Original article

Nutritional Status of adult population in West Bengal, India: Insights from NFHS-4 (2015-16) data

Sreeparna Banerjee[1], Manoranjan Pal[2], Subir Biswas[1], Premananda Bharati[3]*

ABSTRACT

Malnutrition is a serious health concerns in both under developed and developing countries. The present study was conducted to understand the nutritional status of women and men aged 15-49 years in west Bengal, India. The present study also tries to know the factors effecting the nutritional status of respondent's aged 15-49 years. In addition, we find the differences in nutritional status between men and women. The present study was based on National Family Health Survey 4 (2015-16). Total number of participants in this study was 20483, out of which 17764 were women and 2719 were men. Anthropometric measurements, socio-economic and demographic factors were considered for the present study. Statistical analysis has been carried out and the $p<0.05$ and $p<0.01$ are considered as statistically significant. The findings of the present study revealed that socio-economic and demographic factors have significant impact on nutritional status of the respondents except in few cases. The study depicts that percentages of both underweight (24.0%) and overweight (17.3%) among women were higher than among men (21.2%; 13.2%) in West Bengal. The present study revealed that odds ratio of underweight women was higher among women belonging to middle and richer wealth index category. Residential pattern and household structure show no significant relation with BMI status of respondents (men and women). The present study concluded that overall nutritional status of West Bengal is not satisfactory among the study population. The study depicts poor nutritional status among women than men.

Key words: Underweight, Overweight**,** Nutritional Status, Adults, West Bengal, India, Logistic regression

[1] Department of Anthropology, West Bengal State University, West Bengal, India

[2] Economic Research Unit, Indian Statistical Institute, West Bengal, India

[3] Biological Anthropology Unit, Indian Statistical Institute, West Bengal, India

*Corresponding author: pbharati@gmail.com

INTRODUCTION

Nutritional status shows the condition of the body, i.e., whether the body is in a balanced state or the individual is in the state of undernutrition and overnutrition. Nutrition is considered as an important determinant of current health status. It also determines the future health for an individual throughout the lifetime (Gibson 1990). Malnutrition in women and men results in reduced productivity, slow recovery from illness, increased susceptibility to infections (Mandal et al. 2011a). Many studies revealed that, improved economic conditions (Subramanian et al., 2006, Subramanian et al., 2007; Wang et al., 2009; Sengupta et al., 2014; Rengma et al., 2015; Bhutia 2014; Jain 2016; Mishra 2017), urbanization, sedentary lifestyles, dietary changes caused steady increase in over nutrition (Agrawal 2013, GBD 2015). At the same time, South Asian and sub-Saharan African countries face challenges against undernourishment (NCD Risk Factor Collaboration 2016). The coexistence of undernourishment and over nourishment causes a major health concern in developing countries like India.

According to recent Global Nutrition Report (2018), India shows no progress regarding achieving the target for obesity, with an estimated 5.1 percent of adult woman (aged 18 and above), 2.7 percent of adult men with obesity. In India, prevalence of obesity was lower than the regional average of 8.7 percent for women and 6.0 percent for men. Bitew and Telake (2010) revealed that, unlike men, undernutrition is more prevalent in women. In India, the prevalence of underweight among women has decreased by 36percent in 2005-06 to 23 percent in 2015-16 and prevalence of overweight or obesity has increased from 13 percent in 2005-06 to 21 percent in 2015-16 (Subramanian et al., 2009; Kulkarni 2017; IIPS 2015-16). In developing countries, studies on the prevalence of undernutrition among adults were mainly on women (Scott et al., 2013). Singh et al., 2011 and Dharmalingam et al., 2010 in their findings revealed that women in the reproductive age group remained in the state undernutrition throughout their life, which had serious health consequences. Moreover, underweight women are likely to give birth of an underweight child and as a result, vicious cycle of undernutrition takes place which is repeated over generations (Das et al., 2018).

In India, hunger and malnourishment cause serious problems. In the Global Hunger Index (2020), India secured 94th rank out of 107 countries with a score of 27.2 which means India is in a level of serious hunger. Dambal (2017) explained multiple factors like lack of awareness,

non-availability of safe hygienic food and sanitation, non-functioning of the administrative bodies, non-execution of the programs at the grass root level, responsible for malnourishment in developing and underdeveloped countries.

India, still faces the burden of undernutrition. Along with it the problem of overnutrition is engulfing a considerable section of people. Nutritional status of both men and women has not been extensively studied in developing countries like India.

Objectives

The present study assessed the extent of underweight and overweight of men and women aged 15-49 years in West Bengal, India. It also tried to know the Socio- demographic factors affecting the nutritional status of adult men and women.

Research Questions

1. Does Socio-economic and demographic factors are responsible for determining the nutritional status of adult population in West Bengal?

2. Is there any differences in nutritional status of men and women aged 15-49 years in West Bengal, India?

MATERIAL AND METHODS

Study area and participants

The present study was a cross-sectional and Ex-post facto research. It was based on data of National Family Health Survey (NFHS-4) conducted by International Institute for Population Science (IIPS) during 2015-2016.The study sample includes 20483 female and male adults aged 15-49 years, out of which 17764 were female and 2719 were male residing in West Bengal. The anthropometric measurements on height and weight were taken along with the socio-economic and demographic factors like marital status (Never married, Married, widow), Residential pattern (rural and urban), Household structure (Nuclear and joint), educational attainment (No education, Primary educated, Secondary educated and highly educated), age group of respondents (15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49 years), wealth index (Poor, Middle and Rich) for the present study. Chronic Energy Deficiency (CED) classification among adult population were obtained in accordance with the technique followed by Mandal et al., (2011b).

Study design: Present study is based on the unit level data extracted from National Family Health Survey (NFHS-4) conducted by IIPS during 2015-16. This the largest source which

provides women and men related data at household level. It is a comparative as well as Ex post facto research.

Statistical analysis

Chi square tests were performed to see the association between the nutritional status and socio-economic and demographic variables of the respondents. Binary logistic regressions were carried out to see the effect of the socio-economic and demographic variables (explanatory variables) on the status of underweight and overweight (explained variables). Logistic regressions have been done to show the direct effect of socio-demographic factors on nutritional status of adult population in West Bengal, India. Dependent variable is taken as binary. Underweight is coded as '0' and others (Normal, overweight) are coded as '1'.

RESULTS

Prevalence of CED and nutritional status of adult population in West Bengal, India, as shown in Table 1, revealed that the overall combined prevalence of CED was higher among women (88.2%) than men (11.8%). Out of 5040, 13.2 percent, 6.6 percent and 5.2 percent of women belonged to CED I, CED III and CED II. Among men, the respective percentages were 11.2 percent, 6.4 percent and 4.3 percent. Prevalence of Obese I and Obese II were higher among women than men.

Table 1. Prevalence of CED and nutritional status of adult population in West Bengal, India

BMI	Women	Men	Total
	(%)	(%)	
CED- III (<16.0)	6.6	6.4	1356
CED-II(16.0-16.99)	5.2	4.3	1042
CED-I (17.0-18.49)	13.2	11.2	2646
Total CED	88.2	11.8	5040
Low weight normal (18.5-19.99)	16.2	16.3	3319
Normal (20.0- 24.9)	42.7	48.6	8902
Obese-I (25.0-29.99)	13.0	11.5	2621
Obese-II (>30.0)	3.1	1.7	597
Total	**17764 (100.0)**	**2719 (100.0)**	**20483**

Source: Data Extracted from NFHS 4, 2015-16; CED= Chronic Energy Deficiency

Table 2 depicts that higher percentage of underweight and overweight among married women and men followed by never married, widow or widower women and men. The present study revealed that women and men residing in rural area showed dual burden of malnourishment. The prevalence of underweight and overweight were higher among rural people than urban people. The findings also revealed that 51.5 percent women and 55.2 percent men belonging to nuclear family were underweight, whereas 48.5 percent women and 44.8 percent men belonging to joint family were underweight. The present study also revealed that higher percentage of overweight were found among women belong to nuclear family. While men belonging to joint family showed higher percentage of overweight. The study also depicted that educated women and men had better nutritional status. The lowest percentages of underweight were observed among women and men belonged to Higher educational category. The study revealed that younger women and men had poorer nutritional status. Women and men aged 15-19 years showed higher percentage of underweight than other age-group women and men. With increasing age, prevalence of overweight increased in both the sexes except in few cases. The highest percentage of overweight were observed among women belonging to age 30-39 years while in men it was in the 35-44 age category. Wealth Index played an important role in determining the nutritional status of adult population. The data revealed that prevalence of underweight is more among women and men belonging to poor wealth index category while prevalence of overweight was observed in the rich wealth index category for both the sexes. Pearson Chi square tests showed significant relationship between socio- demographic factors and nutritional status of adults.

Table 2. Nutritional status of adult population with respect of Socio demographic variables

Variables	Women			Men		
Marital status	Underweight (%)	Normal (%)	Overweight (%)	Underweight (%)	Normal (%)	Overweight (%)
Never	28.3	17.0	7.8	44.0	30.8	16.3
Married	67.3	78.6	88.3	55.5	68.1	82.5
Widow	4.4	4.4	3.9	0.5	1.1	1.1
Total	4292	10472	3094	571	1769	355
χ^2	541.422**			79.597**		

Residential Pattern

Urban	21.9	25.1	45.8	31.2	25.6	40.6
Rural	78.1	74.9	54.2	68.8	74.4	59.4
Total	4292	10475	3095	571	1770	355
χ^2	608.876**			34.103**		

Household structure

Nuclear	51.5	49.5	50.3	55.2	50.1	46.2
Joint	48.5	50.5	49.7	44.8	49.9	53.8
Total	4292	10475	3095	571	1770	355
χ^2	4.572			7.680*		

Educational attainment

No education	27.5	23.8	16.1	18.7	16.0	8.5
Primary	18.3	20.0	19.2	21.5	19.7	20.3
Secondary	49.2	49.4	53.4	52.0	52.9	52.8
Higher	5.0	6.7	10.9	7.7	11.4	18.4
Total	4288	10451	3091	571	1765	354
χ^2	208.314**			37.666**		

Age group

15-19	27.4	16.8	5.1	29.8	13.0	3.9
20-24	19.9	19.1	11.8	16.1	16.0	10.4
25-29	13.8	16.2	16.8	12.2	16.5	13.3
30-34	10.7	13.6	17.5	10.9	14.9	16.8
35-39	10.0	12.3	17.3	10.7	15.4	20.1
40-44	9.1	11.0	15.8	10.1	13.3	19.7
45-49	9.1	10.9	15.6	10.1	10.9	15.9
Total	4292	10475	3095	523	1620	309
χ^2	895.544**			151.826**		

Wealth Index

Poor	68.1	56.1	29.2	59.5	54.5	24.5
Middle	17.5	22.9	24.8	19.6	24.1	21.4
Rich	14.4	21.0	46.0	20.8	21.4	46.2
Total	4292	10475	3095	571	1770	355
χ^2	**1406.298****			**147.110****		

Table 3 revealed that nutritional status of women of age 45-49 years, who had BMI 2.086 times followed by women of age-groups 40-44 years (2.054 times), 35-39 years (1.982), 30-34 years (1.917), 25-29 years (1.677), 20-24 years (1.284) compared to women of age-group 15-19 years respectively. The study depicted that respondents' ages showed significant association with BMI status of the respondents. The present study also highlighted that woman with better education have higher BMI and this is statistically significant. Odds ratio of women belonging to higher secondary education category had higher BMI (1.633), followed by secondary and primary educated groups compared to women with no education. Married women showed BMI 1.833 times that of never married women. The study also revealed that widows showed higher BMI status (1.550 times) than that of never married women. Women, who belonged to richer wealth index category showed higher BMI than women belonging to poor wealth index category. Wealth index showed significant relation with BMI status.

Table 3. Effect of socio- demographic factors on nutritional status of women and men using binary logistic regression model

Independent variables	Women			Men		
	OR	95% C.I of OR		OR	95% C.I of OR	
		Lower	*Upper*		Lower	Upper
Wealth Index						
Poor®						
Middle	1.707**	1.548	1.882	1.422*	1.087	1.859
Rich	2.191**	1.940	2.474	1.351	.981	1.859
Educational attainment						
No education®						
Primary	1.386**	1.243	1.546	1.320	.943	1.848
Secondary	1.529**	1.379	1.696	1.733**	1.267	2.372
Higher Secondary	1.633**	1.347	1.981	2.047**	1.293	3.240

Age group (in years)						
15-19®						
20-24	1.284**	1.132	1.457	2.300**	1.628	3.249
25-29	1.677**	1.452	1.935	3.122**	2.097	4.648
30-34	1.917**	1.642	2.236	3.238**	2.061	5.088
35-39	1.982**	1.689	2.326	3.548**	2.215	5.684
40-44	2.054**	1.740	2.425	3.393**	2.085	5.521
45-49	2.086**	1.762	2.470	2.780**	1.700	4.548
Marital status						
Never®						
Married	1.833**	1.635	2.056	1.234	.891	1.708
Widow	1.550**	1.258	1.910	4.070	.524	31.598
Residence						
Rural®						
Urban	1.040	.946	1.143	.654**	.508	.842
Household structure						
Joint family®						
Nuclear family	1.032	0.958	1.143	.966	.786	1.188
Constant	0.697			0.859		

Source: Data Extracted from NFHS 4, 2015-16, **$p<0.01$; *$p<0.05$; Underweight= 0®; Dependent variable: Nutritional status

Study also revealed that nutritional status of men of age 45-49 years showed higher BMI value followed by 20-24, 35-39 year etc. categories than men of age 15-19 years category. Educational status of men also showed significant relation with BMI status. Men belonging to higher secondary category have higher BMI than men belonging to no education category. Marital status of men also showed significant relation with BMI. Married men had higher BMI values than never married men. Richer women had higher BMI values. Residential pattern and household structure, however, showed no significant relation with BMI status of the respondents for both men and women.

DISCUSSION

Prevalence of CED is a serious nutritional problem among Indian women and requires immediate nutritional intervention (Bharali et al. 2017). The findings of the present study revealed that percentages of both underweight (24.0%) and overweight (17.3%) among women were higher than among men (21.2%; 13.2%) in West Bengal. The present findings also revealed that higher percentages of underweight were found among married women (67.3%) and men (55.5%). Residential pattern showed significant impact on nutritional status of the respondents. Higher percentages of underweight were observed among women residing in rural areas (78.1%) than women residing in urban areas (21.9%). Similar result was found among men. This finding is in line with the study of Ethiopia which revealed that 78.3 percent of rural women were undernourished in low- and middle-income countries (Kassie et al. 2020). Study of Hegde and Prasad (2020) found that 40.64 percent of women were underweight and 4.1 percent of women were overweight and obese (3.69%, 0.4% respectively). The present study highlighted that higher percentages of underweight were observed among women (51.5%) and men (55.2%) belong to nuclear family structure than joint family structure. The prevalence of overweight was higher among women (50.3%) belonging to nuclear family while higher percentage of overweight was observed among men (53.8%) belonging to joint family. Educational attainment also showed significant relationship with nutritional status of the respondents. Better educated women and men had better nutritional status than no educational category. Khanam et al. (2018) pointed out that women's education and household wealth inversely related to both underweight and stunting status. Women and men of age 15-19 years showed the highest prevalence of underweight than women and men in other age groups. As the age increases, prevalence of underweight decreases and overweight increases except in the age-group 40-49 years for both men and women. The present findings indicated that the respondents belonging to poor wealth index showed higher prevalence of undernourishment, whereas the respondents belonging to middle and richer wealth index category showed higher prevalence of overweight among both men and women. Banerjee et al. (2018) found that household wealth index is a significant factor towards reducing the chance of becoming underweight for both rural and urban women.

Binary logistic regression showed that women belonging to better wealth index category had better nutritional status than women belonging to poor wealth index category and the result is significant at 1 percent level. The study revealed that men belonging to middle and richer wealth index category had respectively1.422 times and 1.351 times better nutritional status than men belonging to poor wealth index category and the result is significant except men belonging to richer wealth index category. The study also revealed that odds of underweight among respondents who had primary, secondary and higher secondary education was higher than those who had no education. Similar results were also observed in Kenya, Nigeria, and Ethiopia (ICF International 2014; National Population Commission, Nigeria Demographic and Health Survey 2014; Kassie 2020). Age group of women showed significant association with nutritional status. Women in the age-groups 45-49, 40-44, 35-39, 30-34, 25029, 20-24 years showed respectively 2.086 times, 2.054 times, 1.982 times, 1.917 times, 1.677 times and 1.284 times better nutritional status than women in the age-group 15-19 years. Similar observations were found among men also. Marital status of women also showed significant relationship with nutritional status. Men showed no significant relationships between marital status and nutritional status. Respondents' residential pattern, household structure, however, showed no significant effect on their nutritional status except residential pattern in men.

Strength

Present study will help in understanding the effect of socio-demographic factors on nutritional status of adult in West Bengal, India. Present study will also help in understanding the differences of nutritional status between adult men and women. This study tries to explain the present scenario of West Bengal regarding nutritional status of adult population. This study also tries to provide information about the causes of malnourishment.

Limitation

The present study was based on secondary data. It helps us to understand the present situation of malnourishment among adult population in West Bengal, but compared to primary data they are imperfect reflection of reality. As secondary data is usually not collected for the same purpose as the original researcher. So, sometimes the purpose of the original researcher gets biased.

CONCLUSION

Women of the present study shows higher percentage of malnourishment compared to men in West Bengal, India. Women and men aged 15-19 years shows, highest percentage of undernourishment than women and men of other age group. The study also revealed that wealth index has significant impact on nutritional status of women and men. Women and men belong to better wealth index have better nutritional status than women and men belongs to poor wealth index. Residential structure and household structure also determine the nutritional status of the respondent.

Recommendations

Promoting more researches on nutritional status is very important and should give priority. Assessments of body composition and nutritional status using BMI, especially among women, are recommended.

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The Author's contribution

The study by design, analysis and interpreted the data by first author SB. Design of the study and thorough revision were done by other authors MN, PB, SB.

Conflict of interest

The authors declare that there is no conflict of interest.

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