

Nutritional Assessment by Mid-Upper Arm Circumference of Santal Adults of Purulia, West Bengal, India

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ABSTRACT

*The present community based cross-sectional study was undertaken to determine the prevalence of undernutrition using mid-upper arm circumference (MUAC) among adult (> 18 years) Santals of Purulia District, West Bengal, India. It was undertaken at 10 villages of the district. A total of 520 (217 males and 303 females) subjects were measured. Commonly used indicator i.e., MUAC and BMI, were used to evaluate the nutritional status of the subjects. More women (64.7%) than men (54.4%) based on MUAC and women (59.4%) than men (34.6%) based on BMI were undernourished. Significant sex difference both in MUAC ($t=2.378$, $p<0.05$) and BMI ($t=4.971$, $p<0.001$) were observed. Significant age group difference for MUAC was observed ($F=8.93^{***}$, $df=3$) for men and ($F=9.52^{***}$, $df=3$) for women. For BMI, these values were $F=10.10^{***}$ ($df=3$) $F=6.17^{***}$ ($df=3$) respectively. In conclusion, we found that adult Santals of both sexes were under critical nutritional stress, women and the oldest among them were the most.*

Key words: MUAC, BMI, Santal, Purulia, tribe, nutritional status

Introduction

Adult's nutrition and health are of particular importance because at this age group one has to take the primary responsibility for the economic support of the rest of society. India remains one of the poorest countries in the world, with a population of over one billion and a fertility rate well above replacement level¹. More than half the world's undernourished populations live in India². In general, tribal populations of India are recognized as socially and economically vulnerable³. The mid-upper arm circumference (MUAC) is relatively simple and easy to measure and has recently been recommended for use in rapid screening of adults for undernutrition to determine the need for admission to a feeding programme⁴⁻⁷. Anthropometric measurements are well established and widely used as indicator of nutritional and health status of children and adults⁸. The MUAC is an anthropometric measure that can be used to evaluate adult nutritional status. The MUAC has been recommended as a useful measure in diagnosis of malnutrition among adults in developing countries⁷. Being a very simple measure with minimum equipment, MUAC has also been found to predict morbidity and mortality as accurately as deficits in

weight⁹. Arm circumference values have also been derived either to substitute for the BMI measurement or to combine with it as a more selective indicator of the peripheral wasting of muscle and subcutaneous adipose tissue⁷.

In our study, the objective was to evaluate the nutritional status, based on MUAC, of adult Santals of Purulia District, West Bengal, India. We also compared our findings with previous studies which have evaluated nutritional status of various populations based on MUAC.

Materials and Methods

Our study was a community based, cross-sectional study conducted at ten different villages of Purulia District, that are situated about 250 km from Kolkata, the capital of West Bengal, India. This study was carried out from December, 2009 to January 2010. A total of 520 (217 males and 303 females) above 18 years of age were measured. Data were collected after obtaining the necessary approval from the villager's authorities. Partici-

pants were informed about the objectives of our study before the commencement of measurement. Information on age, ethnicity and gender were collected using a pre-tested questionnaire by house-to-house visit following interview and examination. MUAC measurements were taken on each subject by the first author following the standard techniques¹⁰. According to the 2001 census, the district has a population of 25, 36,516 of whom 12, 98,078 are males and 12, 38,438 are females. Out of this total population, 19.35% belong to Scheduled Castes and 19.22% to Scheduled Tribes. The literacy rates of males and females are 74.18% and 37.15% of the total population, respectively. Purulia district is having the second highest percentage of tribal population (18.3%) after Jalpaiguri (18.9%) in West Bengal.

Santals belong to the Proto-Australoid group with dark skin colour, sunken nose and lower forehead. Santals comprise 62.66% of the total tribal population of Purulia, West Bengal.

Nutritional status of the subjects was evaluated using internationally accepted guidelines^{8,7}. Males and females were classified as undernourished if they had MUAC values of <23.0 cm and <22.0 cm, respectively.

Student's t-test was performed to test for sex differences in mean MUAC and BMI. One way Anova (F test) was performed to test for age group differences in mean MUAC and BMI. All statistical analyses were undertaken using the SPSS Statistical Package. Statistical significance was set at $p < 0.05$.

Results

Age and sex specific number mean, standard deviation and prevalence of CED distribution for the mid-upper arm circumference (MUAC) and body mass index (BMI) of Santal adults are presented in Tables 1 and 2. Mean MUAC were 22.7 cm (men) and 21.1 cm (women). Of these, 54.4% men and 64.7% women had an arm circumference measurement that was less than standard cut-off value separately for men (23 cm) and women (22 cm). Examination of the arm circumference and BMI means and prevalence of CED calculated for men and women of four different age groups revealed an apparent effect of age on this parameter in men and women. The arm circumference mean was greatest for men aged 31 to 40 yrs and least for men in the oldest age group and the

BMI mean was greatest for men aged 31 to 40 yrs and least for men in the oldest age group. While the a arm circumference mean was greatest for women aged 41 to 50 yrs and least for women in the oldest age group and the BMI mean was greatest for women aged 31 to 40 yrs and least for men in the oldest age group respectively.

Prevalence of CED among men (Table 1) based on MUAC and BMI clearly revealed that with the advancement of age prevalence of CED also inclined (except 18–30 yrs) gradually and the prevalence of CED increase was maximum (21.2%, based on MUAC) for >50 yrs age group and 22.3% (based on BMI) for 41–50 yrs. Similarly prevalence of CED among women based on MUAC and BMI showed gradual decline in CED from 18–30 yrs to 41–50 yrs then suddenly incline of 26.9% (based on MUAC) and fluctuation of CED was also observed from 18–30 to > 50yrs. The maximum increase was observed as 12.8% for 41–50 yrs women. Significant sex differences existed both in MUAC ($t = 2.378$, $p < 0.05$) and BMI ($t = 4.971$, $p < 0.001$). There is clear age group difference observed among men for mean MUAC ($F = 8.93^{***}$, $df = 3$) and BMI ($F = 10.10^{***}$, $df = 3$). Similarly age group difference existed among women for mean MUAC ($F = 9.52^{***}$, $df = 3$) and BMI ($F = 6.17^{***}$, $df = 3$). Thus, it is clear from the tables that Santal adults of Purulia, India are in very critical situation for all age groups and the oldest among them are experiencing the most worst critical situation with respect to their health and nutritional status.

Discussion and Conclusion

MUAC is an appropriate indicator for the assessment of acute adult undernutrition. This indicator is useful for both screening acute adult undernutrition and for estimating prevalence of undernutrition at a population level⁵. The assessment of adult nutritional status using MUAC requires no equipment apart from a tape measure. As the index is the actual measurement itself, mathematical manipulation of the measurement obtained is not necessary. The ease with which MUAC can be assessed makes it suitable for nutritional screening during the height of an emergency where time and skilled personnel are at a premium⁵.

Figure 1 compares the prevalence of CED based on MUAC among the different available data. It is clear from this figure that Santals of the Purulia were experi-

TABLE 1
PREVALANCE OF UNDERNUTRITION, BASED ON MUAC AND BMI, AMONG ADULT MALE SANTALS OF PURULIA, WEST BENGAL, INDIA

Age Group (years)	N	MUAC (cm) μ /SD	BMI (kg/m ²) μ /SD	CED % MUAC	CED % BMI
18–30	88	23.1/1.7	19.6/2.2	44.3	23.9
31–40	46	23.6/2.5	20.2/2.5	41.3	23.9
41–50	26	22.8/1.8	19.5/2.6	57.7	46.2
>50	57	21.2/2.1	18.2/2.0	78.9	54.4

$F = 8.93$ (0.000) $df = 3$ $F = 10.10$ (0.000) $df = 3$

TABLE 2
PREVALANCE OF UNDERNUTRITION, BASED ON MUAC AND BMI, AMONG ADULT FEMALE SANTALS OF PURULIA,
WEST BENGAL, INDIA

Age Group (years)	N	MUAC (CM) μ /SD	BMI (kg/m ²) μ /SD	CED % MUAC	CED % BMI
18–30	142	21.2/1.7	18.3/1.7	64.1	59.2
31–40	69	21.5/2.7	18.9/2.4	56.5	47.8
41–50	33	21.7/2.1	18.5/2.5	54.5	60.6
> 50	59	19.8/2.2	17.3/2.2	81.4	72.9

F=9.52 (0.000) df=3 F=6.17 (0.000) df=3

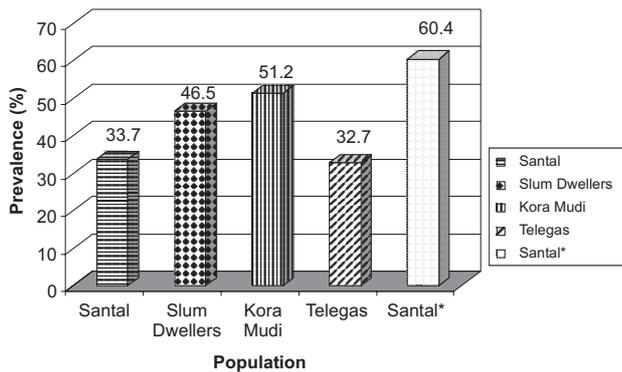


Fig. 1. Comparison of CED (based on MUAC) among different tribal populations.

encing highly critical nutritional stress (60.4%) followed by Kora Mudis (51.2%) of Paschim Medinipur¹¹, Slum dwellers (43.5%) of Paschim Medinipur¹², Santals (33.4%) of Bankura¹³ and Telegas (32.7%) of Paschim Medinipur¹⁴ using MUAC.

The MUAC is recognized as a potential screening tool for poor nutritional status in adults¹⁵. The MUAC measurement reflects adult nutritional status as defined by BMI⁴. The measurement of MUAC has been used as a useful screening method for the assessment of nutritional status in different ethnic groups^{6,16}. Since it is the most reproducible and simplest measurement to perform, its use has been recommended in nutritional studies¹⁷.

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Measuring MUAC has several advantages; the measurement can be taken quickly and at little cost. It requires neither sophisticated equipment nor anything but the most basic literacy level to carry out¹⁸. However, although an MUAC value <23 cm & <22 cm have been recommended for use to define undernutrition⁷ this value may not be the most appropriate cut-off point in all ethnic groups. A recent study from Nigeria¹⁵ reported that a MUAC cut-off point of 23 cm was optimal for the north of the country, while a 24 cm cut-off point was more appropriate for the South. A similar cut-off point of 24 cm was also obtained in a recent study from South India¹⁸. Thus, there is a need for more studies using MUAC in different ethnic groups of India so that they provide ethnic-specific cut-off points of MUAC to facilitate better public health planning and implementation.

It may be prudent to add here that the uniqueness of our study is the paucity of data on the prevalence of undernutrition, based on MUAC, from India.

We conclude that, Santal tribals of Purulia Distirct, West Bengal, were experiencing critical nutritional stress. Immediate appropriate nutritional intervention programs should be implemented among this ethnic group.

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PROCJENA UHRANJENOSTI MJERENJEM OPSEGA NADLAKTICE KOD ODRASLIH SANTALA IZ PURULIJE, ZAPADNI BENGAL, INDIJA

S A Ž E T A K

Studija presjeka je korištena kako bi se utvrdila učestalost pothranjenosti kod odraslih, punoljetnih Santala iz Purulije u zapadnom Bengal, u Indiji, mjerenjem opsega nadlaktice. Istraživanje je provedeno u deset sela u regiji i izmjereno je ukupno 520 pojedinaca, 217 muškaraca i 202 žene. Kod procjenjivanja prehrambenog statusa ispitanika korišteni su uobičajeni indikatori, opseg nadlaktice i indeks tjelesne mase. S obzirom na oba parametra, utvrđeno je da su žene pothranjenije od muškaraca. Značajna razlika po spolu utvrđena je i za opseg nadlaktice ($t=2,378$, $p<0,05$) i za indeks tjelesne mase ($t=4,971$, $p<0,001$). Također je utvrđena značajna razlika po dobi u opsegu nadlaktice kod muškaraca ($F=8,93^{***}$, $df=3$) i kod žena ($F=9,52^{***}$, $df=3$). Za indeks tjelesne mase, navedene vrijednosti su iznosile $F=10,10^{***}$ ($df=3$) za muškarce i $F=6,17^{***}$ ($df=3$) za žene. Zaključno možemo reći da su odrasli Santali oba spola pothranjeni, pogotovo žene i osobe starije životne dobi.