

# Nutritional and Health Status Evaluation of Tribes of Uttar Pradesh: An Anthropological Dimension



Ajeet Jaiswal\*

Department of Anthropology, Pondicherry University, India

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\*Corresponding author: Ajeet Jaiswal, Assistant Professor, Department of Anthropology, Pondicherry University, Puducherry, India, Tel: 09791201427; 08122594335; Email: rpgajeet@gmail.com

## Abstract

Man needs a wide range of nutrients to lead a healthy and active life and these are derived through the diet they consume daily. Good nutrition is a basic component of health. Health and nutritional status of an individual depends on the food he eats. This paper deals with the utility of various anthropometric cut-off points in the evaluation of nutritional & Health status. The Kharwar is one of the Adivasi groups of Uttar Pradesh and Bihar. They are contemporary of Mundari speaking Indian tribes. Racially they belong to Proto-Australoids and linguistically to Dravidian group. The traditional economic activities of the Kharwar have been agriculture and other wage earning labour. The present study is to investigate the nutritional status of adult tribals of Kharwar group. This cross-sectional study was undertaken to determine the prevalence of undernutrition using body mass index (BMI) among 18 years and above Kharwar adults of Uttar Pradesh, India. A total of 151 (75 males and 76 females) adult from different villages of Varanasi District were measured. Result revealed that prevalence of undernutrition (age and sex combined) among Kharwar was 26.5 %. The sex specific rates were 33.3 % and 19.4 % among females and males, respectively. There was a highly significant sex difference in CED prevalence based on BMI. Kharwar adults were experiencing high (serious) situation for all age groups and the women and oldest among them were experiencing the most serious situation with respect to their health and nutritional status.

**Keywords:** Chronic Energy Deficiency; Kharwar tribes; Nutritional Profile; Body Mass Index; Dense forest; Community; Malnourishment; Proteins; Carbohydrates; Minerals; Morbidity; Mortality; Food scarcity; Height; Waist circumference

## Introduction

**Table 1:** Distribution of Kharwar tribes according to Age group.

Age Group (Yrs)	Kharwar tribes (151)			
	No.	Male	Female	%
18-39	87	43	44	57.62
40-59	44	22	22	29.12
≥60	20	10	10	13.26

India has a variety of tribal population reflecting its great ethnic diversity. They constitute about 8.2% of total population, though they are scattered all over the hilly and dense forest regions of the country. Nutrition is the basics for the survival of an individual. It is not just confined with the intake of nutrients but also the utilization for proper growth and development of the body. Nutritional status grossly depends upon the feeding habits, ecology, vegetation of the area and the socioeconomic condition of the community. India, in recent years has become self-sufficient from the agricultural point of view, but the problem of malnutrition continues undoubtedly, and it is still considered to be one of the crucial issues. According to Calder & Jackson [1] undernutrition is one of the major causes of morbidity and mortality in the developing world (Table 1). Inadequate dietary intake and disease are immediate causes of malnutrition and they reinforce one another synergistically.

Malnourishment may increase income inequality, lower social returns to educational expenditure, impede economic growth and increase unemployment. Epidemiological data show that the world's populations living under low socio-economic conditions and high rates of parasitic diseases are also those that have most of the world's malnutrition [2]. Nutrition plays a major role in human adaptation because it acts both as an independent stress (e.g. food scarcity) that may necessitate adjustment and as an important modifier of other stresses (e.g. disease severity). Good nutrition promotes the production and activities of growth hormones, which influences the metabolism of proteins, carbohydrates, fats and mineral and promotes nitrogen retention. Tribals who constitute 8.2 % of India's population are drawing the attention of planners and administrators and are given priority in developmental measures [3]. Assessment of nutritional status is considered as a measure of health and it is necessary for planners to understand the food and nutrition situation among tribal population for upliftment of these vulnerable groups. There is very little information available regarding the diet and nutritional status of Kharwar. Hence to fill up some of this knowledge gap, the present study was carried out to assess the health and nutritional status of the kharwar. This information will be useful in the formulation of suitable development programmes like "food for work" or

other development programmes for the nutritional upliftment of this tribe. Therefore, the objective of the present study was to evaluate the nutritional status of the adult Kharwar tribe of Varanasi- Mirzapur District of Uttar Pradesh, India.

**Materials and Methods**

The present study is cross-sectional and was conducted among 151 adult Kharwar tribe of Varanasi- Mirzapur District of Uttar Pradesh. The Kharwar is one of the Adivasi groups of Uttar Pradesh and Bihar. They are contemporary of Mundari speaking Indian tribes. Racially they belong to Proto-Australoids and linguistically to Dravidian group. The traditional economic activities of the Kharwar have been agriculture and other wage earning labour. They are contemporary of Mundari speaking Indian tribes. Racially they belong to Proto-Australoids and linguistically to Dravidian group. The Kharwar villages are found in comparatively plain areas. They erect their houses with mud, wood, bamboo and tiles. The traditional economic activities of the Kharwar have been agriculture and other wage earning labour.

A total of 75 males and 76 females were measured. Adults were grouped into three age group to observe the age-trend in their anthropometric measures as well the age group wise nutritional status. In the present study Kharwar of age from 18 to 80 years (both males and females) were included. Data were collected during December-January 2011-12. There were 57.6% subject belongs to 18-39 years age group followed by 29.12% and 13.26% Kharwar people belongs to 40-59 and ≥60years age group respectively.

Several anthropometric measurements like Weight (Wt), height (Ht), circumferences and skinfolds were measured using the standard methodology of Weiner & Lourie (1981) Lohman et al. [4,5] and BMI was computed using standard equation. Technical errors of measurements (TEM) were within acceptable limits. For ethical issue, both written and oral consent were obtained from each subject before commencement of the study. Nutritional status was evaluated using internationally accepted BMI guidelines [6].

Researcher followed the World Health Organization's classification (1995) of the public health problem of low BMI, based on adult populations worldwide. This classification categorizes prevalence according to percentage of a population with BMI < 18.5. Student's t-tests were performed to test for sex differences in mean values. Age-group difference was performed by ANOVA (F test). Sex differences in CED were determined by chi-square (χ<sup>2</sup>) test. All statistical analyses were undertaken using the Statistical Package (SPSS- 16). Statistical significance was set at p < 0.05.

**Results**

The above Tables 2 & 3 shows the Mean, standard deviation, t-test , ANOVA (F) and significance (p) of anthropometric measurements of adult Kharwar tribes based on of Age

groupwise and, Sexwise like weight (kg), height (cm), mid-upper arm circumference (cm), waist circumference (cm), hip circumference (cm), biceps skinfold (mm), triceps skinfold (mm), sub-scapular skinfold (mm) and BMI (kg/m<sup>2</sup>) of more than 18 years old Kharwar tribals are presented in Table 4. Significant (p < 0.001) sex differences in mean Weight (t = 3.63, p < 0.001) and Height (t = 6.03, p < 0.001) were observed. Marked trend (Table 5) in Height, Waist Circumference, Hip Circumference and Biceps skinfold with increasing age-group among females; marked decline in Height, Mid Upper Arm Circumference, Waist Circumference and Hip Circumference among males and Triceps skinfold and Sub-scapular skinfold among females with increasing age-group; marked increase then decrease in mean values of Weight, Biceps skinfold, Triceps skinfold, Sub-scapular skinfold & Body Mass Index (BMI) among males and Weight, Mid Upper Arm Circumference and BMI among females with increasing age-group were observed. Significant sex difference in mean weight (t = 3.56, p<0.001) in 18-39 and (t = 2.24, p<0.05) in (40-59) years age group, in mean height (t =5.35, p<0.001) in 18-39 & (t = 2.60, p<0.01) in 40-59 years age group, in mean Mid Upper Arm Circumference (t = 2.57, p<0.01) in 18-39 years age group were observed. Results of ANOVA revealed significant (p<0.05) differences in Triceps skinfold, Sub-scapular skinfold and BMI.

**Table 2:** Nutritional status was evaluated using internationally accepted BMI guidelines.

<b>CED BMI= &lt;18.5</b>	CED III= < 16.0 kg/m <sup>2</sup>
	CED II= 16.0-16.9 kg/m <sup>2</sup>
	CED I= 17.0- 18.4 kg/m <sup>2</sup>
	Normal: BMI = 18.5-24.9 kg/m <sup>2</sup>
Overweight: BMI ≥ 25.0 kg/m <sup>2</sup>	

**Table 3:** Student's t-tests were performed to test for sex differences in mean values.

Low (5-9%):	Warning sign, monitoring required.
Medium (10-19%):	poor situation
High (20-39%):	serious situation
Very high (≥ 40%):	critical situation

**Table 4:** Sex wise distribution of anthropometric measurements of adult Kharwar tribes based on Mean (SD) and t-test with significance (p).

Variables	Sex		t-test	p
	Male	Female		
	Mean± SD	Mean± SD		
Age	38.90±16.80	37.90 ±16.678	0.38	0.687
Weight	48.98± 6.53	45.00 ±7.55	3.63	0.000
Height	152.81± 6.51	148.82 ± 4.46	6.03	0.000
Mid Upper Arm Circum.	24.85 ± 2.53	24.42± 5.67	1.93	0.057
Waist Circumference	71.20 ± 5.46	70.99 ± 6.10	0.23	0.724

Hip Circumference	80.68 ± 4.61	80.83 ± 6.41	-0.07	0.838
Biceps skinfold	3.90 ± 0.79	3.43 ± 0.45	1.28	0.188
Triceps skinfold	4.96 ± 1.01	4.53 ± 1.25	-0.01	0.986
Sub-scapular skinfold	5.95 ± 1.21	5.42 ± 1.55	0.18	0.873
BMI	21.50 ± 2.81	20.49 ± 3.40	0.58	0.561

The above Table 5 shows age group and sex wise distribution of prevalence of CED (%) based on BMI (kg/m<sup>2</sup>) among adult

**Table 5:** Age group and Sex wise distribution of anthropometric measurements of adult Kharwar tribes based on mean (SD), t-test and ANOVA (F) with significance (p).

Variables	Sex & t-test	Age-group (Years) Mean (SD)			ANOVA (F)	significance (p)
		18-39	40-59	≥ 60		
Weight	Male	49.28±5.35	51.24±6.73	44.78±6.78	3.28	0.04
	Female	44.62 ± 6.58	45.49±8.64	45.45±1.72	0.15	0.87
	t-test	3.56*** -	2.25*	0.23	-	-
Height	Male	155.44 ± 5.49	153.44±6.45	152.42±5.55	1.16	0.32
	Female	148.43 ± 6.22	148.62±8.69	149.59±2.29	0.14	0.87
	t-test	5.35***	2.60**	1.13		
Mid Upper Arm Circumference	Male	25.59 ± 2.13	25.34±3.13	25.11±3.03	0.54	0.58
	Female	24.28 ± 3.36	25.43±4.36	25.20±2.45	0.75	0.47
	t-test	2.57**	0.10	-0.07		
Waist Circumference	Male	72.39 ± 5.03	72.24±5.77	68.16±6.67	2.69	0.07
	Female	71.13 ± 6.28	72.13±6.44	74.20±5.34	0.99	0.37
	t-test	1.29	0.07	0.94		
Hip Circumference	Male	82.38 ± 4.23	81.33±5.12	79.37±4.82	1.64	0.20
	Female	80.76±4.85	82.38±5.83	84.38±5.43	1.79	0.17
	t-test	1.54	-0.74	-1.89		
Biceps skinfold	Male	3.35 ± 0.85	3.71 ± 0.40	2.99 ± 0.42	2.89	0.06
	Female	3.23 ± 0.70	3.26±0.84	3.38 ± 0.87	0.16	0.85
	t-test	0.79	1.93	-1.11		
Triceps skinfold	Male	4.25 ± 1.22	4.75 ± 0.72	3.71±0.42	4.46	0.01
	Female	4.37 ± 1.13	4.36 ± 1.55	4.15 ± 0.76	0.12	0.88
	t-test	-0.51	1.15	-1.54		
Sub-scapular skinfold	Male	5.43 ± 1.33	5.92 ± 1.24	4.58 ± 0.78	4.28	0.02
	Female	5.46 ± 1.41	5.45 ± 1.90	5.27 ± 1.85	0.06	0.94
	t-test	-0.08	1.03	-1.03		
BMI	Male	20.38 ± 2.32	21.75±3.84	18.99±2.96	3.57	0.03
	Female	20.25 ± 3.34	20.48±3.41	20.28±3.55	0.04	0.96
	t-test	0.23	1.25	-0.82		

### Discussion

India has a large and diverse tribal population. Scheduled Tribe people constitute about less than 9% of the total population in India, with varying proportions in different States. They live in unique physical, socio-economic and cultural environment, isolated from general population. In view of their habitat and food habits, they form a distinct group compared to other populations. Their food intake is influenced by vagaries of nature, with large seasonal variations, depending upon availability of agricultural

and forest produce. Result revealed that prevalence of undernutrition (CED grades age and sex combined) among Kharwar was 27.05%. The sex specific rates were 32.5% and 21.6%, among females and males, respectively. It was also observed that young adult females (18-39 years) had the highest prevalence of CED (36.6%) followed by elderly males and females (33.5%) i.e. ≥ 60 years age group, females of age group 40-59 (27.5%), males of age group 18-39 (21.5%) and males of age group 40-59 (9.8%), respectively. There was a highly significant sex difference in CED prevalence based on BMI ( $\chi^2 = 10.34$ ,  $df = 4$ ,  $p = 0.05$ ).

and forest produce. Several studies have documented a close relationship between the tribal ecosystem and their health and nutritional status. [7,8]. Inadequate health care facilities and ecological degradation further aggravate the situation. There are wide variations among the groups in nutritional status and access to utilization of nutrition and health services.

Comparisons of mean BMI (among males and females) of the present study with various tribal populations of North India (Table 6). From this table it is clear that Santal (Birbhum) [9],

Birhors [10] and Kharwar (present study) have the highest mean BMI (more than 20.0 kg/m<sup>2</sup>) followed by Santal (20.0) [11]; Dhimal [12], Lodha [13], Lodha [14] and Santal [9] (19.5); Oraon (18.8) [15]; Bhumij [16], Kora Mudi [17], Munda [18] and Bhumij (18.7) [13]; Kora Mudi (18.6) [19] and least mean BMI was observed among the Santal (18.5 kg/m<sup>2</sup>) males of North India.

Similarly, Kharwar (present study) females have the highest mean BMI (20.5 kg/m<sup>2</sup>) followed by Birhors, Oraon (19.7) [14]; Santal (19.5) [9]; Lodha [12] and Santal (19.3); Dhimal (19.1); Santal (18.7); Bhumij (18.4) [20]; Kora Mudi (18.3); Santal (18.1) and the least among them was observed among Munda (17.7) females of North India (Table 7).

**Table 6:** Age group and Sex wise distribution of prevalence of CED (%) based on BMI (kg/m<sup>2</sup>) among adult Kharwar tribes.

Nutritional Status	Sex					
	Male (N=75)			Female(N=76)		
	18-39 (n= 43)	40-59 (n=22)	≥ 60 (n= 10)	18-39 (n= 44)	40- 59 (n= 22)	≥ 60 (n= 10)
CED III	1.5	4.7	11.2	4.6	9.2	11.2
CED II	0.5	0.5	0.5	13.7	4.6	0.5
CED I	19.5	4.6	21.8	18.3	13.7	21.8
Overall CED	21.5	9.8	33.5	36.6	27.5	33.5
Normal	76.0	75.8	65.9	54.2	63.3	55.3
Overweight	2.5	14.4	0.6	9.2	9.2	11.2

**Table 7:** Sex wise and overall comparison of mean BMI (kg/m<sup>2</sup>) and prevalence of CED of the Kharwar tribe with some of the tribal population of North India.

Community	Male	Female	Overall Mean	CED (%)	Reference
Bhumij	18.7	18.4	18.6	53.7	Ghosh [20]
Dhimal	19.5	19.1	19.3	36.7	Banik et al. [12]
Kora Mudi	18.7	18.3	18.5	52.2	Bose et al. [17]
Kora Mudi	18.6	18.3	18.5	53.5	Bisai et al. [19]
Lodha	19.5	19.3	19.4	43.0	Mondal [13]
Munda	18.7	17.7	18.2	58.5	Ghosh & Bharati [18]
Oraon	18.8	19.7	19.3	39.4	Mittal & Sivastava [15]
Santal	20.0	19.3	19.7	31.6	Bose et al. [17]
Santal	18.5	18.7	18.6	53.7	Ghosh & Malik [16]
Santal	20.5	19.5	20.0	34.5	Mukhopadhyay [9]
Lodha	19.5	--	--	45.2	Bose et al. [14]
Bhumij	18.7	--	--	48.4	Bose et al. [14]
Santal	19.5	18.1	18.8	46.7	Das & Bose [10]
Birhor	20.5	20.2	20.3	26.5	Das et al. (2013)
Kharwar	21.6	20.5	21.05	27.05	Present study

In general, prevalence of CED among the tribals of North India shows that the overall CED was highest among the Mundas (58.5 %) of Kolkata followed by Bhumij and Santal (53.7 % by Ghosh [20]); Kora Mudi (53.5 % by Bisai et al., 2008); Kora Mudi; Bhumij (48.4 % by Bose et al., [14]); Santal (46.7 % by Das and Bose, 2010); Lodha (45.2 % by Bose et al., 2008); Lodha (43.0 % by Mondal, 2007); Oraon (39.4 % by Mittal and Srivastava, 2006); Dhimal (36.7 % by Banik et al. [12]); Santal (34.5 % by Mukhopadhyay [9]); Santal (31.6 % by Bose et al., 2006), Birhor (26.5 % by Das et al. 2013) and the present study Kharwar (27.05 %) had the least prevalence of CED among the other studied tribal community of North India.

According to National Family Health Statistics- 3 report (NFHS-3, 2005-2006), the prevalence of undernutrition in India

is 33.0% among males and 28.1% among females. In urban areas, these figures were 19.8% and 17.5%, respectively. In rural areas these were 38.8% and 33.1%, respectively. However, the situation is much worse in North India especially Uttar Pradesh and Bihar with corresponding prevalence of 37.7% and 31.6%, respectively. Among urban males and females, they were 19.9% and 15.5%, respectively. The corresponding rural figures were 44.9% (males) and 38.0% (females). Therefore, the use of BMI and WHO [6] BMI based cut-off points for the evaluation of CED are valid for use among tribal populations of India.

The primary importance, from the public health perspective is the need for immediate nutritional intervention programs to be implemented among Kharwar tribes of Varanasi-Mirzapur district of Uttar Pradesh and all other tribal groups experiencing

nutritional stress. The Government should play an active role in reducing the rates of undernutrition among tribal people. It is imperative that the recommendations should include not only adequate dietary intake but also various ways in which they can enhance their socio-economic status through improved education and employment opportunities. It has already been emphasized [21-24] that there exists variation in social and economic conditions among tribes of India. Similar studies should also be undertaken among all other tribal populations in India since they constitute a sizeable portion of India's population.

### Conclusion

From our study it can be concluded that the nutritional status of Kharwar tribes was serious; females and oldest peoples experiencing the most severe situation than the others. There is strong evidence that, in general, Kharwar tribes and other tribal populations of India were experiencing serious to critical nutritional stress.

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