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Nutritional status according to body mass index among the adult Munda population of Sundarban, West Bengal, India

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***Abstract*---**Background: In India, the profile of body mass index and chronic energy deficiency in tribal society is a significant issue. In terms of various facilities, tribal people are separated from the general population. This paper examines the health structure of adult males and females from Munda tribes. Materials and Methods: A cross-sectional community-based study was directed among the Munda tribe (N = 110) of Gram Panchayat Lahiripur, Sundarban, Block Gosaba, 24 Parganas (South), and Southern Bengal. Results: The proportion of Munda people who were malnourished (BMI 18.5) was very low. The WHO classifies men as undernourished at 23.72% and women as undernourished at 27.53%. According to Asia specific, the percentage of male undernutrition is 23.71, and the percentage of female undernutrition is 28.77. Conclusion: In both classifications, the incidence is lower in men than in women. This population has good nutritional status compared to the other tribes of the eastern part of the country.

Keywords---chronic energy deficiency, body mass index, nutritional status, Z-core, Munda tribe.

Introduction

One of the most reliable markers of an adult's nutritional status is the quetlet or body mass index (BMI), which is universally regarded (James et al. 1988; Ferro-Luzzi et al. 1992; Shetty and James 1994; Naidu 1994; Bailley and Ferro-Luzi 1995). Despite significant diversity in weight and height between human populations, BMI may be nutritionally rather than genetically connected (Rolland & Chachera 1993). (Eveleth and Tanner 1990; Majumdar et al. 1990). So, in a nation with a variety of ethnic groups, like India, the use of BMI as an anthropometric indication of nutritional status may be more appropriate (Khongsdier 2001). (cf. Adak et al. 2006).

Malnutrition affects people of every country. The cause of malnutrition is not only the excess or lack of nutrition, but it is also affected by social condition. The best way to depict the scope and distribution of undernourishment using anthropometric markers is to characterise the nutritional status of communities. In many field situations with severely limited resources, anthropometry can be used as a screening tool to identify people at risk of undernutrition. After this preliminary diagnosis, additional methods can be used to undertake a more thorough investigation. Body mass index (BMI) is an age independent nutritional index. It is used effectively to evaluate status of nutrition in any population group. Living conditions of the tribal people in our country are deplorable in general, characterized with marked poverty, lack of sewage and housing. Level pf socio-economic development is relatively low among them when compared to the non-tribal groups. The prevalence of malnutrition among adult members of Indian tribes varies (NFHS-III, 2009). It is an abnormal metabolic condition brought on by unacceptably high, unevenly distributed, or excessive macronutrient intake. In this study, nutritional status is examined according to Body Mass Index among the adult Munda population of Sundarbans, West Bengal, India.

Material and Methods

Sunderban of West Bengal is the largest mangrove forest and the largest delta in the world. The study area comprises three villages, Sadarpara (Tipligheri Bazar area), Luxbagan, and Parasmoni of the World Heritage Sundarban, Gosaba Block, south 24 Parganas district, West Bengal, India.


INDIA
States and Union Territories
TAJIKISTAN
AFGHANISTAN
PAKISTAN
CHINA (TIBET)
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BHUTAN
BANGLADESH
MYANMAR (BURMA)
SRI
LADAKH
Srinagar
Leh
JAMMU & KASHMIR
Jammu
HIMACHAL PRADESH
Shimla
PUNJAB
Chandigarh
Dehradun
UTTARAKHAND
HARYANA
DELHI
New Delhi
UTTAR PRADESH
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RAJASTHAN
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Itanagar
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Imphal
MANIPUR
Agartala
TRIPURA
Aizawl
MIZORAM
BIHAR
Patna
JHARKHAND
Ranchi
WEST BENGAL
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Bhopal
MADHYA PRADESH
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BAY OF BENGAL
Daman
Silvassa
DAMAN & DIU
DADRA & NAGAR HAVELI
MAHARASHTRA
Mumbai
TELANGANA
Hyderabad
Amaravati
Yanam (Puducherry)
ARABIAN SEA
Panaji
GOA
ANDHRA PRADESH
KARNATAKA
Bengaluru
Chennai
Mahe (Puducherry)
PUDUCHERRY
LAKSHADWEEP (INDIA)
Kavaratti
KERALA
TAMIL NADU
Karaikal (Puducherry)
Thiruvananthapuram
Palk Strait
ANDAMAN & NICOBAR ISLANDS (INDIA)
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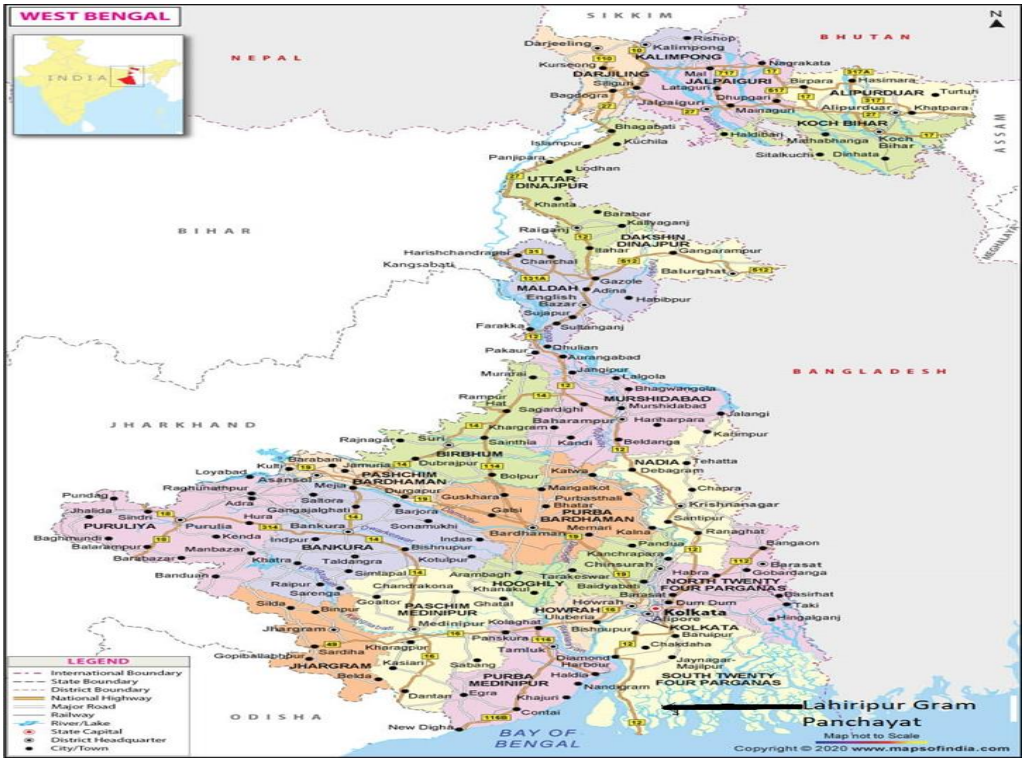
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ALIPURDUAR
KOCH BIHAR
UTTAR DINAJPUR
DAKSHIN DINAJPUR
MALDAH
MURSHIDABAD
NADIA
BIRBHUM
PASCHIM BARDHAMAN
PURBA BARDHAMAN
PURULIYA
BANKURA
HOOGHLY
HOWRAH
Kolkata
NORTH TWENTY FOUR PARGANAS
SOUTH TWENTY FOUR PARGANAS
PASCHIM MEDINIPUR
PURBA MEDINIPUR
JHARGRAM
Lahiripur Gram Panchayat
Map not to Scale
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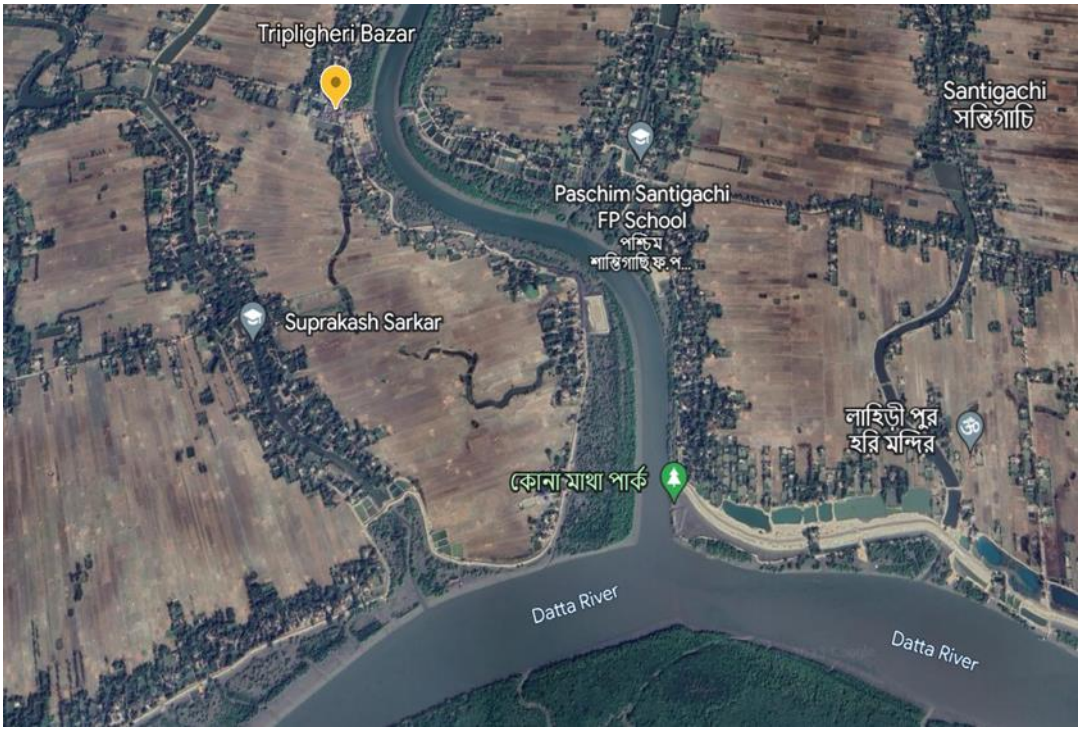
LEGEND
International Boundary
State Boundary
District Boundary
National Highway
Major Road
Railway
River/Lake
State Capital
District Headquarter
City/Town



The poor economic condition of the inhabitants was presented by the mud-built houses of the villagers. The vast majority of the houses were made of mud and had straw-thatched roofs. Investigators discovered that most Munda villagers did not own agricultural land, and that many Mundas used to visit the nearby Sundarban forest to collect fish, crabs, honey, and some fuel wood.

The overall number of households in the studied tribe is one hundred and ten (110). The entire number of individuals studied is three hundred and five (305). The total number of individuals available is 156 adult males and 149 adult females. Only adults (above 18.0 years of age) were considered for this study. Subjects were recruited from their respective villages to participate in this investigation on the basis of ethnicity. Munda peoples gave their written consent to participate in this study. Anthropometry: Anthropometric measurements such as height, weight, chest girth (for males only) was taken according to Singh and Bhasin (1989).

Internationally accepted BMI guidelines are used to evaluate nutritional status (WHO 1990). For CED and BMI, the following cutoff values were applied: Normal: BMI = 18.5 24.9 kg/m^2, CED: BMI 18.5 kg/m^2. BMI = 25.0 kg/m^2. The World Health Organization's 1995 designation of the issue of low BMI as a public health issue was applied to adult populations all across the world. This classifies the occurrence of BMI 18.5 kg/m^2 according to the percentage of a population as follows: The situation is critical (very high (40%)).
Medium (10–19%): the situation is poor.
Low (5–9%): Monitoring is required; follow the warning sign.

Results and Discussion

The classification of adult Munda males based on their BMI into different nutritional status categories as per the WHO classification (1995) is shown in Table 1.

Table 1: Distribution of Body Mass Index (Kg/m^2) among the Munda Community

Category	Range (Kg/m^2)	MALE (N=156)		FEMALE (N=149)	
		No. of Male	%	No. of Female	%
CED Grade III	< 16.0	7	4.49	8	5.37
CED Grade II	16.0 – 16.9	6	3.85	10	6.71
CED Grade I	17.0 – 18.4	24	15.38	23	15.45
Normal	18.5 – 24.9	117	75.00	106	71.14
Overweight	25.0 – 29.9	2	1.28	2	1.34
Obese	≥ 30.0	0	0.00	0	0.00

It is evident from the table that out of 156 adult males, 25 percent are malnourished, compared to 75 percent who are found to be normal. Within malnourished males, 15.38 percent are found to be CED Grade 1, and 15.38 percent are found to be CED Grade II, whereas 3.85 percent of male members are suffering from CED Grade III malnutrition. It is also found that 1.28 percent are overweight. No male member is in the obese category.

On the other hand, only 71.14 percent of females are categorised as "normal," compared to 28.86 percent of females who are found to be malnourished. Within malnourished females, 15.45 percent of females fall under the category of CED Grade 1. Overall, 6.71 percent of adult females are CED Grade II. It is to be noted that 5.37 percent of females in this country suffer from CED Grade III malnutrition. Table 1 also delineates that the Munda females represent only 1.34 percent in the category of overweight nutrition status. Whereas, in the case of obese nutritional status, no one was detected as being in the obese category. A comparison of both genders reveals that women have a higher prevalence of grade I (15.45%), grade II (6.71%), and grade III (5.37%) malnutrition than men, at 15.38 percent, 3.85 percent, and 4.49 percent, respectively. It depicts that 28.86 percent of women are malnourished as compared to 25 percent of males. Therefore, the females are the worse sufferers in terms of nutritional status in comparison to their male counterparts among the Munda population residing in Lahiripur Gram Panchayat. Women with better nutritional conditions (BMI of 18.5-24.9 kg/m^2) historically have had better baby health status, according to the NNMB (1994; 1996). The mother's health, as well as the health of the foetus and child, are all negatively impacted by nutritional deprivation (Winikoff 1990).

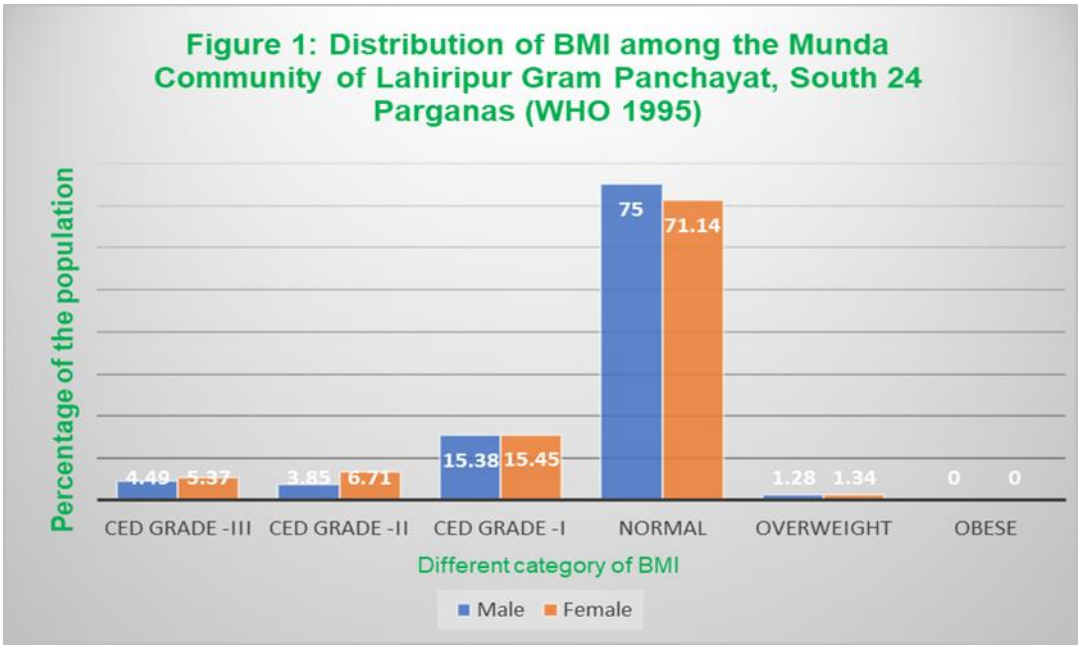


Figure 1: Distribution of Body Mass Index (BMI) and different Chronic Energy Deficiency (CED) Grade of the Munda Community, WHO,1995.

Figure 1 is the bar diagram of the Body Mass Index (BMI) and Chronic Energy Deficiency (CED), WHO, 1995, which is for a clearer understanding.

Data are further analyzed, and the Z-score has been performed by sex to verify the adult nutritional status of Munda of Gram Panchayat Lahiripur, Gosaba, 24-Parganas (South), and the southern part of West Bengal within those individuals in relation to the standard deviations. The results have been presented in Table 2.

Table 2: Body Mass Index cut – off point of Z-Score among studied Munda

Sex	Cut off point of Z-Score	Category	No.	%
Male (No. = 167)	+ 2 to -2	Normal	156	95.84
	-2 to -3	Moderate	0	0.00
	-3 and above	Sever	0	0.00
Female (No. = 153)	+ 2 to -2	Normal	148	86.29
	-2 to -3	Moderate	1	0.59
	-3 and above	Sever	0	0.00

Source: NCHS -- National Centre for Health Statistics. (1977)

It is observed from the table that 95.84 percent of males fall into the category of normal status of nutrition, whereas 86.90 percent of females fall into the normal category of nutrition. Only 0.59 percent of females are suffering from moderate malnutrition.

The data are further analyzed and summarized in Table 3 for the classification of adult Munda of Lahiripur Gram Panchayat, based on their BMI in different nutritional status categories as per Asia–pacific (2000) classification.

Table 3: Distribution of Body Mass Index among the Munda according to Asia Pacific (2000) classification

Category	Range (Kg/M^2)	MALE		FEMALE	
		No.	%	No	%
CED Grade III	< 16.0	7	4.49	8	5.36
CED Grade II	16.0 – 16.9	6	3.85	10	6.71
CED Grade I	17.0 – 18.4	24	15.38	25	16.77
Normal	18.5 – 22.9	115	73.71	86	55.13
Overweight	23.0 – 24.9	4	2.56	18	12.08
Obese	≥ 25.0	0	0.00	2	1.28

It is evident from the table that out of 156 adult males, 26.29 percent of males are malnourished as compared to 73.71 percent male, who are found to be Normal. Within malnourished males' 15.38 percent are found to be CED Grade I and 3.85 percent are found to be CED Grade II, whereas, 4.49 percent male members are suffering from CED Grade III malnutrition. Overall, 2.56 are in the overweight and obese category is zero percentage of adult males. Otherside, only 55.13 percent females are categorized as Normal as compared to 44.87 percent females, who are found to be malnourished. Within malnourished female's 16.77 percent fall under the category of CED Grade 1. Overall, 6.71 percent adult females are CED Grade II. Notable, mater of concern over here is 5.36 percent females are suffering from CED Grade III malnutrition. Table 3 also delineates that the Munda female represents 12.08 percent in the category of overweight status of nutrition, whereas, in case of obese nutritional status, alarming frequency is also noticed (1.28 percent).

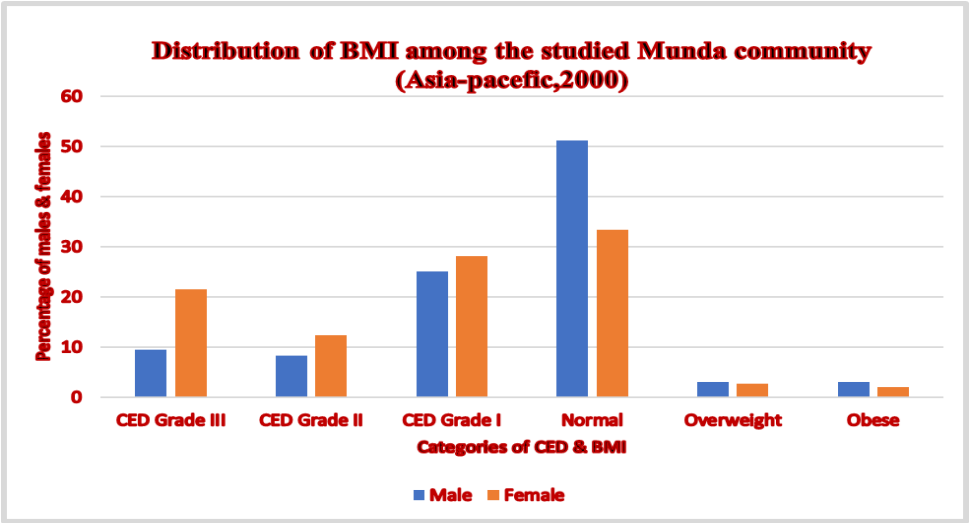


Figure 2: Distribution of Body Mass Index (BMI) and different Chronic Energy Deficiency (CED) Grade of the Munda Community, Asia-pacific, 2000.

Figure 2 is the bar diagram of the Body Mass Index (BMI) and Chronic Energy Deficiency (CED), Asia-pacific, 2000, which is for a clearer understanding.

Table 4: Prevalence of CED (based on BMI) and Mean BMI among several tribes of West Bengal
M: Male; F: Female

Researcher Name	Study area	No. Of Individuals	Mean BMI (Kg/ m^2)		CED (%)		Tribe's name
			Male	Female	Female	Male	
Bose et al (2006b)	Bankura	500	18.6	18.2	56.4	48	Kora-mudi (M& F)
Ghosh & Malik (2007)	Bankura	800	-	-	52.5	55	Santal (M& F)
Bisai & Bose (2009)	Bankura	123	18.3			55.3	Kora-mudi (F)
Ghosh et al. (2018)	Bankura	226	19	18.4	56.5	46.8	Sabar (M& F)
Mukhopadhyay A (2010)	Birbhum	251	20.5	19.5	38.5	30.5	Santal (M& F)
Mittal & Srivastava (2006)	Jalpaiguri, WB	350	18.8	19.7	30.7	47.0	Oraon (M&F)
Ghosh & Bharati (2006)	Kolkata	234	17.7	-	-	67.9	Munda (F)
Bose et al. (2006a)	West Medinipur	410	20.0	19.0	41.8	31.5	Santal (M& F)
Bose et al. (2008)	West Medinipur	157	19.5	-	-	45.2	Lodhas (M)
Bose et al. (2008)	West Medinipur	161	18.6	-	-	48.4	Bhumij (M)
Bose et al. (2011)	West Medinipur	106	19.3	-		35.8	Munda (M)
Das et al. (2013a)	West Medinipur	106	18.4	-	-	50.0	Munda (M)
Bose et al. (2011)	West Medinipur	104	19.4	-	-	37.5	Oraon (M)
Ghosh & Bose (2015)	West Medinipur	195	18.6	-	-	52.3	Bhumij (M)
Mahapatra et al. (2021)	West Medinipur	100	17.8	19.96	40	72.0	Oraon (M& F)
Bose et al (2011)	West Medinipur	104	19.4	-	-	-	Oraon (M)
Das & Bose (2010)	Purulia	513	19.5	18.1	63.4	30.6	Santal (M&F)
Das et al. (2013b)	Purulia	72	20.5	-	-	19.4	Birhor (M)
Das et al. (2020)	Purulia	307	19	-	-	47.2	Sabar (M)
Banik et al. (2007)	Siliguri	305	19.5	19.1	46.4	27	Dhimal (M&F)
Present Study (2022)	South 24 Parganas	306	19	18.11	43	37	Munda (M&F)

On the whole, a comparative study, from both the genders, Table 3 revels that the women show higher prevalence of grade I (16.77 percent), grade II (6.71 percent) and grade III (5.36 percent) malnutrition compared to 15.38, 3.85 and 4.49 percent of males, respectively. It shows that compared to men, who are

malnourished at a rate of 26.29 percent, women are at 44.87 percent. Therefore, among the Munda people living in Lahiripur Gram Panchayat, the ladies are worse off nutritionally than their male counterparts.

Conclusion

Undernutrition is extremely easily caused when people are continually hungry but aren't given anything to eat. The Body Mass Index (BMI) measures adult malnutrition, and a BMI below 18.5 indicates a persistent energy deficiency. People in the states of Karnataka, Gujarat, Madhya Pradesh, and Odisha suffer from severe adult malnutrition. More than half of adult individuals in Karnataka, Gujarat, Madhya Pradesh, and Odisha have a BMI under 18.5. (FAO 2010). The male Santal population of West Bengal has the highest mean BMI (20.5 kg/m^2) (Mukhopadhyay 2010:118). The male Warli population of Maharastra has the lowest mean BMI (BMI = 16.8 kg/m^2) (Adak et al. 2006: 12). Similarly, Jarowa women have the highest BMI (BMI = 19.8 kg/m^2) of any ethnic group (Sahani 2003: 52). The lowest mean BMI of any of the examined tribal communities is seen in the female Munda community of West Bengal (BMI = 17.7 kg/m^2) (Table 4).

There are many reasons for the inconsistent prevalence rate of undernutrition. The limited sample size, non-representative sampling, and other factors are the main contributors to the disparity in the incidence rate of undernutrition. The various West Bengali tribes' nutritional status is not great. The morbidity and mortality rates, as well as the health profiles, of the various West Bengali tribes are crucial and disturbing. With the exception of a few towns in the country's northeast, almost all of the tribes (Table No. 4) showed high rates of CED or chronic energy deficiency. It is reasonable to state that investigation among many tribal people from other regions of India is necessary before a more complete picture can be developed.

In India, there are 28.1% more women than men who are underweight, according to the National Family Health Statistics-3 report (NFHS-3, 2005–2006). Tools for evaluating nutritional status include chronic energy deficiency and the body mass index. The Munda community in West Bengal, India, has a better health profile than other tribes.

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Ethics-approved: Verbal agreement from local administrators and members of the community

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