Research Paper

ASSESSMENT OF NUTRITIONAL STATUS OF ADULT TRIBALS IN THE WESTERN PLATEAU FRINGE OF WEST BENGAL - AN ANTHROPOMETRIC ANALYSIS

[1]**Binoy Chowdhury** [2]**Sarla Sharma**
[1]Research Scholar, S.o.S in Geography, Pandit Ravishankar Shukla University, Raipur,
[2]Former Professor and Head, S.o.S in Geography, Pandit Ravishankar Shukla University, Raipur, C.G.

Abstract

India is home to a large number of tribes which constitutes 8.6% of the country's total population. The scheduled tribes of our country are distinguished from any other community in terms of their primitiveness, remoteness, and social and economic backwardness. The tribal communities of India are known to be the autochthonous people of the land. The tribal groups of India inhabit extreme geo-climatic conditions with distinct socio-cultural and economic backgrounds.

Study objectives

To assess the anthropometric characteristics and nutritional status of Scheduled tribe populations (Santhal, Sabar, and Bhumij) in the Western plateau fringe of West Bengal, India with the help of Body Mass Index (BMI) and Mid Upper Arm Circumference (MUAC). It also attempted to present a comparative analysis of anthropometric characteristics and prevalence of undernutrition among Santhal, Sabar and the Bhumij tribes of the Western plateau fringe of West Bengal along with other tribes of West Bengal.

Methods

The study was conducted in the Western plateau fringe of West Bengal among different scheduled tribes (Santhal, Sabar, Bhumij). A total of 1686 adult tribal populations (801 males and 885 females) belonging to different tribal communities (Santhal, Sabar, Bhumij) from eighteen villages of the Western plateau fringe of West Bengal were studied. The standard methods and procedures were used to measure anthropometric measures such as height, weight, and MUAC. The nutritional status of the scheduled tribe population was determined by using internationally accepted BMI guidelines provided by WHO as well as a new MUAC cut-off point proposed by the Food and Nutrition Technical Assistance III Project (FANTA) by USAID.

Results

The prevalence of undernutrition (BMI <18.5) was found higher among the Sabar tribe (63.7%) followed by Santhal (52.9%) and Bhumij tribes (51.4%). The overall prevalence of undernutrition based on MUAC was also recorded higher among the Sabar tribe (64.0%), followed by Santhal (49.4%), and the Bhumij tribe (47.6%). According to World Health Organization (WHO) recommendations, both of these prevalence percentages are categorized in the extremely high-prevalence group (>40%) and indicate a severe situation. The prevalence of undernutrition increases with increasing age and it can be seen higher among old age group populations (>60 years). The prevalence of undernutrition was found significantly (p <.05) higher among women than men (56.05% vs 49.77% for Santhal, 68.41% vs 59.06% for Sabar, and 57.66% vs 45.09% for the Bhumij tribe based on BMI and 52.65% vs 46.14% for Santhal, 70.86% vs 57.17% for Sabar and 50.91% vs 44.24% for the Bhumij tribe based on MUAC).

Conclusion

The present study highlighted the critical situation of different tribes especially, the Sabar tribe in terms of nutritional deficiency. The condition of women was poorer than men and the oldest men and women were experiencing a severe situation in respect to their health and nutritional status.

Keywords: Undernutrition, Body Mass Index, mid-upper arm circumference, nutritional deficiency, Santhal, Sabar, Bhumij, Western plateau fringe, West Bengal

Introductory Statement

"India is a melting pot of culture and the tribal communities are part of India's diverse cultural industry". Article 366 (25) defined scheduled tribes as "such tribes or tribal communities or parts of or groups within such tribes or tribal communities as are deemed under article 342 to be scheduled tribes for the purposes of this constitution". The scheduled tribes of our country are distinguished from any other community in terms of their primitiveness, remoteness, and social and economic backwardness. India is home to a large number of tribes which constitutes 8.6% of the country's total population (Census of India, 2011[1]). India has the largest number of tribes as compared to any other country. The tribal communities of India are known to be the autochthonous people of the land. The tribal groups of India inhabit extreme geo-climatic conditions with distinct socio-cultural and economic backgrounds. About 63 percent of India's tribal population is concentrated in seven major states, namely Madhya Pradesh (14.7 %), Maharashtra (10.1 %), Orissa (9.2 %), Rajasthan (8.8

%), Jharkhand (8.3 %), Chhattisgarh (7.57 %), and West Bengal (5.1 %) (Census of India, 2011[1]). According to the 2011 census West Bengal is the home of 52,96,963 tribal populations which constitute 5.8 percent of the total population of the state whereas, the state contributes about 5.1 percent of the total population of the country [1]. Scheduled tribes of the Indian state of West Bengal, as recognized by the Constitution of the Indian Republic, a total of 40 distinct tribes are identified. Santhal is the major tribal community of the state concerned. The present study is about an attempt to determine the nutritional status of adult tribal people of the Western plateau fringe of West Bengal, giving more emphasis on the Santhal, Sabar, and Bhumij tribes.

The nutritional status of Scheduled tribes become a challenging issue worldwide, attracting researchers from different disciplines. In India, the prevalence of undernutrition is highest among the tribal people. Additionally, the population's nutritional status has not much improved over the past two to three decades. (2). India is home to more than half of the world's undernourished population. (3). The adults' health and nutrition have enormous importance as this age group plays a significant role to support the rest of the society (4). Generally, the tribal populations of India are recognized as socially and economically vulnerable. The anthropometric analysis has now become a well-established parameter for assessing an individual's health and nutritional status (5). Although there are several anthropometric measurements to assess adults' nutrition, Body Mass Index (BMI) is one of the most reasonable and widely acceptable measures to determine the nutritional status of an individual because it is simple, less expensive, non-invasive, and suitable for large-scale surveys (6-7). In general, BMI is the reflection of not only the nutritional status but also the socio-economic condition of a population, especially adult populations in developing countries (8-9). Numerous researches in this area have demonstrated that BMI is a valid anthropometric indicator of total body fat or the body's ability to store energy. (10-11). MUAC, or mid-upper arm circumference, is another crucial tool for a quick evaluation of nutritional status. MUAC is an easy, simple, and inexpensive indicator for assessing nutritional status. (12). Mid-upper arm circumference (MUAC) is a simple, easy, reasonable, and reliable tool for determining nutritional status, which also enables a quick assessment of large populations in epidemiological field of research (13). There are very few studies on the nutritional status of adult tribes in India, and there is a lack of data on the anthropometric measurements and nutritional status of the country's various tribal populations. (14-15). The tribal communities in India are the most underprivileged groups both in relation to socio-economic conditions as well as nutritional status (16). The prevalence of CED of females and males among 17 studied tribes of West Bengal was recorded highest among Mundas 67.9% (17) and Santals 55.0 % (18).

Santals are the largest tribe in Jharkhand and West Bengal and the third largest in India after Gonds and Bhills in terms of population. They speak Santali, the widely spoken Munda language of the Austro-Asiatic language family. The main occupation of the Santals is agriculture and they inhabit the extreme geo-climatic condition of the country (forest, hill, plateau etc.). The Sabar tribe are one of the Adivasi of the Munda ethnic group who lives mainly in Odisha and West Bengal.

1. Materials and methods

1.1. Study area

The Western Plateau fringe, a major physiographic division of the state of West Bengal, is situated in the western part of the state. It occupies about 6% in proportion to the state's total area. The Western plateau fringe and the adjoining uplands constitute the area of the whole of Purulia district, the western part of Bankura, Birbhum, Bardhhaman and West Midnapore district. The region forms the eastern fringes of the Chota Nagpur Plateau.

1.2. Study participants

The study is based on community-specific and cross-sectional method. The study was conducted in the Western plateau fringe of West Bengal among different scheduled tribes (Santhal, Sabar, Bhumij) from February 2018 to December 2019. Whereas, three tribal-dominated districts Purulia, Bankura, and West Medinipur were selected out of which six tribal-dominated blocks (Ranibandh, Raipur, Bandwan, Manbazar-II, Binpur, Nayagram) were selected through random sampling and three villages from each block i.e. eighteen (18) villages were selected through stratified random sampling method. The study was carried out among a total of 1686 tribal populations out of which 801 are males and 885 are tribal females belonging to different tribal communities (Santhal, Sabar, Bhumij) of different age groups; Younger adults (15-39 years), Elderly adults (40-59 years), and old adults (60> years). The assessment of nutritional status has been determined and analysed by giving more emphasis on various anthropometric parameters and statistical techniques.

1.3. Anthropometric measurements

The standard methods and procedures were used to measure anthropometric measures such as height, weight, and MUAC. (6). To within 0.1 cm, the height was measured in centimetres+. The measurements were obtained to the closest 0.1 cm using a non-stretchable height board while the respondents were standing straight, barefoot, and firmly against the wall. On the other hand, using a common weighing machine, the respondents' weight was recorded to be closest to 0.5 kg. MUAC was measured with the help of a measuring tape and the

Research Paper

measuring value was taken from the mid-point of the left upper arm by following the standard techniques of Lohman et al. (6).

2.4. Assessment of nutritional status

The nutritional status of the scheduled tribe population was determined by using internationally accepted BMI guidelines provided by WHO (5). BMI was calculated with the help of the following equation: BMI = weight (kg) / height (m2). Following are the cut-off points of BMI were used to determine the nutritional status –

Status	BMI
CED grade	
III	<16.0
II	16.0-16.9
I	17.0-18.4
Normal	18.5-24.9
Overweight	>24.9

The WHO classified low BMI as a public health concern affecting adult populations worldwide. Using the percentage of the population with a BMI of less than 18.5 as a basis, this classification categorizes the prevalence of CED into the following groups:

Low (5%–9%): warning sign, monitoring required

Medium (10%–19%): poor situation

High (20%–39%): serious situation

Very high (≥ 40%): critical situation

MUAC is an appropriate indicator for the assessment of acute adult undernutrition. This indicator is helpful for detecting severe adult undernutrition as well as determining the prevalence of undernutrition overall in the community (19). According to a number of studies, nutritional status is determined using MUAC cut-offs of 23 cm depending on their MUAC range. Two investigations (20, 21) included 23 cm MUAC cut-off as the low category in this regard whereas, the other two research works (22, 23) did not include the cut-off i.e. < 23 cm as low category. The present study applied a new MUAC cut-off point proposed by the Food and Nutrition Technical Assistance III Project (FANTA) by USAID (13). This cut-off is based on numerous researches throughout the world including India (except pregnant women and lactating mothers).

2.5. Statistical analysis

The mean and standard deviation of various anthropometric characteristics like height, weight, BMI, and MUAC were calculated. Student's t-tests were performed to test the sex differences in mean anthropometric characteristics. ANOVA (F-test) was performed to test the age group differences among mean anthropometric characteristics. Sex differences in chronic energy deficiency were analysed by using the chi-square test ($x2$). All the statistical analysis was performed by setting up the significance level at <.05. statistical analysis was performed by using SPSS software version 29.0.1.0.

Results

The table shows the mean and standard deviation of various anthropometric characteristics (height, weight, BMI, MUAC) of different tribes belonging to different adult age groups (15-39, 40-59 and >60 years). The mean weight of younger adult males and females (15-39 years) was found higher among the Bhumij tribe i.e. 58.57 ± 5.6, 47.95 ± 4.49 respectively followed by Santhal (56.5 ± 6.57, 47.22 ± 6.48) and Sabar tribe (51.61±4.89, 45.32 ± 5.82) respectively. The mean weight of elderly adult males and females can be seen higher among Bhumij and Santhal tribes respectively i.e. 55.6 ± 7.47, 48.59 ± 7.81 respectively followed by Santhal 53.78 ± 7.87 for males and Bhumij tribe for females 42.86 ± 7.38 and Sabar tribe 46.93 ± 4.21, 42.15 ± 5.88 for male and female respectively. The mean weight of males and females belonging to the old age group was recorded higher among males and Bhumij tribes 40.92 ±4.21 for females and Sabar tribe 45.68 ± 4.27, 37.1 ± 1.53 for males and females respectively. The mean weight of males and females belonging to the Sabar tribe was found significantly (p <.001) lower among all age groups compared to other tribes. The mean weight of males and females of different age groups of different tribes has gradually decreased with increasing age (p <.001). The mean weight of females is significantly (p <.001) lower than males among different tribes in all age groups. The highest mean height was recorded higher among younger adult males and females of the Bhumij and Santhal tribes respectively (163.8 ± 4.29, 152.8 ± 4.93).

Research Paper

UGC CARE Listed (Group -I) Journal

Table 1: Age group and Sex wise distribution of Anthropometric characteristics of different adult tribes (Santhal, Sabar, Bhumij) in the Western plateau fringe of West Bengal, India (Mean ± SD).
    *** =P <.001, **= P <.01, * P= < .05

Tribes	Variables	Sex & t test	15-39	40-59	>60	ANOVA (F)	(P)
			Age groups (years) Mean and SD				
Santhal	Weight	Male	56.5±6.57	53.78±7.87	48.22±6.91	35.04	<.001
		Female	47.22±6.48	48.59 ±7.81	41.47 ±7.31	25.59	<.001
		t test	17.24***	6.36***	5.23***	-	-
	Height	Male	162.36±4.76	160.36±5.39	156.51±5.13	26.39	<.001
		Female	152.8 ±4.93	150.6±4.84	148.21±4.94	29.22	<.001
		t test	23.56***	12.38***	9.33***	-	-
	MUAC	Male	26.78 ±1.96	25.84±2.08	24.57±1.23	34.01	<.001
		Female	25.38±1.96	24.99±2	23.43±1.66	35.50	<.001
		t test	8.24***	2.60***	3.26***	-	-
	BMI	Male	20.2 ± 2.01	20.8 ±2.51	19.4±2.34	60.16	<.001
		Female	19.5±2.63	19.8±2.87	19.1±2.19	16.83	<.001
		t test	7.05***	-0.26	1.84*	-	-
Sabar	Weight	Male	51.61±4.89	46.93±4.21	45.68 ±4.27	18.22	<.001
		Female	45.32±5.82	42.15±5.88	37.1±1.53	8.90	<.001
		t test	7.90***	3.98***	5.37***	-	-
	Height	Male	159.09±4.16	157.09 ±2.91	156.32±3.5	8.15	<.001
		Female	151.78±3.18	149.33 ±3.48	149.68±3.02	2.42	0.092
		t test	12.96***	7.86***	4.01***		
	MUAC	Male	24.29±1.2	23.51±0.7	22.39±1.05	24.84	<.001
		Female	24.75±1.24	23.39 ±1.25	22.67±1.11	15.38	<.001
		t test	3.61***	3.18***	1.94*		
	BMI	Male	19.6±1.59	19.7 ±1.61	18.5±1.22	17.93	<.001
		Female	18.6±2.39	19.1±2.37	18.2 ±0.79	6.20	0.003
		t test	2.58**	0.842	3.80***		
Bhumij	Weight	Male	58.57±5.6	55.6 ±7.47	52.5 ±6.18	13.20	<.001
		Female	47.95±4.49	42.86± 7.38	40.92 ±4.21	18.14	<.001
		t test	13.29***	6.98***	5.24***		
	Height	Male	163.8±4.29	161.0±6 4.6	157 ±4.86	15.56	<.001
		Female	152.22± 4.04	151.22±4.99	149.23±4.76	2.95	0.056
		t test	18.16***	9.95***	4.58***		
	MUAC	Male	27.2 ± 1.61	26.29 ± 1.94	24.67±1.18	14.99	<.001
		Female	25.67±1.29	24.23±1.93	23.57 ±1.17	22.34	<.001
		t test	6.99***	4.49***	3.28***		
	BMI	Male	20.4±1.97	21.2±2.57	19.6±2.33	1.07	0.345
		Female	19.6±1.8	20.0±2.5	18.7±1.51	14.84	<.001
		t test	3.90***	3.60***	3.02**		

On the other side, the lowest mean height of males and females can be seen among old age (>60 years) of the Sabar and Bhumij tribes respectively (156.3 ± 2 3.5, 149.23 ± 4.76). The mean height of males was found significantly (p <.001) higher than females among different tribes in all age groups. The mean MUAC and BMI for males and females were found higher among the younger adult age group and elderly adult age group and the lowest was recorded among the old age group respectively. The mean MUAC for males and females was found higher among the Bhumij tribe of the younger adult age group (27.2 ± 1.61, 25.67 ± 1.29 respectively). But the mean BMI for males and females was recorded as higher among the elderly adult age group of the Bhumij tribes respectively (21.2 ± 2.57, 20.0 ± 2.50). The lowest mean BMI and MUAC for males and females can be seen among the Sabar tribe of the old age group (18.5 ± 1.22, 18.2 ± 0.79, 22.39 ± 1.05, 22.67 ± 1.11 respectively). The mean MUAC of females were significantly (p <.001) lower than males among all these tribes in all age groups except in the case of the old age group of the Sabar tribe where it was found significant at p <

Research Paper

.05. The mean BMI of females of younger adult age group was significantly ($p < .001$ for Santhal and Bhumij and $p < .01$ for Sabar tribe) lower than males. But the difference in mean BMI of males and females of the elderly adult age group (40-59 years) of the Santhal and Sabar tribes was not significant whereas, it was highly significant in the case of the Bhumij tribe ($p < .001$). on the other side, the difference in mean BMI among males and females of the old age group was found significant ($p < .05$ for Santhal, $p < .001$ for Sabar and $p < .01$ for Bhumij tribe).

Table 2: Age group and Sex wise prevalence of undernutrition of different adult tribal populations (Santhal, Sabar, Bhumij) based on BMI

Tribes	Nutritional status	Sex						Combined sex	χ2
		Male			Female				
		Age groups (Years)			Age groups (Years)				
		15-39	40-59	>60	15-39	40-59	>60		
		N=319	N=151	N=56	N=351	N=170	N=59	N=1106	
Santhal	Underweight	37.3	42.38	69.64	45.87	49.41	72.88	52.91	6.24*
	Normal	56.43	52.32	30.36	49.86	45.88	23.73	43.10	
	Overweight	6.27	5.3	0	4.27	4.71	1.69	3.71	
Sabar	Nutritional status	N=87	N=45	N=16	N=103	N=41	N=15	N=307	6.26*
	Underweight	44.83	51.11	81.25	61.17	70.73	73.33	63.74	
	Normal	51.72	46.67	18.75	36.89	26.83	26.67	34.59	
	Overweight	3.45	2.22	0	1.94	2.44	0	1.67	
Bhumij	Nutritional status	N=78	N=37	N=12	N=87	N=45	N=14	N=273	6.51*
	Underweight	30.77	37.84	66.67	45.98	55.56	71.43	51.38	
	Normal	62.82	59.46	33.33	50.57	42.22	28.57	46.16	
	Overweight	6.41	2.7	0	3.45	2.22	0	2.46	

The prevalence of undernutrition (chronic energy deficiency) among different tribes based on BMI was found higher among the Sabar tribe whereas, the highest prevalence of undernutrition was found significantly (<.05) higher among females than males in all the age groups. The highest rate of undernutrition among males and females can be seen higher among the Sabar tribe whereas, 44.83 % (15-39 years), 51.11 % (40-59 years) and 81.25 % (>60 years) males and 61.17 % (15-39 years), 70.73 % (40-59 years) and 73.33 % (>60 years) females were undernourished based on their BMI status. Followed by Santhal where, 37.30 % (15-39 years), 42.38 % (40-59 years) and 69.64 % (>60 years) males and 45.87 % (15-39 years), 49.41 % (40-59 years) and 72.88 % (>60 years) females were undernourished, whereas, 30.77 % (15-39 years), 37.84 % (40-59 years) and 66.67 % (>60 years) males and 45.98 % (15-39 years), 55.56 % (40-59 years) and 71.43 % (>60 years) females belongs to the Bhumij tribe were found undernourished i.e. BMI category <18.5.

Table 3: Age group and Sex wise prevalence of undernutrition of different adult tribal populations (Santhal, Sabar, Bhumij) based on MUAC

Tribes	Nutritional status	Sex						Combined sex	χ2
		Male			Female				
		Age gropus (Years)			Age gropus (Years)				
		15-39	40-59	>60	15-39	40-59	>60		
		N=319	N=151	N=56	N=351	N=170	N=59	N=1106	
Santhal	Underweight	31.03	37.75	69.64	39.32	42.35	76.27	49.39	5.43*
	Normal	68.97	62.25	30.36	60.68	57.65	23.73	50.61	
Sabar	Nutritional status	N=87	N=45	N=16	N=103	N=41	N=15	N=307	4.75*
	Underweight	41.38	48.89	81.25	53.4	65.85	93.33	64.02	
	Normal	58.62	51.11	18.75	46.6	34.15	6.67	35.98	
Bhumij	Nutritional status	N=78	N=37	N=12	N=87	N=45	N=14	N=273	2.06
	Underweight	28.21	37.84	66.67	39.08	42.22	71.43	47.58	
	Normal	71.79	62.16	33.33	60.92	57.78	28.57	52.42	

*= P <.05

The prevalence of undernutrition based on MUAC was also found higher among the Sabar tribe. The prevalence of undernutrition was found significantly (<.05) higher among females than males in all the age groups and tribes. About 41.38 % (15-39 years), 48.89 % (40-59 years) and 81.25 % (>60 years) males and 53.40 % (15-39 years), 65.85 % (40-59 years), and 93.33 % (>60 years) females belongs to Sabar tribe were undernourished followed by Santhal where, 31.03 % (15-39 years), 37.75 % (40-59 years) and 69.64 % (>60 years) males and 39.32 % (15-39 years), 42.35 % (40-59 years), and 76.27 % (>60 years) females were

UGC CARE Listed (Group -I) Journal

undernourished and the Bhumij tribe whereas, 28.21 % (15-39 years), 37.84 % (40-59 years) and 66.67 % (>60 years) males and 39.08 % (15-39 years), 42.22 % (40-59 years) and 71.43 % (>60 years) females were undernourished.
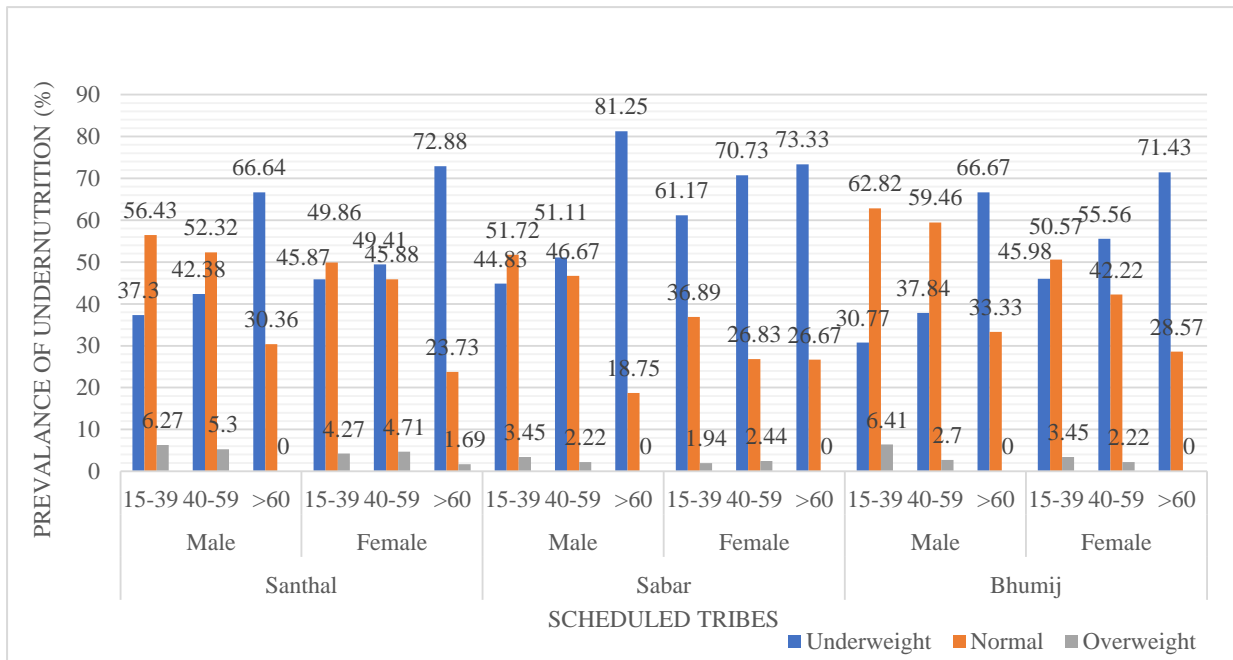

Fig no. 1: Prevalence of undernutrition of different adult tribal populations (Santhal, Sabar, Bhumij) based on BMI
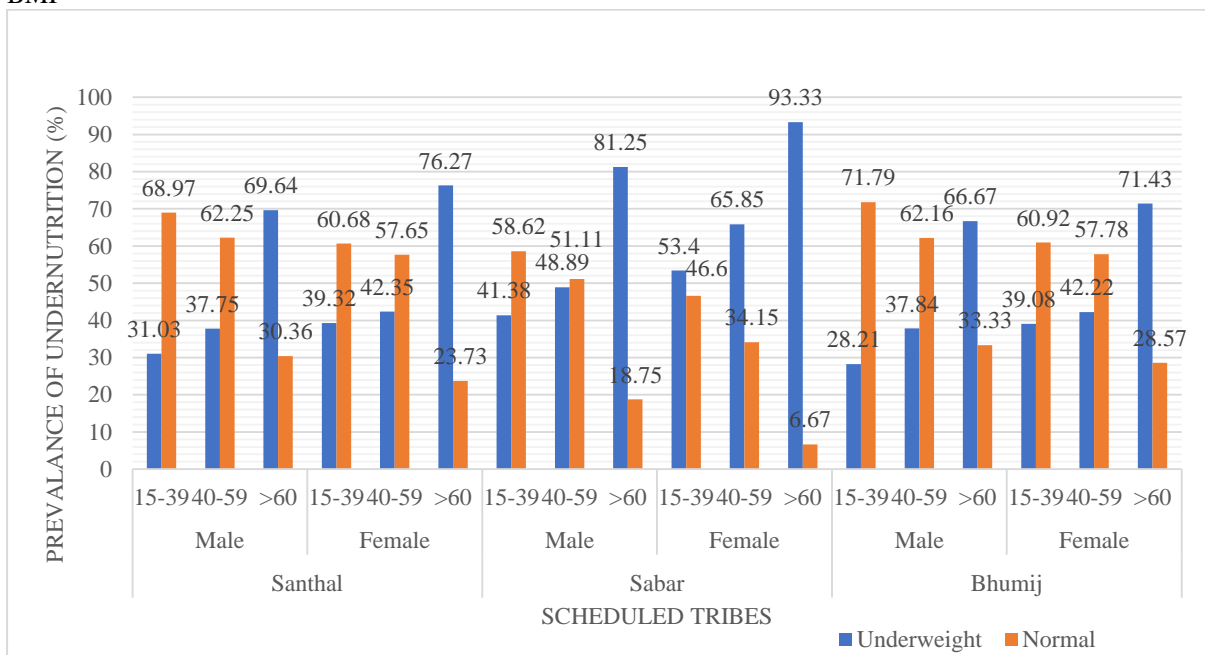

Fig no. 2: Prevalence of undernutrition among the Santhal, Sabar, and Bhumij tribes based on MUAC

DISCUSSION

Several studies in this regard (8,14, 15, 22, 24, 25, 26, 27, 28, 29, 30, 31, 32) revealed that Body Mass Index is a widely used and established measurement for assessing the nutritional status of adults, especially in developing countries and Mid- Upper arm circumference is another important, reliable, simple, inexpensive method for determining adult nutritional status specifically in developing countries (22, 33, 34).

Table 4: Sex wise comparison of mean BMI (kg/m2) and overall CED (%) among different tribes of West Bengal, India

Research Paper

UGC CARE Listed (Group -I) Journal

Tribes	Male Mean BMI	Female Mean BMI	Overall mean	CED (%)	Reference
Santhal	20.5	19.5	20.0	34.5	Mukhopadhyay, 2009
Santhal	20.0	19.3	19.7	31.6	Bose et al.
Santhal	19.5	18.1	18.8	46.7	Das and Bose, 2010
Santhal	18.5	18.7	18.6	53.7	Ghosh and Mallick, 2007
Bhumij	18.7	18.4	18.6	53.7	Ghosh, 2007
Bhumij	18.7	….	….	48.4	Bose et al.
Sabar	19.4	18.0	18.7	58.5	Bhandari et al., 2019
Sabar	….	….	….	47.0	Das et al., 2019
Kora Mudi	18.7	18.3	18.5	52.2	Bose et al., 2008
Kora Mudi	18.6	18.3	18.5	53.5	Bose et al., 2006
Lodha	19.5	19.3	19.4	43.0	Mondal, 2007
Lodha	19.5	….	….	45.2	Bose et al.
Munda	18.7	17.7	18.2	58.5	Ghosh and Bharti, 2006
Oraon	18.8	19.7	19.3	39.4	Mittal and Sivastava, 2006
Birhor	20.5	20.2	20.3	26.5	Das et al., 2013
Santhal	20.1	19.5	19.8	52.9	Present study
Sabar	19.3	18.6	18.9	63.7	Present study
Bhumij	20.4	19.4	19.9	51.4	Present study

Thus, the use of BMI and BMI cut-off points (WHO) for determining nutritional deficiency is a relevant, reliable, and valid anthropometric measurement. Recent studies on anthropometric characteristics and prevalence of chronic energy deficiency among different tribal populations of India. Thus, several research works (15, 32, 35, 36, 37, 38) in this regard made it clear that males are heavier than females. The present study highlighted the anthropometric characteristics of three tribes out of which it was found that the Bhumij tribes are significantly taller and heavier than the Santhal and Sabar tribes. The table-4 reveals that the Birhor (20.3 kg/m2), (32), Santhal (20.0 kg/m2), (35), Bhumij (19.9 kg/m2), (Present study), Santhal (19.8 kg/m2) (Present study), have the highest mean BMI followed by Santhal (19.7 kg/m2), (15), Lodha (19.4 kg/m2), (36), Sabar (18.9 kg/m2) (Present study), Sabar (18.7 kg/m2), (37), Oraon (19.3 kg/m2), (38), Bhumij (18.6 kg/m2), (39), Kora Mudi (18.5 kg/m2), (25, 16), Munda (18.2 kg/m2), (17), Santhal (18.6 kg/m2), (18). The table-2 shows the prevalence of undernutrition among different tribes of West Bengal. The prevalence of undernutrition among the Santhal tribe is about 52.9 % (Present study) compared to 34.5 % (Mukhopadhyay, 2009, [35]), 31.6 % (Bose et al., 2006 [25]), 46.7 % (Das and Bose, 2010, [40]), 53.7 % (Ghosh and Mallick, 2007, [18]). The prevalence of undernutrition among the Sabar tribe (Present study) was found higher (63.7 %) compared to Santhal and Bhumij tribes i.e. 52.9 % and 51.4 % respectively (Present study). Two other research works in West Bengal on the assessment of the nutritional status of adult Sabar tribes were led by Bhandari et al. [37] and Das et al., 2019 [41] highlighted the prevalence of undernutrition at 58.5 % and 47.0 % which is extremely high and the present study also reveals a high prevalence of undernutrition among Sabar tribe. About 51.4 % of adult Bhumij tribes (Present study) were undernourished. Similar researches in this regard highlighted that 53.7 % and 48.4 % of adult tribes belonging to Bhumij tribes were undernourished (Ghosh and Mallick [18] and Bose et al. [42] respectively). The table-2 reveals that the prevalence of undernutrition significantly increases with increasing age. The highest rates of undernutrition were recorded among the old age (>60 years) population (69.64 % Santhal, 81.25 % Sabar and 66.67 % Bhumij for males and 72.88%, 73.33 %, and 71.43% for females respectively) than elderly adult (40-59 years) populations (42.38 % Santhal, 51.11 % Sabar, and 37.84 % Bhumij for males and 49.41 %, 70.73 %, and 55.56 % for females respectively) and younger adult (15-39 years) populations (37.30 % Santhal, 44.83 % Sabar and 30.77 % Bhumij for males and 45.87 %, 61.17 % and 45.98 % for females respectively). Several researches (41, 43, 44) had also highlighted that a higher prevalence of undernutrition was recorded among old age groups. One of the probable reasons for the poor nutritional status of the old-age tribal population is due to their inadequate diets which reflected poor nutritional intake and higher prevalence of undernutrition (45). The prevalence of undernutrition in Sabar tribes was found higher among all age groups compared to Santhal and Bhumij tribes which reflects their poor socio-economic status and nutritional intake which make them more vulnerable to diseases. It was also observed that most of the Sabar tribes were either agricultural labourers or daily wage labours which reflects their poor economic status. It is considered that limited access to safe drinking water and unhygienic condition, poor residential status, health-seeking behaviour, and unconsciousness towards health is the probable reason for their poor health and nutritional status. A number of similar research work in this regard also reveals that the poor nutritional status of the Bumia tribe is due to their poor socio-economic status, illiteracy, and lack of awareness (43). Poor dietary intake, socio-economic status, limited access to safe drinking water, and unhygienic condition are the probable reason of underweight among Toto tribes (46), whereas, (Naser, 2015, [47]) highlighted that the poor level of nutritional status among Garo ethnic people was due to their low level of income and illiteracy. The table also

Research Paper

clearly shows that there is significantly (<.001) higher rates of undernutrition among females than males in the case of all these three tribes. A number of studies in this sense made it clear that females are more undernourished than males. About 30.5 % male and 38.5 % female Santhal population of the Birbhum district of West Bengal were undernourished (Mukhopadhyay, 2010, [48]), about 19.4 % of males and 33.3 % females belong to Birhor tribe were undernourished (Das et al., 2013, [32]), 38.0 % males and 49.0 % females of Sabar tribe belonged to undernutrition category (Bisai and Bose, 2012, [49]), (Bhandari et al., 2019, [29]) highlighted that about 52.0 % males and 65.0 % females of Sabar tribe were undernourished. According to UNICEF report "malnutrition in women is rooted in poor care practices at the individual, household, community and societal level" (50). The poor dietary intake during pregnancy, higher prevalence of anaemia, early marriage, low social status, poverty, illiteracy, limited access to healthcare facilities, lack of awareness and gender bias is the probable reason for undernutrition among adult females.

CONCLUSION:

From the above discussion it can be concluded that the prevalence of undernutrition among these three tribes is extremely high (WHO percentage classification of low BMI <18.5). The situation was evidently critical in the case of oldest people and females.

ACKNOWLEDGEMENTS

REFERENCES

1. Census of India. (2011). Office of the Registrar General and Census Commission. Ministry of Home Affairs, Government of India.

2. Krishnaswami K. Country profile: India. Nutritional disorders—old and changing. Lancet 2000; 351:1268–9.

3. Griffiths PL, Bentley ME. The nutrition transition is underway in India. J Nutr 2001; 131:2692–700.

4. World Bank. World Development Report 2000/2001: Attacking poverty. New York: Oxford University Press (2000).

5. World Health Organization. Physical status: the use and interpretation of anthropometry. World Health Organ Tech Rep Ser 1995; 854:1–452.

6. Lohman TG, Roche AF, Martorell R. Anthropometric standardization reference manual. Chicago, III, USA: Human Kinetics Books, 1988.

7. Lee RD, Nieman DC. Nutritional assessment. New York: McGraw-Hill, 2003.

8. Khongsdier R. Body mass index and morbidity in adult males of the War Khasi in Northeast India. Eur J Clin Nutr 2002; 56:484–9.

9. Shetty PS, James WPT. Body mass index: a measure of chronic energy deficiency in adults. Food and Nutrition Paper No. 56. Rome: Food and Agriculture Organization, 1994.

10. Deurenberg P, Weststrate JA, Seidell JC. Body mass index as a measure of body fatness: age and sex-specific prediction formulas. Br J Nutr. 1991; 65(2): 105-14.

11. Bose K. Generalised Obesity and Regional Adiposity in Adult White and Migrant Muslim Males from Pakistan in Peterborough. J R Soc Promot Health. 1996; 116: 161-67.

12. Velzeboer MI, Selwyn BJ, Sargent F 2nd, Pollitt E, Delgado H. The use of arm circumference in simplified screening for acute malnutrition by minimally trained health workers. J Trop Pediatr 1983; 29:159-66.

13. Tang AM, Dong K, Deitchler M, Chung M, Malouf-Manasseh Z, Tumilowicz A, Wanke C. Use of Cut-offs for Mid-Upper Arm Circumference (MUAC) as an Indicator or Predictor of Nutritional and Health-Related Outcomes in Adolescents and Adults: A Systematic Review; Food and Nutrition Technical Assistance III Project (FANTA III)/FHI 360: Washington, DC, USA, 2013.

14. Bose K, Chakraborty F. Anthropometric characteristics and nutritional status based on body mass index of adult Bathudis: A tribal population of Keonjhar District, Orissa, India. Asia Pac J Clin Nutr 2005; 14:80–2.

15. Bose K, Banerjee S, Bisai S, Mukhopadhyay A, Bhadra M. Anthropometric profile and chronic energy deficiency among adult Santal tribals of Jhargram, West Bengal, India: Comparison with other tribal populations of Eastern India. Ecology of Food Nutrition 2006; 45: I-II.

16. Bisai S, Bose K, Katun A, Ganguli S, Das P (2008) Nutritional stress in Kora Mudis of two districts in West Bengal. India: A comparative statement. In: Basu SK, Banik SD (Eds.), Environment Pollution, Protection and Policy Issues. APH Publication Corporation, New Delhi, India.

17. Ghosh R, Bharati P. Nutritional status of adults among Munda and Pod populations in a peri-urban area of Kolkata City, India. Asia Pacific Journal of Public Health 2006; 18(2): 12-20.

18. Ghosh S, Malik SL. Sex Differences in Body Size and Shape among Santhal of West Bengal. Anthropologist 2007; 9(2): 143-149.

19. Collins S, Myatt M, Duffield AE, Geneva: ACC/SCN, (2000).

20. Chakraborty R, et al. "Mid-Upper Arm Circumference as a Measure of Nutritional Status among Adult Bengalee Male Slum Dwellers of Kolkata, India: Relationship with Self-Reported Morbidity." Anthropologischer Anzeiger 2009; 67(2):129–37.

21. Bisai S, et al. "Undernutrition in the Kora Mudi Tribal Population, West Bengal, India: A Comparison of Body Mass Index and Mid-Upper-Arm Circumference." Food & Nutrition Bulletin 2009; 30(1):63–7.

22. James WPT, Mascie-Taylor CGN, Norgan NG, Bristrian BR, Shetty P, Ferro-Luzzi A. The value of arm circumference measurements in assessing chronic energy deficiency in Third World adults. Eur J Clin Nutr 1994; 48:883–94.

23. Gartner A, et al. "Body Composition Unaltered for African Women Classified as 'Normal but Vulnerable' by Body Mass Index and Mid-Upper-Arm-Circumference Criteria." European Journal of Clinical Nutrition 2001; 55(5):393–9.

24. Khongsdier R. BMI and morbidity in relation to body composition: A cross-sectional study of a rural community in North-East India. Br J Nutr 2005; 93:101–7.

25. Bose K, Ganguli S, Mamtaz H, Mukhopadhyay A, Bhadra M. High prevalence of undernutrition among adult Kora Mudi tribals of Bankura District, West Bengal, India. Anthropological Science 2006; 114: 65- 68.

26. Bose K, Chakraborty F, Bisai S, Khatun A, Bauri H. Body mass index and nutritional status of adult Savar tribals of Keonjhar District, Orissa, India. Asia Pac J Public Health 2006; 18:3–7.

27. Yadav YS, Singh P, Kumar A. Nutritional status of tribals and non-tribals in Bihar. Indian J Prev Soc Med 1999; 30:101–6.

28. Gogoi G, Sengupta S. Body mass index among the Dibongiya Deoris of Assam, India. J Hum Ecol 2002; 13:271–3.

29. Sahani R. Nutritional and Health status of the Jarawas: A preliminary report. J Anthropol Surv India 2003; 52:47–65.

30. Dash Sharma P. Nutrition and health among the tribes of India. In: Kalla AK, Joshi PC, eds. Tribal health and medicines. New Delhi: Concept Publishing Company, 2004:71–98.

31. Mosha TCE. Prevalence of obesity and chronic energy deficiency (CED) among females in Morogoro District, Tanzania. Ecol Food Nutr 2003; 42:37–67.

32. Das S, Mahata M, Bose K. Nutritional profile of adult Birhors of Purulia: A particularly vulnerable tribal group of West Bengal, India. Asian Acad Res J Multidiscip. 2013; 1(5): 262-75.

33. Goossens S, Bekele Y, Yun O, Harczi G, Ouannes M, Shepherd S. Mid-upper arm circumference-based nutrition programming: Evidence for a new approach in regions with high burden of acute malnutrition. PLoS ONE 2012, 7, e49320. [CrossRef] [PubMed]

34. Tang AM, Chung M, Dong K, Wanke C, Bahwere P, Bose K, Chakraborty R, Charlton K, Hong S, Nguyen P, Patsche CB, Deitchler M, Manasseh ZM. Determining a global mid-upper arm circumference cut off to assess underweight in adults (men and non-pregnant women). In: Food and Nutrition Technical Assistance III Project (FANTA); 2017.

35. Mukhopadhyay A (2009) Anthropometric characteristics and undernutrition among adult Santal tribe of Birbhum District. West Bengal, Anthropological Science, India, p. 1-4.

36. Mondal PS (2007) Nutritional status of adult Lodha males of Shyamraipur, Paschim Medinipur. Paper presented in seminar on Approaching Development in Department of Anthropology, Vidyasagar University, India, p. 6.

37. Bhandari S, Ghosh M, Bose K. Socio- demographic characteristics and prevalence of under nutrition among adult Sabars of Bankura district, West Bengal, India. Int J Adv Life Sci Res. 2019; 2(1): 1-10.

38. Mittal PC, Srivastava S. Diet, nutritional status and food related traditions of Oraon tribes of New Mal (West Bengal), India. Rural and Remote Health 2006; 6(1): 385.

39. Ghosh M (2007) Nutritional status of adult Bhumij males of Kharagpur, Paschim Medinipur. Paper presented in seminar on Approaching Development in Department of Anthropology. Vidyasagar University, India, 5: 22.

40. Das S, Bose K (2010) Body Mass Index and Chronic Energy Deficiency among Adult Santals of Purulia District, West Bengal, India. International Journal of Human Science 7: 2

41. Das K, Mukherjee K, Chanak M, Pal S, Ganguli S, Bagchi S, Bose K. Co-existence of high levels of undernutrition and hypertension among Sabar males of Purulia, West Bengal, India: a paradox. Int J Adv Life Sci Res. 2019; 2(4): 38-47.

42. Bose K, Bisai S, Mondal PS, Ghosh M. Body mass index and chronic energy deficiency among adult male Lodhas and Bhumijs: A comparison with other tribal populations of West Bengal, India. Journal of Public Health 2008; 16: 117–121.

43. Jaiswal A, Health and Nutritional status of a primitive tribe of Madhya Pradesh: Bhumia. Global Journal of Human Social Science History Archaeology & Anthropology 2013, 13 (1).

44. Das S, Bose K. Nutritional Status among Adult Santals, Coll. Antropol. 36 (2012) 2: 581–584.

Research Paper

UGC CARE Listed (Group -I) Journal

45. Arlappa N, Balakrishna N, Brahmam GN, Vijayaraghavan K. Nutritional status of the tribal elderly in India. J Nutr Elder. 2005; (2): 23-39.

46. Chattopadhyay et al., Journal of Advanced Scientific Research, 2020; 11(4): 300-306

47. Naser M.A., Socio-economic profile and Nutritional status of aged Garo ethnic people. European Academic Research, 2015; III (7): 8045-8051

48. Mukhopadhyay A. Anthropometric characteristics and undernutrition among adult Santhal tribe of Birbhum District, West Bengal, India. Anthropological Science 2010; 118 (1), pp. 57-60.

49. Bisai S, Bose K. (2012) Critical nutritional stress among adult tribal populations of West Bengal and Orissa, India. Nature Precedings hdi; 10101/npre. 2012.7068.1.

50. United Nations Children's Fund. UNICEF Programming Guidance. Prevention of malnutrition in women before and during pregnancy and breastfeeding. New York: UNICEF, 2021.