Expenditure	0.853	0.171	0.331	-0.046
Additional Income	0.385	0.015	0.673	-0.115
Weekly Food Expenditure	0.831	0.179	0.272	-0.126
Agricultural Income	-0.065	0.423	-0.148	0.645
Amount of Loan	0.639	-0.189	-0.252	0.156

The Scree plot for determining the factors influencing food security in considering the daily protein intake for the groups are given in Figure 1.



a) LSG b) SG c) MSG

Figure 1. Scree plot of Daily Protein Intake

The set of variables (Monthly Income, Monthly Expenditure, Weekly Food Expenditure, Amount of Loan); (Total Family Member, Dependent Member, Child Member, Aged Member);

(Age of Respondent, Earning Member) and (Agricultural Income) were found to be influential for the LSG that have been found from Table 3. It is depicted from Table 5 that the set of variables (Monthly Income, Monthly Expenditure, Additional Income, Weekly Food Expenditure); (Total Family Member, Dependent Member, Child Member); (Earning Member, Aged Member) are influential for the SG. The influential set of variables (Monthly Income, Monthly Expenditure, Weekly Food Expenditure); (Total Family Member, Dependent Member, Child Member); (Earning Member, Aged Member, Additional Income); (Age of Respondent and Agricultural Income) have also confined for the MSG that have been found from Table 6. The variables for LSG can explain about 68.632 of the total variation for the four retained components while there components retained for the SG can explain about 63.680 of the total variation. About 73.644 of the total variation can be explained for the four retained components of MSG.

Conclusion

According to the objectives of the study we were intended to identify the factors influencing the protein intake of the respondent of Rajshahi district of Bangladesh. Following proper sampling methodology and well structured questionnaire a field study was conducted to collect the data of 350 households. As Bangladesh Government is trying to incorporate and address all the associated elements with food security to achieve touch the SDGs setting we have been computed protein intake index and on basis of protein intake level three categories have mentioned as LSG, SG and MSG. The rotated component matrices of daily protein intake have computed respectively for the categorized groups. The factor-wise variable lists have recognized with the help of such rotated component matrices. The factors of LSG included the variables (Monthly Income, Monthly Expenditure, Weekly Food Expenditure, Amount of Loan); (Total Family Member, Dependent Member, Child Member, Aged Member); (Age of Respondent, Earning Member) and (Agricultural Income) accordingly. The three factors of variables (Monthly Income, Monthly Expenditure, Additional Income, Weekly Food Expenditure); (Total Family Member, Dependent Member, Child Member); (Earning Member, Aged Member) are found to be influential for the SG respectively. For MSG the prominent respective set of variables are marked as (Monthly Income, Monthly Expenditure, Weekly Food Expenditure); (Total Family Member, Dependent Member, Child Member); (Earning Member, Aged Member, Additional Income) and (Age of Respondent and Agricultural Income). In this study four factors have explained for LSG which can explain about 68.63% of total variation. Three factors also explained for SG which can explain about 63.68% of total variation. Similarly four factors have retained for MSG with about 73.64% explained variation.

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