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Nutritional Status of Rural Households: A Case Study in Cooch Behar District of West Bengal

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ABSTRACT

The present work focuses on studying the effect of socio-economic factors on nutritional status of rural households under the Coochbehar-II block of Coochbehar district in West Bengal. A well-structured interview schedule was prepared to collect information about the socio-economic status and nutritional status of the respondents. As an indicator of Nutritional status, the Body Mass Index (BMI) values of the respondents were studied. In the present study, the Independent-Samples Kruskal-Wallis Test and Independent-Samples Mann-Whitney U Test (non-parametric test) were employed to study the effect of different socio-economic variables on nutritional status of the respondents. Age of the respondents, educational qualification of the respondents, Family size, and House type of the respondents were found to significantly affect the BMI scores of the respondents. The categories of the significantly contributing variables for nutrition like age, education, and house type show significant associations with the BMI categories using Contingency table and Chi-square test.

Keywords: Nutritional status; Body Mass Index; Non-parametric test; Contingency table.

Nutrition is a primary necessity for health, and health is one of every human being's fundamental rights (Devadas, 1951). The science of food and its connection to health is called human nutrition. It is the process through which chemical components in food are absorbed by body tissues, giving energy to the body for performing physical and mental activities that are part of everyday life (Weininger *et al.*, 2020). Nutrients are chemical components present in food that help the human body stay nourished. Nutritional status represents the fulfilment of the human body's nutritional and protective needs, as reflected in physical, physiological, and biochemical features, function, and health status (Gurinovia *et al.*, 2017).

According to the National Family Health Survey, 2019-20 for the state of West Bengal, 34.4 per cent of children under the age of five are stunted, 20.4 per cent are wasted, 33.5 per cent are underweight, and 3.6 per cent are overweight in rural regions. In rural areas, 17.4 per cent of women and 16.8 per cent of men have a BMI which is below normal. Obesity affects around 20.3 per cent of women and 14.5 per cent of men. Under the Coochbehar district, 28.7 per cent of children under the age of five are stunted, 16.8% are wasted, 22.5 per cent are underweight, and 2.3 per cent are overweight. Among adults, 18.1 per cent of women have a BMI that is below normal, and 16.5 per cent are obese. Body Mass Index (BMI) is a common weight-for-height index

that is used to categorise people as underweight, normal, overweight, or obese. An individual's BMI value is found out by dividing the weight in kilograms by the square of the height in meters. BMI is one of the widely accepted nutritional status indicators for adults (*James et al., 1988; Ferro-Luzzi et al., 1992; Naidu and Rao, 1994*). In Indian society, social factors are the main factors influencing nutritional status (*Upadhyay and Tripathi, 2017*). According to the *National Centre for Educational Statistics (2008)*, socio-economic status is a complete combined assessment of an individual's or family's sociological and economic level, indicating their socio-economic position in comparison to others based on education, employment, and income. A person's or a family's socioeconomic position is a major determinant of their health and nutritional condition. Socio-economic conditions also affect the food habit, food availability, and amount of food consumption of an individual or within a family or household. This, in turn, has an impact on household food security.

METHODOLOGY

The present work focuses on the objective of studying the effect of socio-economic status on the nutritional status of rural households under the Coochbehar-II block of Coochbehar district in West Bengal. Three-stage sampling without replacement design is used for the selection of households. In the first stage, 3 Gram Panchayats are selected by random sampling without replacement from among 13 Gram Panchayats under the Block. The 3 Gram Panchayats Pundibari, Madhupur, and Dhangdhinguri are the first-stage or primary sampling units. In the second stage, from each of the 3 G.P., 3 villages are selected randomly without replacement. From Pundibari G.P. 3 villages Kalarayer Kuthi, Sajerpar Ghoramara, and Hoglabari are selected. From Madhupur G.P. 3 villages Petbhata Chandan Chowraha, Haripur, and Jagga Narayaner Kuthi are selected. From Dhandhinguri G.P. Dharmaborer kuthi, Holonger kuthi, and Basantapur are the selected villages. These 9 villages are the secondary or second-stage sampling units. In the third stage, from each of the selected villages 7 households are selected randomly without replacement. Total 63 households are selected in the third stage of sampling and they are the tertiary or third-stage sampling units. The head of the household is the respondent for our study. A well-

structured interview schedule was prepared to take into consideration the objectives of the study. Data was collected by visiting the selected households and interacting with the respondents. For studying the nutritional status, BMI values are calculated. The weight of the respondents was measured using a weighing machine and height was taken using a measuring tape. The Body Mass Index (BMI) value for each respondent was calculated by dividing their weight (kg) by the square of their height (m). They were classified into three categories of BMI based on their BMI value by utilizing the following scale: Underweight - <18, Normal - 18-25, Overweight - 25-39. Information regarding socio-economic status was collected by taking into consideration the variables such as age, gender, income, education, occupation, landholding, house type, family type, and family size. The collected data were processed and tabulated for statistical analysis.

In the present study, the independent-samples Kruskal-Wallis test and independent-samples Mann-Whitney U Test (non-parametric test) were employed to study the effect of different socio-economic variables on nutritional status of the respondents. The frequency table and chi-square contingency tests were also applied to the dataset. The results have been analysed statistically by using SPSS (Statistical Package for the Social Sciences) Software.

RESULTS AND DISCUSSION

Status of anthropometric measurements : The status of height, weight and Body mass index (BMI) of the respondents participated in the study was presented in terms of gender. They are tabulated in the following tables. Table 1 indicates that the mean BMI for the respondents is 22.94 Kg/m², 22.81 kg/m² for males and is more (23.43 kg/m²) for females. The mean height and weight for males is 162 cm and 59.78 kg; for females, the mean height and weight are 150 cm and 54 kg. It also indicates that overall 68.25 per cent of the respondents are having normal BMI, 4.76 per cent are underweight and 26.98 per cent are overweight. Among males, 68 per cent are normal, 6 per cent are underweight and 26 per cent are overweight. 69.23 per cent of the females are normal and 30.76 per cent are overweight.

Status of socio-personal variable : The status of socio-personal variables of the respondents participated in the

Table 1. Height, weight and BMI of respondents

Measurements	Overall	Male	Female
Mean height(cm)	159	162	150
Mean weight(kg)	58.58	59.78	54
Mean BMI(Kg/m ²)	22.94	22.81	23.43
<i>BMI category</i>	<i>Male</i>	<i>Female</i>	<i>Total</i>
Underweight	3(6%)	0	3(4.76%)
Normal	34(68%)	9(69.23%)	43(68.25%)
Overweight	13(26%)	4(30.76%)	17(26.98%)
Total	50	13	63

study are found out and tabulated in the per centage of observations that exist under each category of the variables are mentioned in the following tables. Table 2, indicates that out of 63 respondents who participated in the study, 41 (65.1%) respondents are having their age between 28-54 years and 13 (20.6%) respondents are having age more than 54 years and 9 (14.3%) respondents are having age of less than 28 years. It also indicates that out of 63 respondents who participated in the study, 50 (79.4%) are male Table 2 indicates that out of 63 respondents who participated in the study, 15 (23.81%) have family sizes of <3, 36 (57.14 %) have family sizes of 3 and 5, while, 12 (19.05%) have a family size >7. Out of 63 respondents who participated in the study, 27 (42.9%) are qualified to primary level, 9 (14.3%) of them are qualified to the middle school level, 9 (14.3%) can only read and write. 6 (9.5%) of them are qualified to the high school level, 6 (9.5%) can read only while 5 (7.9%) are graduates. Only 1 (1.6%) respondent is illiterate. Table 2 also reflects that out of 63 respondents who participated in the study, 23 (36.5%) are cultivators, 21 (33.3%) are labourers, 10 (15.9%) are having business as their occupation, 8 (12.7%) are engaged in service while only 1 (1.65) respondent have an independent occupation. Table 2 also indicates that out of 63 respondents who participated in the study, 40 (63.5%) are having a Gross monthly income of more than Rs.5000, 22 (34.9%) are having a Gross monthly income within the range of Rs. 2001-Rs. 5000 while only 1 (1.6%) respondent is having an income of less than Rs. 2000. Out of 63 respondents who participated in the study, 27 (42.9%) are living in a mixed house, 22 (34.9%) are living in a pucca house, 10 (15.9%) are living in a kutch house while 4 (6.3%) are living in a hut.

Results on Kruskal-Wallis test and Mann-Whitney U Test : The two non-parametric tests viz. Kruskal-Wallis test and Mann-Whitney U Test were applied to

Table 2. Distribution of respondents among various age groups (N=63)

Profile	No.	%
<i>Age group</i>		
<28	9	14.3
28-54	41	65.1
>54	13	20.6
<i>Gender</i>		
Male	50	79.4
Female	13	20.6
<i>Family Size</i>		
<3	15	23.81
3.00-5.00	36	57.14
>5	12	19.05
<i>Educational qualification</i>		
Illiterate	1	1.6
Can Read Only	6	9.5
Read And Write	9	14.3
Primary	27	42.9
Middle	9	14.3
High School	6	9.5
Graduate	5	7.9
<i>Occupation</i>		
Labourer	21	33.3
Business	10	15.9
Independent	1	1.6
Cultivation	23	36.5
Service	8	12.7
<i>Income group</i>		
<2000	1	1.6
2001 to 5000	22	34.9
>5000	40	63.5
<i>House type</i>		
Hut	4	6.3
Kutcha house	10	15.9
Mixed	27	42.9
Pucca	22	34.9

study (Table 3) the effect of different independent variables on the BMI score of the respondents. The independent variables and the test used are listed as follows: According to the results of the Independent-Samples Kruskal-Wallis Test and Independent-Samples Mann-Whitney U Test, the variables - age of the respondents, educational qualification of the respondents, family size, and house type of the respondents were found to significantly affect the BMI scores of the respondents. Whereas, the variables occupation, income, family type, landholding category, and gender

failed to significantly affect the BMI scores of the respondents. The BMI scores were also not found to be significantly affected by difference in residence of Gram Panchayats.

Table 3. Results of non-parametric test used for different variables

Variables	Test performed	Level of significance
Age	ISKWT	0.013*
Occupation	ISKWT	0.115
Income	IISKWT	0.072
Education	ISKWT	0.036*
Family type	ISMWUT	0.209
House type	ISKWT	0.029*
Landholding	ISKWT	0.246
Family size	ISKWT	0.043*
Gender	ISMWUT	0.470
Gram Panchayat	ISKWT	0.644

*Significance at 5% level of significance;

ISKWT = Independent-Samples Kruskal-Wallis Test

ISMWUT = Independent-Samples Mann Whitney U Test

BMI category and Age of respondents : The contingency table was found out for the different levels of the age of the respondents with different BMI categories (1 for Underweight, 2 for Normal weight, and 3 for Overweight) to check the correspondence between the categories of these two variables. Then the chi-square test was used to check the significance between the associations of the two variables.

Table 4. Contingency table between Body Mass Index (BMI) category and age of the respondents

BMI category	Age (years) category			Total
	<28	28-54	>54	
1 (Under weight)	2	1	0	3
2 (Normal weight)	5	26	12	43
3 (Over weight)	2	14	1	17
Total	9	41	13	63

Table 4 indicates that among 63 respondents in the age group 28 years, 3.17 per cent of individuals are underweight, 7.9 per cent of individuals have a normal BMI and 3.17 per cent are overweight. For the age group of 28-54 years, only 1.6% of individuals are underweight, 41.2 per cent are normal and 22.2 per cent are overweight. The problem of being underweight is not recorded for the age group > 54 years, as 19 per cent of individuals are normal and only 1.6 per cent are overweight.

Table 5. Chi-square tests of the above contingency table between BMI category and age of the respondents

Test	Value	df	Asymptotic sig. (2-sided)
Chi-square	10.949	4	0.027*

*Significant at 5% level of significance

The Chi-square test was used to check the significance between the association of the two variables and it was found that the chi-square test was significant at 5 per cent level of significance which implies that there is an association between BMI category and age group of respondents.

BMI category and Educational qualification : The contingency Table 5 was found out for the different Educational level of the respondents with different BMI categories (1 for Underweight, 2 for Normal weight, and 3 for overweight) to check the correspondence between these two variables. Then the chi-square test was used to check the significance between the associations of the two variables.

Table 6. Contingency table between Body Mass Index (BMI) category and educational qualification of the respondents

BMI category	Educational qualification							Total
	1	2	3	4	5	6	7	
1 (Underweight)	0	2	0	1	0	0	0	3
2 (Normal)	1	3	5	20	8	5	1	43
3 (Overweight)	0	1	4	6	1	1	4	17
Total	1	6	9	27	9	6	5	63

(Various educational categories are: 1-illiterate, 2-can read only, 3-read and write, 4-primary, 5-middle, 6-high school, 7-graduate.)

Table 6 indicates that among 63 respondents, 9.5 per cent of individuals who are overweight are educated to primary level. For graduates and for those who can only read and write, 6.34 per cent of individuals are overweight. 3.17 per cent of individuals who can only read are underweight and 1.6% of individuals educated to primary level are underweight. The majority of individuals having normal BMI are seen among those having qualifications at primary level (31.7%), middle school level (12.6%) and high school level (7.9%).

Table 7. Chi-square Tests of the above contingency table between BMI category and educational qualification of the respondents

Test	Value	df	Asymptotic sig. (2-sided)
Chi-square	23.067	12	0.027*

Significant at 5% level of significance

The chi-square test was used to check the significance between the association of the two variables and it was found that the chi-square test was significant at 5 per cent level of significance which implies that there is an association between the BMI categories and educational qualification categories of the respondents (Table 7).

BMI category and family size : The contingency table was found out for the different family size of the respondents with the 3 BMI categories (1 for Underweight, 2 for Normal weight, and 3 for Overweight) to check the correspondence between these two variables. Then the Chi-square test was used to check the significance between the association of the two variables.

Table 8. Contingency Table between Body Mass Index (BMI) category and family size of the respondents

	Family size (Fs)											
BMI	2	3	4	5	6	7	8	11	12	14	Total	
1	0	1	1	1	0	0	0	0	0	0	3	
2	0	11	14	11	1	4	0	0	1	1	43	
3	1	2	7	2	2	1	1	1	0	0	17	
Total	1	14	22	14	3	5	1	1	1	1	63	

(Fs - Family size; BMI categories : 1- Underweight, 2- Normal, 3- Overweight)

Table 8 shows that among 63 respondents, 15.8 per cent of individuals are overweight, 3.17 per cent are underweight and 39.6 per cent of individuals show normal BMI when the family size is two, three or four. 11.11 per cent overweight is seen among those having a family size of four. 7.9 per cent overweight is seen in people having a family size of five, six, or seven, while 25.3 per cent of individuals show normal BMI.

Table 9. Chi-square tests of the above contingency table between BMI category and family size of the respondents

Test	Value	df	Asymptotic sig. (2-sided)
Chi-square	21.105	22	0.514

(*Significant at 5% level of significance)

The chi-square test was used to check the significance between the association of the two variables and it was found that the Chi-square test was not significant at 5% level of significance which implies that there is lack of association between BMI category and family size of the respondents (Table 9).

BMI category and house type : The contingency table was found out for the different house type of the

respondents with the 3 BMI categories (1 for Underweight, 2 for Normal weight, and 3 for Overweight) to check the correspondence between these two variables. Then the chi-square test was used to check the significance between the associations of the two variables.

Table 10. Contingency table between BMI category and House type of the respondents

BMI category	Hut	Kutchha	Mixed	Pucca	Total
1(Underweight)	0	1	0	2	3
2(Normal)	2	7	24	10	43
3(Overweight)	2	2	3	10	17
Total	4	10	27	22	63

Table 10 indicates that among 63 respondents, majority (15.8%) of the overweight individuals live in pucca house, followed by mixed house (4.7%), kutchha house and Hut (3.1% each). 3.1 individuals live in pucca house and are underweight, while 1.6 per cent individual living in kutchha house are underweight. 38 per cent people living in mixed house show normal BMI, followed by pucca house (15.8%), Kutchha house (11.1%) and hut (3.1%). House type is associated with maintenance of hygiene, house space and living condition cumulatively acting as an indirect factor for affecting BMI

Table 11. Chi-Square tests of the above contingency table between BMI category and house type of the respondents

Test	Value	df	Asymptotic sig. (2-sided)
Pearson chi-square	12.746	6	0.047*

*Significant at 5% level of significance

The chi-square test was used to check the significance between the association of the two variables and it was found that the chi-square test was significant at 5 per cent level of significance which implies that there is an association between BMI category and house type of respondents (Table 11).

Table 12. Association of BMI category with variables

Variables	χ^2 value	p-value
Age	10.949	0.027*
Education	23.067	0.027*
Family size	21.105	0.514
House type	12.746	0.047*

*Significant at 5% level of significance

Contingency tables were constructed for the different categories of age of the respondents, educational qualification, family size, and house type with

the three BMI categories, underweight, normal, and overweight. Pearsonian chi-square test results show that among the 4 variables, age, education and house type show significant associations with the BMI categories. Whereas, family size was not able to show any significant association with the BMI categories (Table 12).

CONCLUSION

Underweight was most prevalent among those individuals aged less than 28 years, and those having minimal or no education at all. Low BMI values were recorded for individuals having a family size of three to five members. The prevalence of overweight was maximum among those aged between 28-54 years and for those having educational qualifications from primary level to graduation. People living in pucca houses recorded higher BMI values as compared to those living in huts, kutcha houses, or mixed houses. Although overweight was prevalent among those having a family

size of three to five, maximum overweight individuals are also seen among those having a family size of two to six members. This can be attributed to different resource and food allocation patterns existent in different households. Well-educated people and people having a better house type show higher BMI values, while those with low educational qualifications show the problem of being underweight. Higher socioeconomic status is associated with a higher risk of being underweight, while low socioeconomic status may lead to the problem of being underweight. Hence, it is suggested to make awareness among the people regarding the intake of nutritious food and balance diet, importance of Psychical exercise and proper maintenance of hygiene for helping to keep the body and environment healthy and clean.

CONFLICTS OF INTEREST

The authors declare that they have no conflicts of interest.

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