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Consumption Pattern and Determinants of Nutritional Intake among Rural Households of West Bengal, India

Sanjit SARKAR [1]

[1] *International Institute for Population Sciences, Mumbai, INDIA*

E-mail: sanjitiips@gmail.com

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ABSTRACT

Adequate intake of nutrition is essential for growth, development and a healthy life. Hence, this study sought to understand the nutrition consumption pattern and their determinants in the case of rural households of West Bengal. The data of a cross-sectional sample survey, involving 485 households from rural West Bengal of India, were analysed. The study collected information regarding household's consumption quantity of various food items for a thirty-day period, which were used to calculate the three specific nutrition i.e. calories, proteins and fat. Nutritional intake per capita was estimated based on adult male equivalent norms or consumer unit norms. Bivariate and multi-variate analyses were applied in this study. Against the average calorie, protein and fat consumptions of 2,642 kcal, 66.6 gms and 27.8 gms per capita per day, the Muslim households and ST households proved the most deprived in case of all three nutrients. Per capita calorie and protein consumptions are found higher in case of female headed households but fat consumption is higher in case of male headed households. The level of nutritional intake is much lower in case of the agricultural labour households and landless households. Multiple linear regression model shows that household size ($p<0.10$), availability of livestock ($p<0.10$), and source of income ($p<0.10$) are significantly associated with the level of nutritional intake. The lack of resources makes the households deprive in nutritional consumption. Thus, access and proper management of physical, human and economic capitals may improve nutritional intake in the households.

1. INTRODUCTION

Men need proper and adequate nutrition for growth, development, and to live an active and healthy life. There are wide ranges of nutrients that perform various functions in the body and help us survive in good health. These nutrients include energy, protein, fat, carbohydrate, vitamins and minerals. Foods that we include in our diet are the main sources of nutrients in our body. Most food contains almost all the nutrients in various proportions but some food is richer in certain nutrients. Improper diets and cheap quality food lead to a low intake of nutrition. Nutritional intake of people is mainly determined by availability of food, types of food and quality of food [1]. It has been found that food is not accessible adequately to all people, a large segment of the population remaining beyond the sufficient access of food [2]. Many studies pointed to the supply side factors, such as lack of precise and comprehensive food policy and low priority given to food self sufficiency goal, as the reasons of food deprivation by people. Recently, agricultural practices have shifted towards the cash crops production rather than to the production of traditional or subsistence food. Again, the high price of several foods in the recent inflationary situation is another reason, which has made the lower income group and fixed wage earners be able to afford less and less food [1], [2]. The Indian diets mainly include vegetable-based food such as cereals, pulses and vegetables, green leafy and non-leafy vegetables, roots and tubers, etc. [3]. These foods are an important part of diet in the rural areas, as they play a very significant role in food security, health and nutrition status of the rural population in India. Yet, many studies have shown

that the quality of Indian foods is very low and they are grossly deficient in micronutrients such as vitamin A, iron, riboflavin and folic acid, which have led to the development of micronutrients malnutrition among the population [4], [5], [6]. In India, the economic cost of micronutrient malnutrition is 0.8 to 2.4% of the GDP [7]. The most vulnerable segments of the population in nutritional deficiency are children, adolescents, pregnant women and nursing mothers [8], [9], [10], [11], [12], [13]. Nutritional adequacy in the early age of life is very significant for their optimal growth and development [14]. Chandra and Salil (1994) have showed that dietary pattern among preschool and school going children are profoundly influencing their growth and nutritional status [15]. Many studies have highlighted the nutritional deficiency among children. Mehrotra et al. (2011) revealed that the diet of 20% of rural children was more deficient in protein than the recommended dietary allowances [16]. Another study in Udaipur district of Rajasthan showed that energy and protein intake among children were highly inadequate [17]. There have been many studies that pointed out the nutritional deficiency not only among children but also among adolescents, pregnant women and elderly population [18], [19], [20], [21]. Thus, low nutritional intake is a problem at household level as a whole. According to the technical report of the National Nutrition Monitoring Bureau, the share of households with energy inadequacy was of about 70% while that of protein adequacy was of about 27% [22]. Another debate on the household's nutritional intake was on selecting the core nutrient that is the most important for nutrition security perspectives. Until the mid-sixties, nutritional deficiency was looked upon as on one of protein deficiency only, mainly of animal food products. But thereafter, scholars showed that calorie deficiency was of much greater concern because in almost all classes there was no group that was protein deficient but not calorie deficient [23], [24], [25]. It was taken as granted that adequate intake of calorie will ensure an adequate amount of protein. Not only that but adequate amounts of essential micro nutrients are also ensured [26]. Thus, malnutrition caused by calorie deficiency has become the central concern, opinion shared especially by economists. Many studies that estimated the poverty lines were exclusively based on the calorie norms whereas the importance of other nutrients was completely ignored [27]. In the middle of the eighties, some tried to raise the issue of imbalance of other nutrients [28], [29]. In recent times, many researchers have engaged in understanding the puzzling aspects of nutritional intake pattern in India. Now, India is considered as one of the fastest-growing economies in the world. India showed a GDP growth of 4.98% during 2013-2014 and expected a growth of 5.5% in 2014-2015. Not only the GDP per capita but also real per capita consumption has also increased rapidly, from 2.2%/year in the 1980s, to 1.5%/year in the 1990s, and up to 3.9%/year from 2000 to 2005 [30]. In spite of economic development and increase in per capita consumption expenditure, the average calorie intake has declined rapidly over the time in India. This reverse fact of economic growth and calorie intake pattern is termed by Chandrashekhar and Gosh (2003) as *"calorie consumption puzzle"* [31]. Data from the National Sample Survey Organization (NSSO) showed a sharp decline in the average calorie intake between 1972-1973 and 2009-2010. In India, the decline in calorie intake is associated with the decline in cereal consumption over the period [30]. The decline in cereal consumption can be attributed to the diversification of food products, easy access of high value commodities, changed tastes and preferences and reduction in prices of cereals relative to other food commodities [32], [33]. Other explanations that have been offered in literature to address the calorie intake puzzle are: economic growth, urbanization, changing taste and food preferences, market integration, mechanisation of agriculture, infrastructural development, and medical facility, etc. [32], [34]. The demand for food is not only influenced by income changes but also by difference in rural and urban life styles. Occupational changes will increase the real per capita income which in turn will influence food preferences and tastes [33]. The present study will thus seek to understand the nutrition consumption pattern and their determinants among rural households of Bankura district, West Bengal.

Explaining consumer behaviour is indeed a complex process to understand, particularly when it comes to food consumption behaviour. Traditional theories emphasized income as the important determinant of food consumption but other factors such as choice, utility value of product influence the consumer's consumption behaviour. Beyond food consumption, the most important is nutrient rich food consumption which further depends on the availability, income and other set of socio-demographic factors. Thus, an increase amount of food expenditure does not always ensure the consumption of nutrients rich food. It is implied that an increase in food expenditure automatically improves nutritional status but the linkage between household's food expenditure and nutritional status is not yet firmly established. Since income is the primary determinant of expenditure, the household's nutritional consumption is determined by income level via nutrients rich food expenditure at household. Empirical literature supports the theory that the income variable is a major determinant of household food expenditures [35], [36]. There is also some evidence of a positive relationship between income and nutritional status. This relationship is not as strong as that of the expenditure relationship. Some studies evidence a positively significant impact on the nutritional status but others reported no significant impact of income on nutritional status. Hence, higher nutrition consumption via food expenditures is not automatic as postulated in traditional theory, but the impact is dependent on the nutrient composition of the items purchased.

Several theories have been postulated by many economists to simplify and understand the consumer's behaviour on consumption. Among all of the theories of consumption, Keynes' theory (1936) comes first in orderly manner. Keynes had three main conjectures about the consumption function. Firstly, the marginal propensity to consume (MPC) is between zero and one (*i.e* 0<MPC<1). Secondly, the average propensity to consume (APC) falls as income rises (*i.e* APC=C/Y). Thirdly, income is a primary determinant of consumption and interest rates are relatively unimportant [37]. The Keynesian function says that as income rises, consumers save a larger fraction of their income, so the APC falls. But this prediction did not come true. Contrary to Kaynes's theory, Kuznet (1946) found that the average propensity to consume (APC) had remained constant over a long period despite the substantial increase in income [38]. Further consumption puzzle arises when it is observed that APC declines with the rising income in cross-sectional data but it remains constant despite of rising income in long time-series data. Fisher's theory (1930) is little different from the Kaynes's theory of consumption. Unlike Kaynes, who assumed that current consumption depends on current income, Fisher viewed that current consumption and savings depend on lifetime income and interest rates [39]. Another view, which departs from the traditional Kaynes theory of consumption, has been put forwarded by J. S. Duesenberry, known as the relative income theory of consumption. According to Duesenberry's hypothesis, the consumption of an individual is not the function of his absolute income but of his income relative to the incomes of other individuals in the society. According to life cycle theory of consumption, put forwarded by Ando and Modigliani (1963), the consumption in any period is not the function of current income of that period but of the whole lifetime expected income [40]. The life cycle hypothesis (LCH) says that income varies systematically over the phases of the consumer's life cycle, and saving allows the consumer to achieve smooth consumption. The LCH can solve the consumption puzzle. Across households, income varies more than wealth, so high-income households should have a lower APC than low-income households. On the other hand, over long time, aggregate wealth and income grow together, causing APC to remain stable. Like life-cycle hypothesis, the permanent income theory of consumption as postulated by Friedman (1957) also insights on solving the consumption puzzle problem. According to Friedman, consumption is determined by the long-term expected income rather than the current level of income [41]. Consumers use savings and borrowings to smooth consumption in response to transitory change in income. According to this hypothesis, if high-income households have higher transitory income than low-income households, APC is lower in high-income households. On the long-run, income varies mainly due to variation in permanent income, which implies a stable APC.

2. THEORY AND METHODOLOGY

A cross-sectional study was undertaken in Bankura district of West Bengal during the months of January – May in 2013. West Bengal is located on the eastern bottleneck of India, stretching from the Himalayas in the north to the Bay of Bengal in the south. It lies between 85° 50ˈE to 89° 50ˈ E and 21° 38ˈN to 27° 10ˈ N. The state has a total area of 88,752 sq km. West Bengal is bordered by three countries: Nepal, Bhutan and Bangladesh, and six Indian states of Odisha, Jharkhand, Bihar, Sikkim, and Assam. It is the nation's fourth-most population state in India, with a population of over 91 million people in 2011 (7.55% of India's population), out of which 46,927,389 are male. Almost 32% of population in West Bengal is living in urban area, whereas 68% of them are living in the villages of rural counterpart. West Bengal shows a decadal growth of 13.84% in the last decade. About 76% of India's population is literate but affected by gender disparity. Nearly 82% of the male population is literate while female literacy level is of 67%. The literacy level of West Bengal has seen a bit of an upward trend from 2001 to 2011.

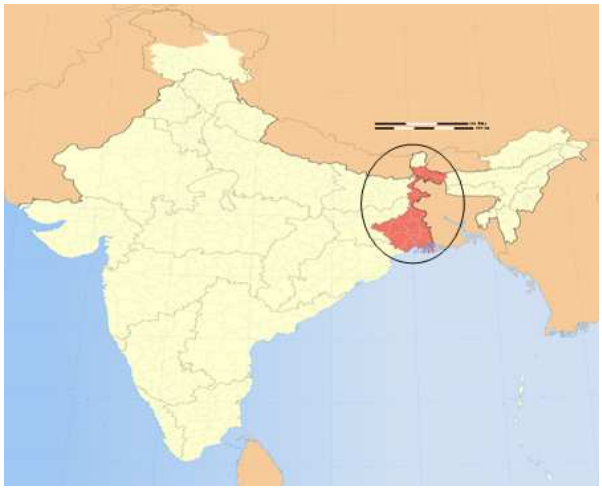

Fig. 1. Location map of West Bengal.

The study was conducted on 485 households selected from eighteen villages of two blocks, namely Sonamukhi Block and Borjora Block. A structured survey was used and information was collected from the head of the household or women who were responsible for cooking and food serving to the household's members. The present study calculates the nutrition intake per day per capita for the households. For this purpose we have used household consumption and expenditure module where information were collected regarding household's consumption quantity and their expenditure for each of the food items at household level.

The consumption quantities were collected using the 30-day recall period method. In order to construct the caloric intake at household level, we followed a standard approach widely used by many

researchers [30], [42]. Each of the food items consumed by the household in a 30-day period was multiplied by revised nutritive conversion factors published by the National Institute of Nutrition and Indian Council of Medical Research [43]. Nutrition value was converted into three specific nutrition elements: calorie, protein and fat. Nutritional intake per capita was estimated based on adult male equivalent norms or consumer unit where a male in the age group of 20-39 doing secondary work was considered as the norm or an adult male unit and other male and female of others age groups are expressed as the ratio of this norm. Thus, adjusted per capita nutritional intake of the household has been defined as the total nutritional intake of the household divided by household size in consumer unit (i.e. household nutritional intake ÷ household size in consumer unit). Household socio-demographic and economic indicators included in this study are: age, sex and education of the head of households; religion, caste, monthly per capita expenditure (MPCE), source of income, size of land holding, livestock availability and size of the household. The present study follows the National Sample Survey (NSS) used by the MPCE where total monthly expenditure incurred by the household was divided by its size to arrive at MPCE. Then, MPCE values are categorized into five equal quintiles to represent the household's level of living.

Simultaneous Multiple Linear Regression Model (SMLR) is used to understand the effects of explanatory variables to the households' nutritional intake pattern. The utility of this multiple regression model is that it predicts a dependent or outcome variable from a set of independent or predictor variables. To preserve the normality assumption of the MLR, logarithmic forms for each of the outcome variables have been considered in the equation. Dependent variables included in this model are as follows: log of per capita calorie consumption, log of per capita protein consumption and log of per capita fat consumption. The independent variables are the selected socio-economic and demographic characteristics of the household.

The mathematical equation of the model can be noted as follows:

$$Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \ldots\ldots\ldots\ldots + \beta_k X_{ki} + €_i$$

where:

Y_i – outcome variable of household I;
β_o – regression constant or intercept;
β_k – regression coefficients of X_k;
X_{ki} – value of k^{th} explanatory variable of house i;
$€_i$ - error term.

One can interpret the result as β_1 is an estimated effect of one additional unit change of X_1 on Y, holding $X_2, \ldots\ldots X_k$ constant. Similarly, β_1 as the estimated effect of one additional unit change of X_2 on Y, holding $X_1, X_3 \ldots\ldots X_k$ constant.

3. RESULTS AND DISCUSSION

3.1. Socio-demographic profile of the study population

The study population shows a spectrum of social and economic diversity (Table 1). There are only two major religious groups found in the study area, Hindus and Muslims.

Table 1. Distribution of sample households by the social- demographic characteristics.

Socio-demographic and economic characteristics	(%)	Total (N)
Religion		
Hindu	74.8	363
Muslim	25.2	122
Caste		
SC	28.7	139
ST	20.6	100
OBC	10.3	50
General	40.4	196
Sex of the household head		
Male	92.8	450
Female	7.2	35
Age of the household head		
Up to 30 years old	24.5	119
31 to 60 years old	55.3	268
> 60 years old	20.2	98
Median age in years	40	485
Mean age in years	44.9	485
Education of the household head		
Uneducated	59.6	289
Up to 5th standard	12.2	59
6th to 10th standard	22.9	111
>10 standard	5.4	26
Size of the household		
2 persons and less	32.0	155
2 to 6 persons	57.9	281
> 6 persons	10.1	49
Mean size of the household	5.72	485
Major source of income		
Agriculture	34.0	165
Agricultural labour	28.5	138
Other labour	21.9	106
Services	6.8	33
Hawker/others	8.9	43
Size of landholding in the household / in acres (Max: 15; Min: 0)		
0 - 0.5	60.0	291
0.51 - 2.0	24.9	121
2.1 - 4.0	9.5	46
4.1 - 15	5.6	27
Mean size of landholding (in acre) - 0.94		
Livestock in the household / in numbers (Max: 39; Min: 0)		
No livestock	37.7	183
1 -5	21.0	102
6 - 15	36.1	175
15 or more	5.2	25
Mean number of livestock (in numbers) - 5.34		

Nearly three-fourths (75%) of the study population is from Hindu community and only one-fourth (25%) of population belongs to the Muslim community.

Out of the 485 surveyed households, 29% belong to Scheduled Castes (SC) and 21% are from Scheduled Tribes (ST) population. Nearly 40% of households belong to General category and 10% of them are in the category of Other Backward Castes. The analysis suggests that the majority of households (92%) are headed by male members. Most of the sampled households (55%) show that the age of the household head lies between 31 to 60 years and mean age of the head of the household in the study population is of 45 years. It is found that in 60% of the sample households the heads of the households are uneducated. Only 5% of the heads of the households have completed the 10th standard of educational level. Thus, most of the families (57%) of the surveyed households are living in joint families.

The mean size of the sampled households is 5.7 (*i.e.* an average household is formed of six persons). Agriculture and agricultural labour are the dominant source of income of the households. Nearly 34% of the households have reported agriculture as the major source of income for their households. It is found that the mean land holding size of the surveyed households is of only one acre, but there is an uneven distribution in the land possession of the population. More than half of the study households (60%) have no land for agriculture or have less than 0.5 acre of land.

3.2. Nutrition consumption pattern in the rural households

Table 2 depicts the nutrition consumption per capita per day in the surveyed households. Muslim households are more deprived than the Hindus ones in the consumption of all the three nutrients. Schedule tribe (ST) households are more deprived compared to other caste households. The average per capita calorie consumption among ST households is of 2,028 kcal/day whereas it reaches 3,914 kcal/day in other backward classes. Per capita calorie and fat consumption is found higher in case of male headed households but protein consumption is higher in the case of female headed households. Consumption of all three nutrients increases with the age of the head of households and education of the head of the households. It is found that when the head of the households is educated, he will be more concerned about the nutritional consumption of all members in the households. With a view to the size of the households, the highest calorie, protein and fat per capita consumption is found in the case of two or less members households. On the contrary these consumptions are the lowest in the case of two-six member households. Calorie (3,154 kcal) and protein (80 gms) consumption is found highest in households where the main source of income is agriculture but fat consumption is found highest (38 gms) in those households where at least one member is engaged in service sector.

Table 2. Mean consumption of calorie, protein and fat in the rural households of West Bengal.

Socio-demographic and economic characteristics	Average per-capita per day consumption			Sample (N)
	Calorie (kcal)	Protein (gms)	Fat (gms)	
Religion				
Hindu	2,774	69.8	28.5	363
Muslim	2,254	57.2	25.7	122
Caste				
SC	2,496	61.9	24.4	139
ST	2,028	50.5	22.6	100
OBC	3,914	95.5	33.5	50
General	2,738	70.8	31.5	196
Sex of the household head				
Male	2,637	66.5	28.0	450
Female	2,721	67.4	25.9	35
Age of the household head				
Up to 30 years old	2,536	63.9	26.0	119
31 to 60 years old	2,654	66.6	27.4	268
> 60 years old	2,745	69.9	31.3	98
Education of the household head				
Uneducated	2,473	61.3	24.4	289
Up to 5th Standard	2,532	66.4	32.3	59
6th to 10th Standard	3,081	77.2	32.0	111
>10 standard	2,919	80.7	38.1	26
Size of the household				
2 persons and less	2,858	72.0	30.1	155
2 to 6 persons	2,540	63.4	26.4	281
> 6 persons	2,560	67.6	29.1	49
Major source of income				
Agriculture	3,154	79.7	34.4	165
Agricultural labour	2,162	53.4	21.2	138
Other labour	2,536	62.0	23.1	106
Services	2,588	73.2	37.7	33
Hawker/others	2,535	65.0	28.2	43
Size of landholding in the household / in acre				
0 - 0.5	2,304	57.3	23.0	291
0.51 - 2.0	3,353	83.7	33.6	121
2.1 - 4.0	2,741	72.8	36.2	46
4.1 - 15	2,956	80.3	39.7	27
Livestock in the household / in numbers				
No livestock	2,352	58.4	23.7	183
1 -5	3,021	76.9	32.1	102
6 - 15	2,715	68.4	28.6	175
15 or more	2,734	71.9	35.3	25
Total	**2,643**	**66.6**	**27.8**	**485**

Note: Household's members adjusted with consumer unit to calculate the per capita nutrition consumption

One explanation could be that most of the calorie and protein rich foods come from cultivation, thus the households who have their own agricultural

land get more calorie and protein rich foods in their diets. But fat rich foods (i.e. milk or milk product, meat, eggs, etc.) come from livestock or from the market, which are more expensive as well, thus, it is expected that service holder households could afford more fat rich food compared to others.

The nutritional consumption also varies with the size of landholding. Calorie (3,353 kcal) and protein (84 gms) are found highest in case of the households that have 0.51 to 2.0 acre of agricultural land and fat consumption is found highest (40 gms) in case of the households having larger farms (4.1 to 15 acre).

It is also observed that the family size of the small farms is lower than that of the larger farms. Thus, again, per capita share of calorie and protein is higher in the small land holding houses as compared to larger farms. On the other hand, larger farms are economically more prosperous, even they posses livestock as well which are rich source of fat rich food, thus, fat consumption is supposed to be higher for larger land holding houses. The nutritional consumption is found higher in the households having livestock compared to the households with no livestock.

Nutritional consumption pattern varies within the monthly per capita expenditure (MPCE) groups. Nutritional consumptions are found lowest for the lowest MPCE groups as compared to the higher MPCE groups. Figure 2 shows that consumption of calorie, protein and fat are of 2,011 kcal, 48 gms and 16 gms per capita per day respectively for first MPCE quintile, whereas the corresponding figures are of 3,435 kcal, 92 gms and 46 gms per capita per day for the fifth MPCE quintile.

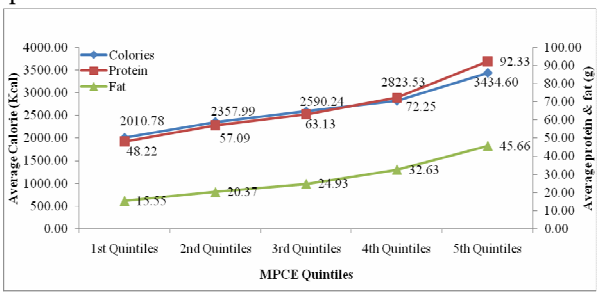

Fig. 2. The average intake of nutrition by MPCE quintile.

Thus, a significant gap is found in nutrition intake among lowest and highest MPCE groups, which clearly indicates a disparity in calorie, protein and fat consumption by economic levels in the studied area.

3.3. Contribution of food groups in the nutritional consumption

Table 3 shows the contribution of various food groups in the total consumption of calorie, protein and fat.

Results show that cereal is the major source for calorie and protein, 76% of the total calorie and 70% of the total fat coming from cereal consumption only. Contribution of nutritious food, such as: milk and milk products, eggs, fish and meat, etc. are found very low in the calorie and protein consumption. In the calorie consumption, milk and milk products contribute by only 3% and eggs, fish and meat contribute by 1% together. The same scenario is observed for protein consumption, as well. Eggs, fish and meat together contribute by only 6% of total protein and only 5% comes from either milk or milk products. A little different picture is found in case of fat consumption. Among all the food groups, oil is ranked highest (59%) to contribute in the fat consumption, followed by milk and milk products (18%) and cereal (12%).

A significant variation in the contribution of food groups is found over various economic groups. The contribution of cereals to total calorie and protein consumption is proportionally high for lower MPCE households and low for upper MPCE households. In the case of lower MPCE households people try to meet their nutritional requirement by non-nutritious and cheap quality food groups. On the contrary, consumption of protein rich foods like milk and milk products, eggs, fish and meats etc are much higher for upper MPCE households than lower MPCE households. The contribution of milk and milk products to total protein consumption varies from below 1% to 10% between the lowest and the highest MPCE groups of households.

A similar pattern is observed in fat consumption as well. Milk and milk products are the rich source of fat. But it contributes by only 2% of total fat consumption among the lowest MPCE group whereas the share is much higher (31%) among the highest MPCE group, which clearly indicates that food diversity among poor is very low. Their diets mainly depend on the consumption of cheap and locally cultivated foods.

3.4. Determinants of nutritional intake in rural households

Three models were used to understand the determinants of nutritional intake pattern in rural households (see Table 4). The first model takes adjusted per capita per day calorie intake as an outcome variable whereas adjusted per capita per day protein and adjusted per capita per day fat intake were considered for the second and the third model. The analysis shows that all the explanatory variables that were considered for these models can explain 28% of total calorie consumption (R square = 0.288), 37% of total protein consumption (R square = 0.370) and about 54% of total fat consumption (R square = 0.544). Result shows that if a household belongs to the Muslim religion then the average calorie consumption is significantly lower than the household belonging to the Hindu religion (β = -0.193; $p<0.05$; 95% Cl = -0.30, -008). The household size is also significantly affecting their calorie consumption. The increase by one member in household will decrease the calorie consumption by about 2% than the average consumption level of the

household (β = -0.026; p<0.10; Cl = -0.05, 0.00). Household's livestock availability shows a significant positive relation with per capita per day calorie consumption. It increases the chances of calorie consumption in the household (β = 0.007; p<0.10; Cl = 0.00, 0.01). The household's monthly per capita expenditure has a strong positive relationship with per capita calorie consumption (β = 0.001; p<0.01; Cl= 0.00, 0.00). The caste of the household is also found as a significant predictor for per capita calorie consumption. Households belonging to schedule tribe population consume less calories (kcal) than the households belonging to schedule caste (β = -0.96; p<0.10; Cl = -0.20, 0.00) and any household of other backward class consumes more than the average calorie consumed by reference group (β= 0.129; p<0.10; Cl = -0.01, 0.27). Another significant predictor is the source of income. Per capita calorie consumption of the households where the main income source is services is by 25% lower (p<0.05; Cl = -0.42, -0.10) and those households that economically depend on business is by 13% lower (p<0.05; Cl = -0.27, 0.01) than households depending on agriculture.

Table 3. Contribution of different food groups to the total nutrition consumption by MPCE groups.

MPCE	Cereals	Pulses	Milk and milk products	Sugar and honey	Oils	Eggs, fish and meat	Roots and tubers	Vege-tables	Fruits	All
% age share of food groups to the total calories intake										
1st Quintiles	81.84	1.41	0.29	1.47	4.82	0.76	7.42	1.92	0.07	100
2nd Quintiles	79.07	1.74	0.36	1.73	5.61	0.98	8.33	2.09	0.09	100
3rd Quintiles	78.08	2.15	1.55	1.85	5.78	1.09	7.50	1.82	0.17	100
4th Quintiles	73.29	2.88	3.95	2.15	5.68	1.39	8.20	2.02	0.44	100
5th Quintiles	71.02	3.66	6.31	2.10	5.83	1.58	6.85	1.92	0.72	100
Total	75.96	2.51	2.90	1.90	5.59	1.21	7.61	1.95	0.34	100
% age share of food groups to the total protein intake										
1st Quintiles	79.07	4.30	0.55	0.02	0.00	3.70	6.29	7.84	0.12	100
2nd Quintiles	75.52	5.27	0.66	0.02	0.00	5.02	6.87	8.53	0.14	100
3rd Quintiles	73.44	6.43	2.74	0.02	0.00	5.47	6.13	7.17	0.27	100
4th Quintiles	66.05	8.21	6.24	0.02	0.00	6.70	6.29	7.52	0.69	100
5th Quintiles	61.23	9.90	10.23	0.02	0.00	7.37	4.95	6.88	1.02	100
Total	69.60	7.28	4.92	0.02	0.00	5.93	5.99	7.50	0.53	100
% age share of food groups to the total fat intake										
1st Quintiles	18.29	0.38	2.42	0.00	69.14	3.80	1.26	4.11	0.60	100
2nd Quintiles	15.48	0.43	2.73	0.00	71.83	3.57	1.28	4.04	0.62	100
3rd Quintiles	13.30	0.52	10.72	0.00	66.36	4.18	0.99	2.90	1.02	100
4th Quintiles	10.55	0.60	23.73	0.00	54.64	4.56	0.88	2.66	2.36	100
5th Quintiles	9.00	0.71	31.38	0.00	48.62	4.48	0.66	2.00	3.14	100
Total	12.12	0.57	18.48	0.00	58.89	4.24	0.93	2.85	1.93	100

MPCE= Monthly per capita consumption.

The second model represents the determinants of per capita protein intake in the household. Protein intake is significantly lower among Muslim households than the Hindu households (β = -0.214; p<0.01; Cl = -0.319, -0.108). Like in the calorie consumption case, the household size is also negatively associated with per capita protein consumption. The increase in size significantly decreases the level of per capita protein consumption in the household (β = - 0.024; p< 0.05; Cl = -0.049, 0.001). The availability of livestock (β = 0.008; p<0.05; Cl = 0.001, 0.014) and monthly per capita expenditure (β =0.001; p<0.01; Cl = 0.001, 0.001) are also significantly and positively related with household's per capita calorie consumption. Per capita protein consumption is by 13% higher among the other backward class households (p<0.05; Cl = 0.004, 0.269) and by 10% higher among the general caste households (p<0.10; Cl = -0.002, 0.205) than the schedule caste households.

The third model examines the determinants of household's fat consumption. Result shows that per capita fat consumption among Muslims households are by 16% lower than the Hindu households. The age of head of households also has significant effects on the per capita fat consumption. The level of per capita fat consumption increases with the increase of the age of household's head. The household's size is also negatively related with per capita fat consumption in the household. An increase by one member in household size determines a decrease by 4% of the

average calorie consumption in the household (p<0.5; Cl = -0.066, -0.015). Surprisingly, the size of land holding status is negatively related with per capita household's fat consumption (β = -0.034; p<0.05; Cl = -0.067, -0.002) but the availability of livestock (β = 0.012; p<0.05; Cl = 0.005, 0.018) and monthly per capita expenditure (β = 0.001; p<0.01; Cl = 0.001, 0.001) increase the level of per capita fat consumption. Per capita fat consumption is higher among other backward caste households (p<0.05; Cl = 0.031, 0.306) and general caste households (p<0.05, Cl =0.071, 0.286) in comparison with the average fat consumption in the households of the schedule caste. The education of head of households also shows a significant and positive relationship with the per capita fat consumption of households.

Table 4. Multiple linear regression analysis showing the determinants of nutritional intake in the rural households.

Explanatory variables	Log of Per capita Calorie (kcal/day)			Log of per capita protein (gms/day)			Log of per capita fat (gms/day)		
	Beta (β)	95% CL		Beta (β)	95% CL		Beta (β)	95% CL	
		Upper	Lower		Upper	Lower		Upper	Lower
Religion (Hindu=0; Muslim=1)	-0.193**	-0.30	-0.08	-0.214*	-0.319	-0.108	-0.165**	-0.274	-0.055
Sex of the household head (Male=0; Female=1)	0.032	-0.11	0.17	0.022	-0.111	0.154	-0.034	-0.172	0.103
Age of the household head	0.002	0.00	0.00	0.002	-0.001	0.004	0.005*	0.002	0.008
Household size	-0.026***	-0.05	0.00	-0.024**	-0.049	0.001	-0.041**	-0.066	-0.015
Currently employed members	0.038	-0.01	0.09	0.026	-0.025	0.076	0.007	-0.045	0.059
Size of land (acre)	-0.02	-0.05	0.01	-0.019	-0.051	0.012	-0.034**	-0.067	-0.002
Total livestock	0.007***	0.00	0.01	0.008**	0.001	0.014	0.012**	0.005	0.018
Log of MPCE in Rs	0.418**	0.32	0.51	0.475**	0.385	0.565	0.657**	0.563	0.750
									Caste (SC ®)
ST	-0.096***	-0.20	0.00	-0.078	-0.174	0.019	0.019	-0.081	0.12
OBC	0.129***	-0.01	0.27	0.137**	0.004	0.269	0.168**	0.031	0.306
General	0.068	-0.04	0.18	0.101***	-0.002	0.205	0.178**	0.071	0.286
									Education of the household head (Uneducated ®)
Up to 5th standard	0.021	-0.09	0.14	0.034	-0.075	0.144	0.124**	0.011	0.237
6th to 10th standard	0.078	-0.02	0.17	0.082***	-0.008	0.173	0.141**	0.047	0.235
>10 standard	0.000	-0.18	0.18	0.005	-0.167	0.178	-0.023	-0.203	0.156
									Major source of income (Agriculture ®)
Agricultural labour	-0.012	-0.12	0.10	-0.008	-0.112	0.097	-0.089	-0.198	0.019
Other labour	0.01	-0.11	0.13	0.019	-0.091	0.129	-0.064	-0.178	0.051
Services	-0.259**	-0.42	-0.10	-0.21**	-0.362	-0.058	-0.176**	-0.333	-0.018
Hawker/others	-0.13**	-0.27	0.01	-0.107	-0.24	0.027	-0.149**	-0.287	-0.01
Constant	7.522*	7.24	7.80	3.799*	3.53	4.069	2.668*	2.389	2.948
R square	0.288			0.3709			0.5443		

*Notes: SC=schedule caste; ST=schedule tribe; OBC= other backward caste; MPCE= monthly per capita expenditure; Hawkers/others includes any business. ® = Reference category; *p <0.01; **p<0.05; ***p<0.10; per capita calorie, protein and fat are adjusted with households age and sex-composition.*

4. CONCLUSION

By the results of the present study we try to understand the nutritional consumption pattern and their determinants in a sample of rural households of Bankura district in the state of West Bengal, India. Results show a significant variation of average nutrition consumption over various social and economic groups. Among all the caste groups, schedule tribe people are the most deprived. Per capita average consumption of all three nutritional components (i.e. calorie, protein and fat) is substantially low among schedule tribe households. The lack in the access of land, unemployment, poverty risks and others make them vulnerable and subject to nutrition deprivation. Protein and calorie consumption is found to be higher among female headed households but fat consumption is found higher among male headed households. The puzzle of nutritional consumption (except fat consumption) with household's income is also observed in the study. Many studies have shown a steep decline of per capita consumption of calorie and protein over the time, and indeed with the rising of per capita income [30], [44]. In fact this trend is true for time series data. This study shows a positive association between nutritional intake pattern and monthly per capita consumption. The average per capita consumption of calorie, protein and fat are higher for economically better-off families than in the case of the economically deprived families. Many of the socio-demographic variables like caste, religion, household size, monthly per capita expenditure are significantly related with per capita calorie and protein consumption.

On the other hand, along with these variables, the age of household head is also found to play a significant role in the per capita consumption of fat. Moreover, calorie and protein are essential intake for human survival. Whatever calorie and protein are consumed in the households, they are obtained from cheap quality cereals and pulses.

The consumption of fat rich food like milk, milk products, and eggs is quite low among economically deprived families. But the presence of livestock in any household may increase the level of nutrition, especially the household's fat consumption.

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