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(RESEARCH ARTICLE)



Assessment of nutritional status among adult Hos of Paschim Medinipur District, West Bengal, India

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Abstract

The tribal population in India, as per 2011 census is 104.3 million, constituting 8.6% of the total population. Overall, 89.97% of them live in rural areas. Nutrition has been a major health issue in India for centuries. Chronic hunger and under-nutrition are the worst tribulation of the poverty that still plagues millions of tribal households in India.

The objective of this study was to assess the anthropometric characteristics and nutritional status of the population.

The present cross-sectional study was carried out at 2 blocks (Debra and Dantan II) of Paschim Medinipur District, West Bengal, India. A total 392 adults (Female= 207; Male= 185) Ho tribal people were included in this study.

The mean (SD) value of height (cm), weight (kg), mid-upper arm circumference [MUAC (cm)], body mass index [BMI (kg/m²)] was higher among males 159.68 (5.64), 54.53 (8.00), 24.79 (2.56) and 21.37 (2.85) respectively, than females 149.16 (5.42), 46.01 (7.98), 22.00 (2.76) and 20.65 (3.19). These values were statistically significant ($p < 0.0001$). Based on MUAC, the prevalence of undernutrition was higher among females (55.6%) than males (26.5%) and this was statistically significant ($p < 0.001$). However, based on BMI, the prevalence of undernutrition was higher among females (27.5%) than males (16.8%), which was statistically significant ($p < 0.05$) also.

According to WHO classification of chronic energy deficiency (CED), the rate of under nutrition indicated a serious situation. Thus, to reduce the nutritional stress among this ethnic group, appropriate nutritional intervention programmes are needed to be initiated.

Keywords: Body Mass Index; Mid Upper Arm Circumference; Ho; Nutritional Status; Undernutrition

1 Introduction

Undernutrition is a coherent health problem among the children as well as the adult populations in India. Prevalence of undernutrition is highest among the individuals from the marginalized sections of the Indian society like Scheduled Tribes (STs) and Scheduled Castes (SCs) than others [1]. The tribal population in India, as per 2011 census is 104.3 million, constituting 8.6% of the total population. Most of the tribal populations reside in rural areas of the country and is socially and economically underprivileged [2,3]. The numbers of tribal communities in West Bengal are forty (40), which constitutes 5.8% of the total population. There are some common characteristics of tribes like- they live definite common topography, among them sense of unity was very high, they are endogamous group in nature, they have common dialect, they have protection awareness, every tribe has its own political organization, they have a common

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culture, they give priority of kinship, tribal society based on egalitarian principle, they believe in rudimentary type of religion etc.

There are some anthropometric measurements to know the nutritional status and health condition of human. In spite of some innate limitations, anthropometry remains the most practical tool for a rapid assessment of nutritional status at individual as well as community level, particularly in resource constrained circumstances in developing countries such as India. Body mass index (BMI) is widely accepted as one of the best indicators of nutritional status in adults [4]. Several studies have shown that BMI is a reasonable anthropometric measure of total body fat or storage of energy in the body [5, 6]. Though the adult nutritional status can be evaluated in many ways, but the BMI is the most widely used because it is simple, inexpensive, safe and suitable for large scale surveys [7-9]. BMI reflects not only the nutritional status but also the socio-economic condition of a population, especially the adult population in developing countries [8, 10-13]. On the other hand, mid-upper arm circumference (MUAC) is other anthropometric measurement used to evaluate adult nutritional status [9]. An extensive study using data from 8 countries (Mali, India, Senegal, Zimbabwe, Somalia Ethiopia, Papua New Guinea and China) suggested that MUAC could be used as a simple screening tool for assessment of nutritional status. MUAC has been suggested as a substitute for BMI when the rapid screening of an adult population is required as a prelude to targeting the provision of assistance to those who are undernourished [9].

Nutritional status is an important index of economic growth and development. The status of nutrition of a given population has positively or negatively influenced nation's economic growth. Though, Nutritional status is most closely associated with food intake behavior but, it's also related health status. In any country the state of health is measured in terms of life expectancy, mortality rate, fertility rate and many more. But it can't be ignored that all these indicators of health are dependent on other factors like per capita income, nutrition, sanitation, safe drinking water, social infrastructure, medical care facilities, employment status, poverty, etc. which affect the health of every individual. There is direct relationship between health and development [14]. In general, data are scarce on the nutritional status of the various tribal populations of India [12, 15-32].

To the best of my knowledge, no previous research on the evaluation of nutritional status, of the adult Ho tribal population, has been undertaken from West Bengal, India. In this point of view, the objective of the present study was to assess the anthropometric characteristic and nutritional status based on BMI and MUAC of the adult Hos of Paschim Medinipur, West Bengal, India.

2 Material and methods

2.1. Study Area

The present cross-sectional study was carried out from 8 villages (Duan, Baguan, Bankakul, Amra Gerya and Kismat Duan Roypukur, Sirni, Keshrambha and Sahania) under Debra and Dantan II blocks of Paschim Medinipur district, West Bengal, India, during August 2019 to March 2021.

2.2. Studied participants

The Ho people are an ethnic group of India. The Ho is one of the major tribes of Jharkhand and Orissa. The Calhan area of Jharkhand is the original place of their inhabitant. In due course of time, they spread towards its neighboring areas of Jharkhand, Orissa and West Bengal and even a few to Assam. According to 2011 census [33], population of Ho tribes is 23,483 in West Bengal. In the Ho language the word 'Ho' means a man. These Hos belong to the Proto-Astrologic group. They are of short stature, dark complex with broad and flat nose. The Ho belongs to the Munda branch of Austro-Asiatic languages.

The participants were selected from eight villages (Duan, Baguan, Bankakul, Amra Gerya, Kismat Duan Roypukur, Sirni, Keshrambha and Sahania) under Debra and Dantan II blocks of Paschim Medinipur district, West Bengal, India. A total of 392 adults (Female= 207 & Male= 185) Ho tribal people, aged above 18 years in those villages were included in this study. The vast majority of the subjects were illiterate and very low-waged manual laborers belonging to low socio-economic status. Ethical considerations were guided by the Helsinki declaration [34]. Appropriate ethical clearance was obtained from authorities of Vidyasagar University and the district level and relevant local administrative authorities and community leaders were informed about the objective of the present study. Verbal informed consent was obtained from each participant in their own language prior to each interview and measurement procedure.

CED grade III:	BMI < 16.0
CED grade II:	BMI = 16.0 – 16.9
CED grade I:	BMI = 17.0 – 18.4
Normal:	BMI = 18.5 – 24.9
Overweight:	BMI ≥ 25.0
Obese:	BMI ≥ 30.0

The CED status was defined as BMI < 18.5 kg/m². The WHO classification [4] of the public health problem of low BMI, based on adult populations worldwide, was followed. This classification categorizes prevalence according to percentage of a population with BMI < 18.5.

- Low (5-9%) Warning sign, monitoring required
- Medium (10-19%) Poor situation
- High (20-39%) Serious situation
- Very high (≥ 40%) Critical situation

Nutritional status was also determined using MUAC values. The following internationally accepted cuts off values were used [9]:

2.3. Anthropometric measurements

All anthropometric measurements (height, weight and MUAC) of lightly clothed subjects were taken by the first author (SB) using standard techniques [6]. Stature or height (cm) is the vertical distance from floor to vertex of the head. The subject stands bare-footed while the head is held with the Frankfurt plane. Height and weight were taken to the nearest 0.1 cm and 0.5 kg, using standard Martin’s anthropometer and weighing machine respectively. Technical errors of measurements (TEM) were computed and were found to be within acceptable limits [35].

MUAC measurement was made using a flexible, non - stretch tape. The subject stood erect and sideways to the measurer with the head held by the Frankfurt plane, arms relaxed and legs apart. The measurement was taken at the midpoint of the left arm between the acromion process and olecranon process. After locating the mid-point, the left arm was relaxed and the palm facing inwards. The tape was wrapped gently but firmly around the arm at the mid-point. Measurement was taken to the nearest 0.1 cm.

2.4. Assessment of nutritional status

Body mass index was computed using the following standard equation: BMI = weight (kg)/height (m²). Nutritional status was determined following WHO guidelines [4] to facilitate international comparison. The following BMI (kg/m²) cut-off points were used:

Nutritional Category	Male	Female
Under nutrition	MUAC < 23 cm	MUAC < 22 cm
Normal	MUAC ≥ 23 cm	MUAC ≥ 22 cm

A new cut-off point of MUAC has been proposed to determine under nutrition. It has been proposed by the Food and Nutrition Technical Assistance III Project (FANTA) [36] by USAID. It was based on numerous studies conducted worldwide including India (except pregnant and lactating women).

Group	Nutritional status	
	Under nutrition	Normal
Adult population	MUAC < 24 cm	MUAC ≥ 24 cm

2.5. Statistical analysis

Student's t-test was performed to determine sex wise differences in mean and SD value of height, weight, MUAC & BMI. Chi-square (χ^2) test was performing to determine the association between two discrete variables. All statistical analyses were done using the SPSS 16.0. Statistical significance level was set at $p < 0.05$.

3 Results

The mean value of HT, WT, MUAC and BMI were higher among males than females. There were statistically significant differentiations ($p < 0.001$) (Table 1).

Table 1 Mean (SD) values of anthropometric characteristics of the studied population

Variables	Male (n=185)		Female (n=207)		't'
	Mean	SD	Mean	SD	
HT (cm)	159.68	±5.64	149.16	±5.42	18.79***
WT (kg)	54.53	±8.00	46.01	±7.98	10.52***
MUAC (cm)	24.79	±2.56	22.00	±2.76	10.33*
BMI (kg/m ²)	21.37	±2.85	20.56	±3.19	2.33***

***= $p < 0.001$, *= $p < 0.05$

The rate of overall undernutrition among studied population based on BMI was 22.4%. Among females, the rate of undernutrition was 27.5% and in cases of male, this rate was 16.8% (Table 2).

Table 2 Nutritional status of the studied population based on BMI

Category	Nutritional status based on BMI			
	Undernutrition	Normal	Overweight	χ^2
Male	31 (16.8%)	135 (73.0%)	19 (10.6%)	0.195*
Female	57 (27.5%)	128 (61.8%)	22 (10.6%)	
Combined sex	88 (22.4%)	263 (67.1%)	41 (10.5%)	

*= $p < 0.05$

The rates of overall undernutrition were 41.8% and 59.7% respectively. The rate of under-nutrition was higher among females (55.6% and 77.3% respectively) than males (26.5% and 40.0% respectively). There were statistically significant differentiations ($p < 0.001$, $p < 0.001$ respectively) between both sexes (Table 3).

Table 3 Prevalence of undernutrition based on MUAC among studied population

Category	MUAC (WHO)			MUAC (FANTA)		
	Undernutrition	Normal	χ^2	Undernutrition	Normal	χ^2
Male	49 (26.5%)	136 (73.5%)	33.924***	74 (40.0%)	111 (60.0%)	56.474***
Female	115 (55.6%)	92 (44.4%)		160 (77.3%)	47 (22.7%)	
Combined sex	164 (41.8%)	228 (58.2%)		234 (59.7%)	158 (40.3%)	

***= $p < 0.001$

Table 4 Association between MUAC and BMI (WHO,1995)

BMI Category	MUAC Category		Total	χ^2
	Undernutrition	Normal		
Undernutrition	81 (92.0%)	7 (8.0%)	88	1.176***
Normal	83 (27.3%)	221 (72.7%)	304	
Total	164 (41.8%)	228 (58.2%)	392	

***= $p < 0.001$, OR=30.81.

This table stated that, those who are belongs to the CED group on the basis of BMI (male= 16.8% and female= 27.5%), also the chances of low MUAC (Male<23 and Female <22) was higher among them and this is statistically significant ($p<0.001$, OR=30.81) (Table 4).

4 Discussion

This study is a preliminary record of information of anthropometric characteristics and nutritional status of the adult Ho, a tribe in Paschim Medinipur district of West Bengal. The results portrayed a significant section of the studied population have been suffering from undernutrition.

Various compatible studies were already done among several adult tribes in many districts of West Bengal, by many trained investigators (Table 5). This table also reflects the mean value of BMI and the prevalence of CED among adult tribal population. In 2010 [27], a study was conducted by some scholars on Santal community of Purulia; among Birhors of Purulia a study was done in 2013 [28]; among male Bhumij of Paschim Medinipur district, a study was done in 2015 [29]; among adult females of Lodha and Santal in 2016 [31]. A study was done by some scholars; adult Sabars of Bankura [32] and the adult Sabar males of Purulia, was also studied by various scholars in 2019 [37]. The present study was carried out among adult Hos of Paschim Medinipur, to gather new information on nutritional status of them.

Table 5 Comparison of mean BMI and prevalence (%) of CED among various tribal population of West Bengal, India

Community	Mean BMI (kg/m ²)		CED Prevalence (%)		Study area (District)	Reference
	Male	Female	Male	Female		
Santal	19.5	18.1	55.0	52.5	Purulia	Das & Bose, 2010
Birhor	20.5	20.2	19.4	33.3	Purulia	Das et al., 2013
Bhumij	18.6	---	52.3	---	Paschim Medinipur	Ghosh & Bose, 2015
Lodha	---	19.33	---	33.1	Jhargram	De & Kundu, 2016
Santal	---	21.08	---	8.7	Jhargram	De & Kundu, 2016
Sabar	19.4	18.0	52.0	65.0	Bankura	Bhandari et al., 2019
Sabar	---	---	47.0	---	Purulia	Das et al., 2019
Ho	21.3	20.6	16.8	27.5	Paschim Medinipur	Present Study

The present study and previous study indicated that overall nutritional conditions of the tribal population of West Bengal are not in satisfactory level. Food habits as well as the ecology of the particular area are directly or indirectly related with nutritional status of the population. Further research should be commenced in details to investigate these factors. Each tribal population has their unique food habits [38]; moreover, there are distinct inter-tribal differences in the environment in which they reside, i.e., ecology of the population [38]. Previous studies in context did not consider these factors, owing beyond their scope of study. These are limitations which must be addressed in future studies. Therefore, it is imperative that future studies on tribal populations include these parameters when investigating their nutritional status.

5 Conclusion

The present study clearly showed that, the prevalence of undernutrition indicated a serious situation, according to the WHO classification of CED. Thus, to reduce the nutritional stress among this ethnic group, appropriate nutritional intervention programmes are needed to be initiated.

Recommendation

Author suggests that similar studies should be undertaken to assess the prevalence of undernutrition among Hos of another region, as well as other ethnic groups, especially in rural areas. In India, there are many such nutritionally vulnerable tribal populations, those studies will help us to generate new data which can be used for compare with the prevalence of undernutrition in the local, national and global context.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there are no conflicts of interest regarding publication of this paper.

Statement of informed consent

Informed consent was obtained from all studied participants involved in the present study.

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