Chapter 13
Nutrition and Nutritional Deficiency Diseases in Sonbhadra District, Uttar Pradesh (India)

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Abstract The present study points out substantial variation in food consumption across communities. Hindu respondents have a better dietary intake than the Muslim counterparts. This statement is not in conformity with the NFHS-2 India survey report (1998–1999, p. 161). With regard to composite nutritional status index, 96.9 % of Muslim respondents fall in the category of poor nutritional status whereas in Hindus this proportion is 66.8 %. Religion, education, occupation, and income are important predictors for better nutritional status. Of the total 420 respondents, about 63.3 % are suffering from some kind of deficiency disease. This proportion is slightly higher (68.8 %) in Muslims. Among Hindus, the condition of scheduled caste/scheduled tribe (SC/ST)[1, 2] respondents is poorer (68.6 %) compared to Other backward classes (OBC)[3], and General caste (general caste). Among SC/ST respondents, asthma is most prevalent followed by scurvy, anemia, and dental decay. Among OBC, scurvy is the most prevalent followed by anemia and dental decay. In contrast, general caste respondents suffer more from diabetes, followed by leprosy and asthma.

Keywords Poverty • Nutritional food intake • Composite nutritional status index • Multivariate analysis • Nutritional deficiency diseases

[1] Scheduled Caste (SC)- is a constitutionally declared collection of castes, which suffered from the practice of untouchability.

[2] Scheduled Tribe (ST)- is a tribe listed in the scheduled list of tribes by Government of India and is identified on the basis of certain criteria such as primitive traits, distinct culture, geographical isolation and general backwardness.

[3] Other Backward classes (OBC)- are castes which have been identified as economically/socially backward by the Central and State governments in India.

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13.1 Introduction

To achieve sustainable human development, it seems imperative to determine nutritional food intake and nutritional deficiency across the society so that nutritional deficiency diseases could be brought to the fore, thus enabling planners to suggest a sound and purposeful plan pertaining to future well-being and health. An assessment of caloric intake has long emerged as a significant geographic problem, but no satisfactory and complete answer has so far been proposed (Singh 1972).

Poverty is an enemy of society, and its elimination requires global attention through a well-formulated strategy. Poverty is the root cause for poor nutritional intake and low nutritional level in any society. Malnutrition adversely affects mental development, physical growth, productivity, and the span of working hours, and as such significantly influences the economic potential of men and women, thereby hindering the economic progress of the country (Chitralekha 1982).

A nutritional availability study becomes essential for several reasons. On the one hand, it provides reliable information for food planning. On the other hand, nutritional deficiency affects the quality of the population and its mobility behavior and as such it may be employed as a yardstick for measuring the level of socioeconomic development (Singh et al. 1997). Nutritional availability reveals the actual food available for human consumption in an area at a given point of time. The measurement of nutritional availability rests on the determination of the quality of food that may affect human consumption locally or otherwise (Dubey and Mishra 1984). After gaining some idea of nutritional deficiency, the diseases related to it can be ascertained.

13.2 Methodology and Study Area

The present study was conducted in Sonbhadra District, which is located between latitudes 23°51′22″N and 24°53′16″N and longitudes 82°31′55″E and 83°33′45″E covering an area of 6,788 km^2. The Sonbhadra District is divided into eight community development blocks: Robertsganj, Ghorawal, Chatara, Nagwa, Chopan, Meyorpur, Dudhi, and Babhani (Fig. 13.1). Sonbhadra District may be classified as a largely rural district with merely 19–20 % of the population living in urban areas (Obra, Robertsganj, Churk, Duddhi, Chopan, Ghorawal, Renukoot, and Pipri towns). According to the 2001 census, the study area was inhabited by 1,463,519 people, and during the past decade (1991–2001), the population in each block has increased tremendously with an average increase of 36.49 %.

13.2.1 Data

The present work is an outcome of intensive fieldwork. This study covers almost all salient features of nutrition and nutritional deficiency diseases in the people of Sonbhadra District. The primary information related to nutrition and nutritional

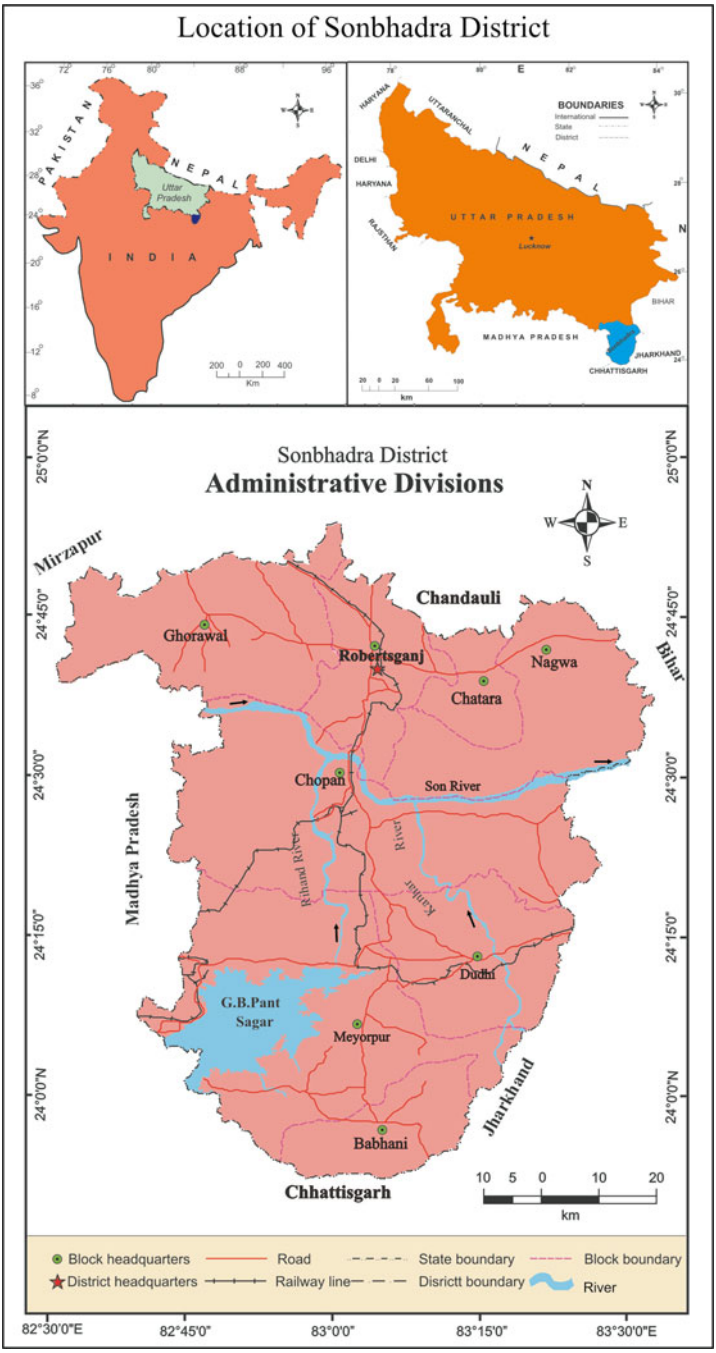

Fig. 13.1 Location map of Sonbhadra district

deficiency diseases has been generated through a questionnaire-based survey of 420 respondents. These respondents were taken from 28 villages (15 respondents from each village) based on purposive random sample. In fact, samples had to be collected from 32 villages (4 villages from each development block) but as a result of guerrilla groups affecting 4 villages of the Nagwa block these were left in the sample survey. Because there were few Christians and Sikhs and no Baudh and Jain populations in Sonbhadra District, they are not included in the sample survey.

Multivariate analysis has been used to show the association between nutritional diseases and socioeconomic determinants. To know the important predictors for a composite nutritional status index, logistic regression has been run. For multivariate and composite index analysis, Strata SE 9.0 and SPSS 16.0 software were used, and Sigma plot 8.0 was used for graph preparation.

13.3 Results and Discussion

13.3.1 Socioeconomic Profile of the Respondents in Sonbhadra District

This study is based on 420 respondents selected from three caste categories: General caste (general caste), other backward caste OBC), and scheduled caste/scheduled tribe (SC/ST) (Table 13.1). Most respondents (173) belong to the OBC caste followed by SC/ST (169) and general caste (78). These respondents have been selected according to their proportion of the total population.

Classification of the respondents by age groups is given in Table 13.2, showed that more than 49 % of respondents were above 40 years of age. Only 11.2 % of the respondents are of lower age group (below 30 years). The number of respondents is increased with increasing age groups. Of the total 420 respondents, 43.8 % of respondents are illiterate, 28.8 % of respondents are educated up to high school level, and 27.4 % of respondents have education above high school (Table 13.3).

Table 13.4 indicates grouping of the respondents by caste according to their educational level. It is clear from this table that 87 % of SC/ST respondents are

Table 13.1 Caste-wise survey information in Sonbhadra district, 2008

	Respondents	
Castes	Number	Percent
SC/ST	169	40.2
OBC	173	41.2
General	78	18.6
Total	420	100.0

Source: Personal survey (2008)
SC/ST scheduled caste/scheduled tribe, *OBC* other backward caste, *General* general caste

Table 13.2 Age structure, 2008

Age group (years)	Respondents	
	Number	Percent (%)
Less than 30	47	11.2
30–35	58	13.8
35–40	108	25.7
More than 40	207	49.3
Total	420	100.0

Source: Personal survey (2008)

Table 13.3 Level of literacy, 2008

Education level	Respondents	
	Number	Percent (%)
Illiterate	184	43.8
Up to high school	121	28.8
Above high school	115	27.4
Total	420	100.0

Source: Personal survey (2008)

Table 13.4 Caste-based literacy, 2008

	Education						Total	
	Illiterate		Up to high school		Above high school			
Castes	Number	%	Number	%	Number	%	Number	%
SC/ST	147	87.0	16	9.5	6	3.6	169	100.0
OBC	37	21.4	75	43.4	61	35.3	173	100.0
General	–	–	30	38.5	48	61.5	78	100.0
Total	184	43.8	121	28.8	115	27.4	420	100.0

Source: Personal survey (2008)

illiterate, with only 9.5 % literate up to high school and 3.5 % above high school. About 21.4 % of OBC respondents are illiterate; 43.4 % are literate up to high school level and 35.3 % above high school. In general caste, all respondents are literate. Table 13.5 reveals that 44.3 % of respondents belong to the lower income group (less than Rs 2,000 per month), 39.5 % belong to the income category of Rs 2,000–3,500 per month, 9 % to the income category of Rs 3,500–5,000 per month, and 7.1 % respondents have an income above Rs 5,000 per month.

13.3.2 Analysis of Nutritional Food Intake

The consumption of a variety of nutritious food is essential for maintaining good health. A well-balanced diet contains adequate amount of protein, fat, carbohydrates, vitamins, and minerals. Meat, fish, eggs, milk, and pulses are rich in

Table 13.5 Income group and number of respondents, 2008

Income [in rupees (Rs)/month]	Respondents	
	Number	Percent (%)
Less than 2,000	186	44.3
2,000–3,500	166	39.5
3,500–5,000	38	9.0
More than 5,000	30	7.1
Total	420	100.0

Source: Personal survey (2008)

Table 13.6 Nutritional food intake, 2008

	Condition of intake				
	Daily	Weekly	Occasional	Never use	
Food items	(%)	(%)	(%)	(%)	Total
Milk/curd	53.3	6.0	40.7	–	420
Fruits	–	29.0	71.0	–	420
Vegetables	70.2	21.2	8.6	–	420
Eggs	2.4	29.0	56.9	11.7	420
Meat/fish	–	3.6	82.4	14.0	420
Sugar	95.0	–	5.0	–	420
Ghee/oil	100.0	–	–	–	420
Pulses	61.4	31.7	6.9	–	420

Source: Personal survey (2008)

protein. Green vegetables are rich sources of iron, folic acid, vitamin C, carotene, riboflavin, and calcium. Vitamin C is also obtained from many fruits. Bananas are rich in carbohydrates. Papayas, mangoes, and other yellow fruits contain carotene that is converted into vitamin A. Vitamin A is also present in milk and milk products as well as in egg yolks (Gopalan et al. 1996).

To obtain information about nutritional food intake, the people were questioned about how often they consume various types of food (daily, weekly, occasionally, or never use). In the study area respondents consume pulses on a daily basis and vegetables frequently; 53.3 % of respondents use milk and curd each day while 40.7 % of respondents use milk occasionally. A variety of fruits is not eaten every day. This food item is consumed on a weekly (29 %) and occasional (71 %) basis. The majority of respondents (70.2 %) consume vegetables at least each day. Akin to fruits, in context of the consumption of eggs, fish, meat, and chicken, the condition of the respondents is pitiable (Table 13.6). About 56.9 % of respondents eat eggs occasionally, 82.40 % use meat and fish occasionally, about 11.70 % of respondents say that they never eat eggs, and 14 % of respondents never eat meat or fish. However, the never use category for such items in the Indian dietary system does not

Table 13.7 Religion and nutritional food intake, 2008

	Muslims				Hindus				
	Daily	Weekly	Occasional	Never use	Daily	Weekly	Occasional	Never use	
Food items	%	%	%	%	%	%	%	%	Total
Milk/curd	25.0	21.9	53.1	–	55.7	4.6	39.7	–	420
Fruits	–	3.1	96.9	–	–	31.2	68.8	–	420
Vegetables	37.5	62.5	–	–	72.9	17.8	9.3	–	420
Egg	3.1	25.0	68.8	3.1	2.3	29.4	55.9	12.4	420
Meat/fish	–	–	96.9	3.1	–	3.9	81.2	14.9	420
Sugar	96.9	–	3.1	–	94.8	–	5.2	–	420
Ghee/oil	100.0	–	–	–	100.0	–	–	–	420
Pulses	59.4	40.6	–	–	61.6	30.9	7.5	–	420

Source: Personal survey (2008)

reveal the true picture of nonavailability/affordability because a sizeable proportion of Hindu community respondents refrain from consuming these food items for religious taboo reasons.

The present survey points out a substantial variation in food consumption of respondents across the communities. Hindu community respondents have a better dietary intake than Muslims (Table 13.7). This statement does not conform to the NFHS-2 India survey report (1998–1999), which states that Muslims consume every food item except dairy products more often than Hindus. The most interesting fact of this survey is that only in the Muslim community is there not a single respondent in the "never consume" category. A large number of the respondents of the SC community consume fruits, meat/fish, eggs, and milk/curd occasionally (Table 13.8). In context of dietary intake, OBC respondents come next to SC respondents. Thus, it can be inferred that respondents of SC and OBC communities have a relatively poor diet that is particularly deficient in milk and curd, fruits, eggs, and fish, meat, and chicken.

13.3.3 Composite Nutritional Status Index (CNSI)

To avoid difficulty in interpretation of the dietary system (daily, weekly, occasional, and never use), as well as the variety of food items, composite nutritional status index has been computed by assigning a weight to each item. This measure helps to provide a rationalized means for discussion and multivariate analysis.

Table 13.9 reveals the composite nutritional status index in the study area by religion. Among the total sampled respondents, 7.62 % of respondents belong to the Muslim religion and the majority, 92.38 % of respondents, are of the Hindu religion. Of the total Muslim respondents, 96.9 % of respondents are characterized by poor

Table 13.8 Caste and nutritional food intake, 2008

	SC/ST				OBC				General				
	Daily	Weekly	Occasional	Never use	Daily	Weekly	Occasional	Never use	Daily	Weekly	Occasional	Never use	
Food items	%	%	%	%	%	%	%	%	%	%	%	%	Total
Milk/curd	45.0	4.1	50.9	–	46.2	10.4	43.4	–	87.2	–	12.8	–	420
Fruits	–	11.2	88.8	–	–	21.4	78.6	–	–	84.6	15.4	–	420
Vegetables	46.2	32.5	21.3	–	80.3	19.7	–	–	100.0	–	–	–	420
Egg	–	24.9	70.4	4.7	2.9	36.4	59.0	1.7	6.4	21.8	23.1	48.7	420
Meat/fish	–	–	95.3	4.7	–	7.5	90.8	1.7	–	2.6	35.9	61.5	420
Sugar	95.9	–	4.1	–	96.5	–	3.5	–	89.7	–	10.3	–	420
Ghee/oil	100.0	–	–	–	100.0	–	–	–	100.0	–	–	–	420
Pulses	30.8	54.4	14.8	–	76.3	21.4	2.3	–	94.9	5.1	–	–	420

Source: Personal survey (2008)

Table 13.9 Religion and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Religion	Number	%	Number	%	Total
Muslim	31	96.9	1	3.1	32
Hindu	259	66.8	129	33.2	388
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

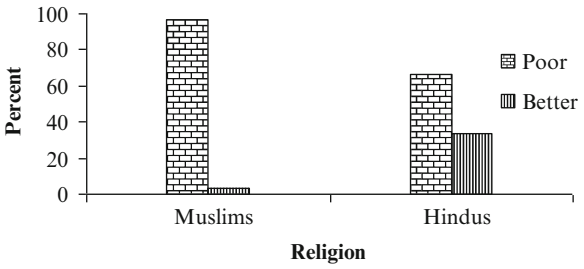

Fig. 13.2 Nutritional status index by region

Table 13.10 Caste and composite nutritional status index (CNSI)

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Caste	Number	%	Number	%	Total
SC/ST	142	84.0	27	16.0	169
Non-SC/ST	148	59.0	103	41.0	251
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

nutritional status (Fig. 13.2); only 3.1 % of Muslim respondents were found to have a better nutritional status. In the Hindu religion, 66.8 % of respondents record poor nutritional status and 33.2 % of respondents have better nutritional status. This table exhibits a notable variation in the nutritional intake of Hindus and Muslims.

Table 13.10 indicates composite nutritional status index by caste in the Sonbhadra District. Among SC/ST, 84 % of respondents revealed poor nutritional status and only 16 % of respondents showed better nutritional status. Compared to SC/ST, good nutritional status can be seen in non-SC/ST castes as only 59 % of respondents of non-SC/ST (general and OBC castes) experience poor nutritional status and 41 % of respondents have a better nutritional status (Fig. 13.3). On average in the study area, 69 % of respondents are characterized by poor nutritional status and only 31 % have shown better nutritional status (Fig. 6.1).

Table 13.11 indicates the relationship between educational status and composite nutritional status index in the study area. Among the illiterate, 84.8 % of respon-

Table 13.11 Education and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Education	Number	%	Number	%	Total
Illiterate	156	84.8	28	15.2	184
Up to high school	72	59.5	49	40.5	121
Above high school	62	53.9	53	46.1	115
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

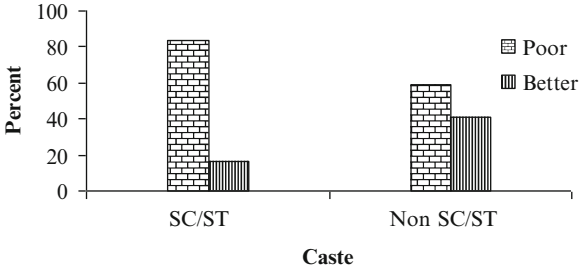

Fig. 13.3 Composite nutritional status index (CNSI) by caste

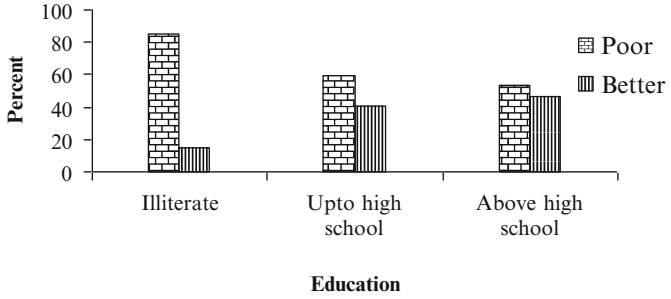

Fig. 13.4 Education-based composite nutritional status index (CNSI)

dents reveal poor nutritional status and only 15.2 % of illiterate respondents record a better condition of nutritional status (Fig. 13.4). Of respondents having education up to high school, 59.5 % have poor nutritional status and 40.5 % are characterized by better nutritional status. In above high school educational status, 53.9 % of respondents have been found with poor nutritional status and 46.1 % with better condition of nutritional status. Thus, it can be inferred that the higher the educational level, the better is the nutritional intake. The analysis of composite nutritional status index and its association with family type is given in Table 13.12. It is clear from this table that in a nuclear family 71.3 % of respondents exhibit poor nutritional intake whereas this proportion is lower in a joint family (Fig. 13.5). Better

Table 13.12 Family type and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Family type	Number	%	Number	%	Total
Nuclear	239	71.3	96	28.7	335
Joint	51	60.0	34	40.0	85
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

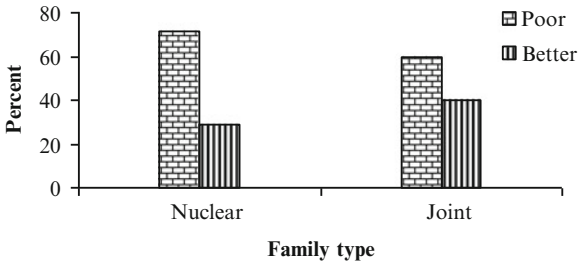

Fig. 13.5 Family-based composite nutritional status index (CNSI)

Table 13.13 Occupation and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Occupation	Number	%	Number	%	Total
Labor	133	88.7	17	11.3	150
Farmer	114	56.4	88	43.6	202
Government job/business	43	63.2	25	36.8	68
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

nutritional status has been found in the joint family (40 % respondents). In the nuclear family system, the proportion of respondents having better nutritional status is much lower than that of the joint family.

Table 13.13 portrays composite nutritional status index according to occupation categories. Remarkable variation is seen in composite nutritional status index (CNSI) performance among the respondents deriving their livelihood through various occupations. The most important and striking feature of this analysis is that 63.2 % of respondents with a government job reveal poor CNSI, even poorer than respondents engaged in farming. The highest proportion of better CNSI (43.6 %) is found in the farming occupation because the farmer is a self-producer of milk and milk products, vegetables, pulses, and chickens, etc., and also eggs by keeping hens in his household (Fig. 13.6).

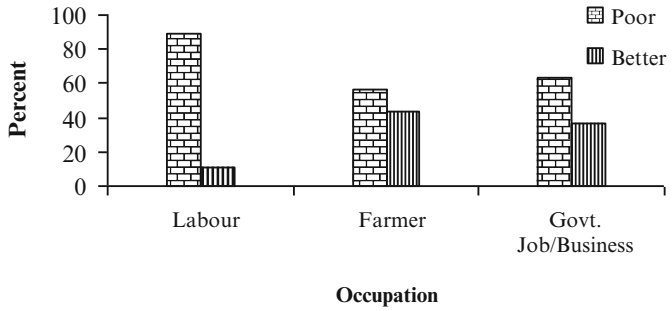

Fig. 13.6 Composite nutritional status index (CNSI) by occupation

Table 13.14 Income and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Income group (in Rs/month)	Number	%	Number	%	Total
Below 2,000	163	87.6	23	12.4	186
2,000–3,500	88	53.0	78	47.0	166
3,500–5,000	27	71.1	11	28.9	38
Above 5,000	12	40.0	18	60.0	30
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

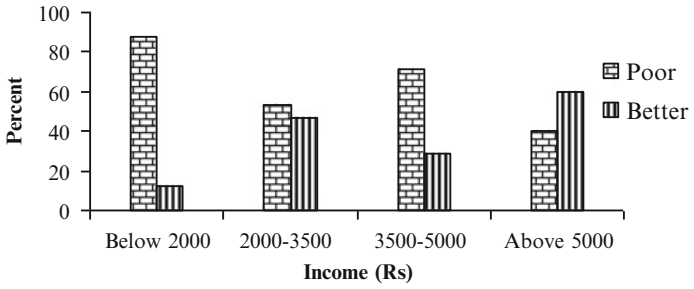

Fig. 13.7 Composite nutritional status index (CNSI) by income

Table 13.14 shows the CNSI by income, which exhibits significant variation across various income groups. However, these variations are in the positive direction. For instance, the magnitude of better nutritional status is increased in respondents having higher income. About 60 % better nutritional status has been reported in the highest income group (Rs 5,000 per month) compared to the lower income groups (Fig. 13.7).

Table 13.15 reveals the CNSI by age group. Respondents having a lower share of better nutritional status have been found in the lower age groups such as groups less

Table 13.15 Age group and composite nutritional status index

	Composite nutritional status index				
	Poor nutritional status		Better nutritional status		
Age group (in years)	Number	%	Number	%	Total
Below 30	43	91.5	4	8.5	47
30–35	46	79.3	12	20.7	58
35–40	81	75.0	27	25.0	108
Above 40	120	58.0	87	42.0	207
Total	290	69.0	130	31.0	420

Source: Personal survey (2008)

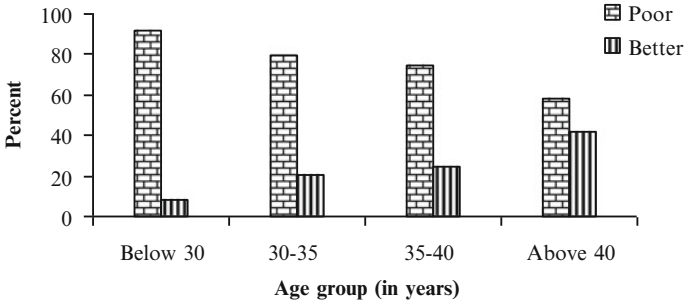

Fig. 13.8 Age group and composite nutritional status index (CNSI)

than 30, 30–35, and 35–40 years of age. It is highest (42 %) in respondents aged above 40 years. Thus, it can be inferred that the proportion of better nutritional status is higher in respondents above 40 years of age (Fig. 13.8). The reason for this may be the higher level of awareness about intake of safe food and less use of tobacco and alcohol and drugs in aged respondents compared to the awareness of younger age group respondents about the risk of nutrition deficiency.

13.3.4 Multivariate Analysis for Composite Nutritional Status Index (CNSI)

Binary logistic regressions to obtain the adjusted effect of the predictor variables on the dependent variables have been applied here. Table 13.16. presents the results of logistic regression assessing the association between composite nutritional status and the explanatory variables. Because of the smaller sample size, the categories of religion and caste have been merged into only two categories. The 95 % confidence intervals are also presented in the table. The results show that a respondent's religion, education, income,

Table 13.16 Logistic regression results predicting the odds of composite nutritional status index (CNSI) according to selected socioeconomic and demographic characteristics

Covariates and categories	Odds ratio exponent (β)	95 % confidence interval	
Religion***			
Muslim®	1.00		
Hindu	30.77	3.60	262.52
Caste*			
SC/ST®	1.00		
Non-SC/ST	2.19	0.96	4.97
Education***			
Illiterate®	1.00		
Up to high school	3.46	1.96	6.10
Above high school	4.63	2.63	8.15
Income groups***			
Below 2,000®	1.00		
2,000–3,500	9.68	3.84	24.42
3,500–5,000	1.63	0.46	5.82
Above 5,000	16.73	3.68	75.99
Occupation***			
Labor®	1.00		
Farmer	7.12	2.36	21.53
Government job and business	2.55	0.57	11.37
Family type			
Joint®	1.00		
Nuclear	1.38	0.68	2.82
Age group			
Below 30®	1.00		
30–35	0.74	0.18	2.98
35–40	1.20	0.33	4.36
Above 40	3.82	1.11	13.12

Source: Personal survey, 2008
Dependent variable: better nutritional status (1); poor nutritional status (0); ® reference category
Comment: Religion, education, income, and occupation are important predictors of having better nutritional status
*$p<0.10$; **$p<0.05$; ***$p<0.01$

and occupation are highly significantly associated ($p<0.01$) with better CNSI and caste is significantly associated ($p<0.05$) with better CNSI. The probability for better CNSI is much higher in Hindus (odds ratio, 30.77 times better condition) than Muslims. Similarly, in comparison to SC/ST, the probability for better CNSI is higher in non-SC/ST castes (odds ratio, 2.19). For a comparison of literate and illiterate respondents for having better CNSI, illiterate has been taken as the reference category.

Respondents belonging to the educated up to high school category (odds ratio, 3.46) and above high school category (odds ratio, 4.63) are more likely to have a

better CNSI compared to those who belong to the illiterate (no formal schooling) category. Income is the most important factor for better CNSI. The analysis for this aspect indicates that for the below Rs 2,000 per month income group, probability is 1 (one) compared to the Rs 2,000–3,500 income group (odds ratio, 9.68), Rs 3,500–5,000 income group (odds ratio 1.63), and above Rs 5,000 group (odds ratio, 16.73). Similarly, the person's occupation is also positively associated with better CNSI. In this analysis the labor category has been referenced as one. The farmer category (odds ratio, 7.12) and government job and business category (odds ratio, 2.55) respondents have a better chance for good nutritional status. Age group and family type have not appeared to be statistically significant in this analysis.

13.3.5 Nutritional Deficiency Diseases

13.3.5.1 Scurvy

Scurvy is a nutritional deficiency disease directly associated with the lack of vitamin C. The signs of this condition are swollen and bleeding gums and bleeding into the skin or joints.

13.3.5.2 Anemia

Anemia usually accompanies scurvy; it is partially caused by hemorrhagic blood loss, but also by the faulty metabolic interrelationship of vitamin C with folic acid and with iron. Concurrent deficiency of other nutrients also contributes to the anemia. Normal percentages are highest in the youngest individuals and decline as people age.

13.3.5.3 Rickets

Rickets, a disease directly related to impaired metabolism of calcium and phosphorus, is manifested in defective bone growth and changes in the body musculature. The impaired mineral metabolism in rickets may have many causes, but by far the commonest cause is a deficiency of vitamin D. Vitamin D may be found in food or formed in the body through the action of short ultraviolet radiations such as those in sunlight. Vitamin D is necessary for the absorption of calcium and phosphorus and for their deposit in bone tissue. A dietary lack of vitamin D may occasionally occur in people on a vegetarian diet who do not consume milk products or in people who have trouble in digesting milk products. A dietary lack of calcium and phosphorus may also have a part in the nutritional causes of rickets.

13.3.5.4 Dental Decay

Dental caries, or cavities, are very common. They are caused by acid on the teeth. The acid is made by the bacteria in dental plaque. The plaque bacteria feed on sugars and starches from the diet and change them into acid. This acid eats into tooth enamel, or the outer layer of the tooth, and dentin, the major part or core of the tooth. The tooth then gradually dissolves. Tooth decay (also known as dental decay) results from a bacterial infection of the teeth.

13.3.5.5 Diabetes

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia and disturbances of carbohydrate, fat, and protein metabolism that are associated with absolute or relative deficiencies in insulin action and/or insulin secretion.

13.3.5.6 Leprosy

Leprosy is a disease that affects primarily the skin and nerves. The disease was thought to have started somewhere in India and then was passed on to Africa and Europe. In the late 1800s leprosy was very common throughout Europe. Today the disease is not very common. Worldwide it is estimated that only 5 % of the population is susceptible.

13.3.6 Distribution of Nutritional Deficiency Diseases

In the study area, scurvy, anemia, asthma, dental decay, diabetes, and leprosy have been found to be the major deficiency diseases (Table 13.17). Of the total 420 respondents, about 63.3 % are suffering with some kind of deficiency diseases. The percentage of respondents having no deficiency diseases is highest in OBC (42.19 %), followed by general caste (35.9 %) and SC/ST (31.36 %); thus, the highest percentage of respondents suffering with deficiency diseases is recorded in SC/ST. Among SC/ST respondents, asthma is more prevalent, followed by scurvy, anemia, and dental decay. Among OBC, scurvy is at the top, followed by anemia and dental decay; among respondents of general caste, diabetes is more common, followed by leprosy and asthma. The reason behind the higher frequency of diabetes in the general caste may be that they do less physical work than OBC and SC/ST respondents.

It is clear from Table 13.18 that in Muslims the occurrence of deficiency diseases is slightly higher (68.8 %) than in the Hindu counterpart (Fig. 13.9). Among Hindus, the highest percentage of nutritional deficiency diseases has been found in SC/ST respondents (68.6 %), followed by general caste respondents (64.1 %). The OBC castes report the lowest percentage of nutritional diseases (Fig. 13.10). Table 13.19 shows the higher prevalence of nutritional deficiency diseases among illiterate

Table 13.17 Nutritional deficiency diseases by major caste groups

Nutritional deficiency diseases	Castes						Total
	SC/ST		OBC		General		
	Number	%	Number	%	Number	%	
No deficiency	53	31.36	73	42.19	28	35.90	154
Anemia	17	10.08	20	11.56	4	5.13	41
Dental decay	15	8.88	19	10.98	4	5.13	38
Leprosy	10	5.92	9	5.20	12	15.38	31
Asthma	26	15.38	8	4.63	6	7.69	40
Diabetes	13	7.69	11	6.36	14	17.95	38
Scurvy	22	13.02	28	16.18	0	0	50
Others	13	7.69	5	2.90	10	12.82	28
Total	169	100.0	173	100.0	78	100.0	420

Source: Personal survey (2008)

Table 13.18 Nutritional deficiency diseases by caste and religion

Religion	No nutritional disease		Having nutritional disease		Total
	Number	%	Number	%	
Muslim	10	31.2	22	68.8	32
Hindu	144	37.1	244	62.9	388
Castes					
SC/ST	53	31.4	116	68.6	169
OBC	73	42.2	100	57.8	173
General	28	35.9	50	64.1	78
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

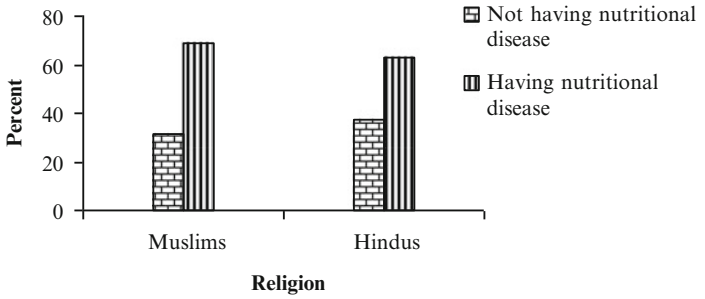

Fig. 13.9 Religion and nutritional deficiency diseases

respondents (70.1 %), followed by respondents having education above high school (65.2 %) and up to high school (51.2 %) (Fig. 13.11). There is no clear-cut positive relationship between education and nutritional deficiency diseases.

Table 13.20 highlights that the highest (above Rs 5,000) and lowest (below Rs 2,000) income groups have a high percentage of respondents suffering from nutri-

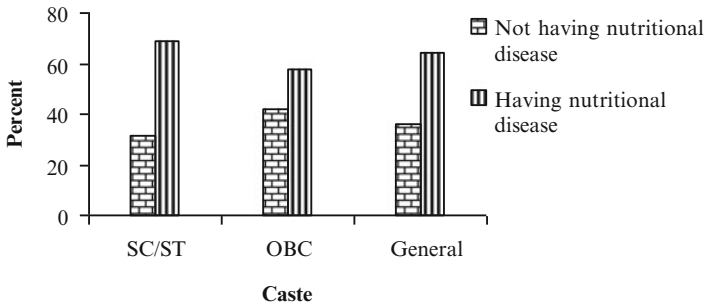

Fig. 13.10 Caste and nutritional deficiency diseases

Table 13.19 Education and nutritional deficiency diseases

	No nutritional disease		Having nutritional disease		
Education	Number	%	Number	%	Total
Illiterate	55	29.9	129	70.1	184
Up to high school	59	48.8	62	51.2	121
Above high school	40	34.8	75	65.2	115
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

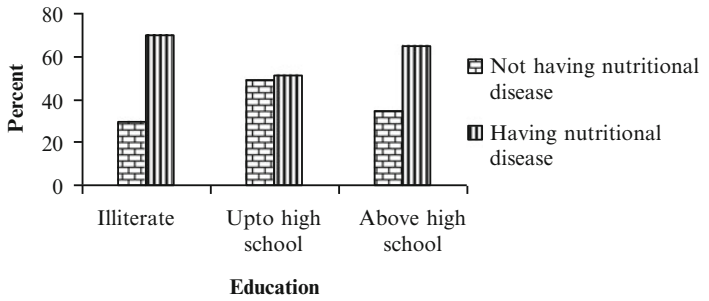

Fig. 13.11 Education and nutritional deficiency diseases

tional deficiency diseases (Fig. 13.12). A lower percentage of respondents having such diseases has been found in the middle income group. Thus, on the basis of these data no inference can be derived showing an association between income and nutritional diseases. Table 13.21 evinces that the respondents having higher percentage of nutritional deficiency diseases belong to a nuclear family, whereas the respondents of a joint family witness a lower percentage of nutritional deficiency diseases (Fig. 13.13). Table 13.22 revealed that 80.9 % respondents of the age group below 30 years have nutritional deficiency diseases. With increase in age, the percentage of respondents having nutritional deficiency diseases declines. Thus, the inference 'the higher the age the lower are deficiency diseases' can be drawn. Relationships between occupation and nutritional deficiency diseases are shown in Table 13.23. It is interest-

Table 13.20 Income and nutritional deficiency diseases

	No nutritional disease		Having nutritional disease		
Income group (Rs/month)	Number	%	Number	%	Total
Below 2,000	52	28.0	134	72.0	186
2,000–3,500	83	50.0	83	50.0	166
3,500–5,000	14	36.8	24	63.2	38
Above 5,000	5	16.7	25	83.3	30
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

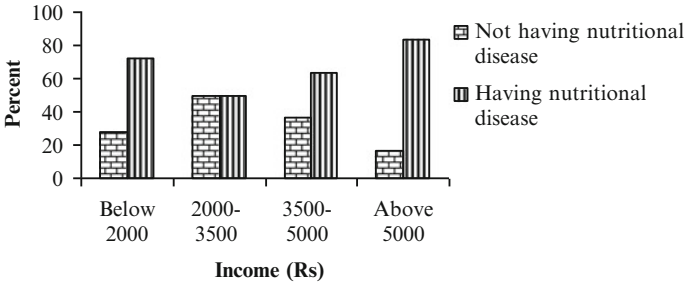

Fig. 13.12 Income and nutritional deficiency diseases

Table 13.21 Family type and nutritional deficiency diseases

	No nutritional disease		Having nutritional disease		
Family type	Number	%	Number	%	Total
Nuclear	120	35.8	215	64.2	335
Joint	34	40.0	51	60.0	85
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

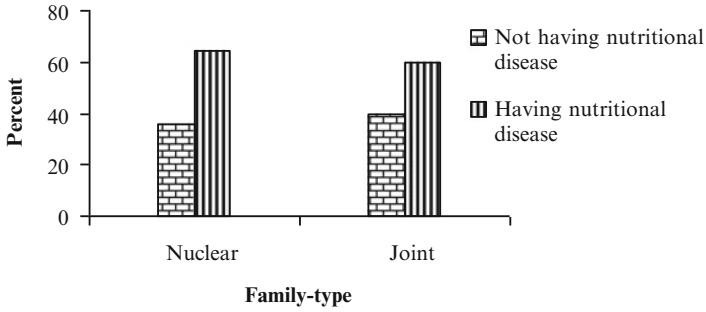

Fig. 13.13 Family and status of nutritional deficiency diseases

Table 13.22 Age group and nutritional deficiency diseases

	No nutritional disease		Having nutritional disease		
Age group (years)	Number	%	Number	%	Total
Below 30	9	19.1	38	80.9	47
30–35	22	37.9	36	62.1	58
35–40	39	36.1	69	63.9	108
Above 40	84	40.6	123	59.4	207
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

Table 13.23 Occupation and status of nutritional deficiency diseases

	No nutritional disease		Having nutritional disease		
Occupation	Number	%	Number	%	Total
Labor	40	26.7	110	73.3	150
Farmer	93	46.0	109	54.0	202
Job/business	21	30.9	47	69.1	68
Total	154	36.7	266	63.3	420

Source: Personal survey (2008)

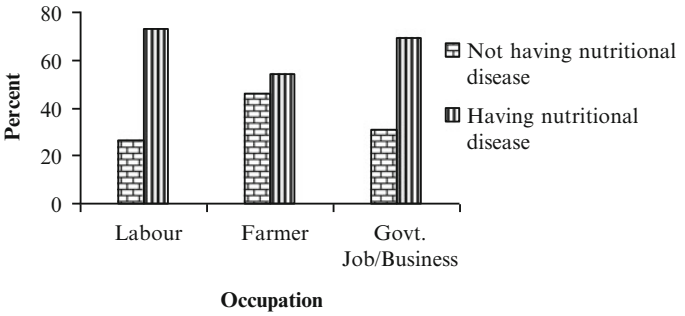

Fig. 13.14 Occupation and status of nutritional deficiency diseases

ing to observe that 73.3 % of respondents having nutritional deficiency diseases belong to the labor group, followed by 69.1 % of respondents having nutritional deficiency diseases in the job/business group (Fig. 13.14). The lowest nutritional deficiency disease occurrences were found in the farmer group.

13.3.7 Multivariate Analysis

Binary logistic regressions to obtain the adjusted effect of the predictor variables on the dependent variables have been applied here. The results of the logistic regressions are presented in Table 13.24, which shows the results of logistic regression assessing the association between nutritional deficiency diseases and other

Table 13.24 Logistic regression results predicting the odds of having nutritional diseases according to selected socioeconomic and demographic characteristics

Covariates and categories	Odds ratio exponent (β)	95 % confidence interval	
Religion			
Muslim®	1.00		
Hindu	0.77	0.31	1.91
Caste**			
SC/ST®	1.00		
OBC	2.59	1.20	5.59
General	1.71	0.60	4.86
Education***			
Illiterate®	1.00		
Up to high school	0.51	0.31	0.82
Above high school	0.51	0.31	0.83
Income groups***			
Below 2,000®	1.00		
2,000–3,500	0.31	0.15	0.65
3,500–5,000	0.25	0.07	0.85
Above 5,000	0.23	0.05	1.18
Occupation***			
Labor®	1.00		
Farmer	0.42	0.18	0.96
Government job and business	0.17	0.05	0.59
Family type*			
Nuclear®	1.00		
Joint	1.84	0.99	3.42
Age group			
Below 30®	1.00		
30–35	1.11	0.46	2.71
35–40	0.70	0.32	1.53
Above 40	0.71	0.34	1.47

Source: Personal survey, 2008
Dependent variable: having nutritional disease (1); no nutritional disease (0); ® reference category
Comment: Caste, education, income, occupation, and family type are important predictors of having nutritional diseases
*$p<0.10$, **$p<0.05$, ***$p<0.01$

explanatory variables. The relationship between religion and nutritional deficiency diseases is insignificant. The OBC category (2.59) and general category respondents have higher odds ratio (1.71) compared to the SC/ST reference category (1.0). Thus, caste has been found to be statistically significant ($p<0.05$). If the educational category is considered, a very significant association is observed ($p<0.01$) with up to high school (odds ratio, 0.51) and above high school (0.51) education compared to the illiterate reference category (1.0). Thus, the higher the education, the lesser is the chance of nutritional deficiency diseases. Similarly, the

income groups appeared statistically significant ($p<0.01$) because they revealed that income groups second (odds ratio, 0.31), third (odds ratio, 0.25), and fourth (odds ratio, 0.23) possess a lesser odds ratio for having nutritional deficiency diseases compared to the reference category (1.0). Table 13.24 indicates that occupations are also significantly associated ($p<0.01$): farmers (odds ratio, 0.42) and government job and business respondents (odds ratio, 0.17) have a lesser odds ratio than the reference category labor (1.0), with a higher percentage of nutritional deficiency disease. Family type is not as significant ($p<0.10$) as education, income, and occupation. Age groups are also not statistically significant for the occurrence of nutritional deficiency diseases.

13.4 Summary and Conclusion

To understand nutritional food intake, nutritional status, and nutritional deficiency diseases across various communities, this study has been carried out in the Sonbhadra District of U.P. Substantial variation in nutritional food intake and nutritional status has been found across the communities, as well as in terms of education, family type, occupation, income, and age group. Religion, occupation, income, and education have been found to be important predictors for having better nutritional status. Scurvy, anemia, asthma, leprosy, dental decay, and diabetes are major nutritional deficiency diseases occurring in the area under study. Similarly, education, income, occupation, and caste appear important predictors for nutritional deficiency diseases. The results of this study suggest improving the educational and economic condition of the rural masses of Sonbhadra District in particular and of India in general. A strong campaign for awareness toward nutritional food intake and nutritional deficiency diseases is necessary for reducing the suffering of the people from nutritional deficiency diseases.

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