

Anthropometric Measurements and Nutritional Assessment in relation to Chronic Energy Deficiency

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Ajeet Jaiswal*

Professor, Department of Anthropology, School of Applied Sciences, (SAS), Dr Hari Singh Gour University, (A Central University) Sagar, Madhya Pradesh, India

***Corresponding Author:** Ajeet Jaiswal, Professor, Department of Anthropology, School of Applied Sciences, (SAS), Dr Hari Singh Gour University, (A Central University) Sagar, Madhya Pradesh, India.

Abstract

India has a severe health issue with undernutrition (U.N.), particularly among the underprivileged poor tribal population. The current cross-sectional study aims to evaluate the nutritional condition of 145 adult male Jene Kurubas in Karnataka and compare the two functional anthropometric indices of Chronic Energy Deficiency (C.E.D.). C.E.D. was assessed using the B.M.I. (body mass index) and the MUAC (mid-upper-arm circumference). According to the results of the current study, chronic energy deficiency was prevalent in 53.8% of cases, and undernutrition based on MUAC < 23.0 cm was present in 48.3% of cases. According to WHO recommendations, these prevalences fall into the highly high-prevalence category (≥ 40 percent), signifying a critical situation. The rate of C.E.D. was significantly higher (81.4%) among those with low MUAC (< 23.0 cm) than among those with a normal MUAC (≥ 23.0 cm) (18.6%). The findings of this study suggest that the Jene Kurubas tribal group was under significant dietary and nutritional stress. For surveys of the human population, particularly among indigenous people, i.e. tribes of developing countries like India, it may be more appropriate to employ mid-upper-arm circumference due to budget constraints or lack of resources and professional labour.

Keywords: Tribal; Jene Kuruba; Karnataka; Anthropometry; Nutritional Assessment; CED; MUAC

Introduction

Despite certain inherent drawbacks, anthropometry continues to be the most helpful method for quickly evaluating nutritional conditions at the person and population levels, especially when resources are scarce in emerging countries like India. The B.M.I. is one of the most reliable indicators of adults' nutritional health. (WHO, 1995).

Numerous studies have demonstrated that B.M.I. (Body Mass Index) is a reliable anthropometric indicator of total body fat or the body's ability to store energy (Jaiswal, 2014; Jaiswal, 2012; Jaiswal et al., 2011; Bose, 1996; Deurenberg et al., 1991). Although there are various approaches to assessing adult nutritional health, The B.M.I. is the most used since it is simple, inexpensive, safe, and suitable for large-scale-surveys (Jaiswal, 2014; Jaiswal, 2007; Lee and Nieman, 2003; James et al., 1994).

Body Mass Index provides insight into a population's socioeconomic status and nutritional state, particularly for adult populations in underdeveloped nations. (Mosha, 2003; Khongsdier, 2005; Nube et al., 1998; Shetty and James, 1994). A BMI < 18.5 kg/m² is widely used as a valuable indicator of C.E.D., which is described as a "steady" state of underweight in which a person is in an energy balance independent of a decline in body weight or body energy stores (Khongsdier, 2005). Such "steady" underweight is most likely associated with morbidity and other physiological and functional deficiencies or impairment (WHO, 1995).

Chronic energy deficiency results from insufficient energy or calorie intake, intense physical activity, and infections over time (Shetty et al., 1994). It is linked to decreased work capability, subpar or poor performance and output at the workplace, suppression of immune system-related morbidity and behavioural changes (Shetty & James, 1994; Durnin, 1994).

Mid-upper arm circumference (MUAC), on the other hand, is one more anthropometric measurement to evaluate the nutritional status of adults. (Ghosh and Bose, 2015; Jaiswal, 2012; James et al., 1994). It is a less complex measurement than B.M.I., requires little equipment, and might be just as accurate at predicting morbidity and mortality as being underweight (Ghosh and Bose, 2015; Briend et al., 1989). A thorough analysis of data from Eight nations found that the primary screening approach for determining nutritional status may be the MUAC. When a population of adults needs to be quickly screened to focus assistance on undernourished individuals, MUAC has been proposed as a replacement for B.M.I. (James et al., 1994).

Even though there is a lot of worry about global hunger and food shortages, the frequency of undernutrition among people hasn't been studied much among people living in underdeveloped nations until recently (Griffiths et al., 2001). Despite the region's economic growth, undernutrition is still a significant public health issue in many Asian countries (Ghosh and Bose, 2015).

India is one of the world's poorest nations. Over the past 20 years, improvements have not been particularly notable despite the town undertaking several current strategies to improve its citizens' nutritional status (Ghosh and Bose, 2015; Griffiths et al., 2001). India was home to over half of the worlds undernourished people at the turn of the 20th century (Ghosh and Bose, 2015; Krishnaswami, 2000). In addition, India's tribal populations are among the most disadvantaged.

More than 104 million tribal people were counted in India's 2011 census, making up 8.6 % of the country's total population. The world's most significant concentration of tribal communities is probably in India (Topal & Samal, 2001). Most tribal or indigenous people are socially and economically disadvantaged and live in rural areas of the nation (Ghosh and Bose, 2015; Mittal and Srivastava, 2006; Ghosh & Bharati, 2006).

Kurubas are Hindus who follow Halumatha, concentrated mainly in the southern states of Karnataka and Andhra Pradesh. The population of Kurubas in Karnataka state alone is around 80 lakhs. Jenu Kurubas were of Dravidian origin, a particularly vulnerable tribal group of Karnataka and is descendent of ancient Kurubas. The Jenu Kurubas are renowned for their honey-collecting skills. They are originally hunting-gathering tribes but possess a unique talent as they are collecting honey from the interior of the forest. Their traditional economy is Honey collection, Food gathering and Small Game Hunting. Jenu Kurubas were short to medium stature, lean body, head from dolichocephalic to mesocephalic, and skin colour was dark brown, with thin wavy hair. Their traditional foods are Honey, Small Game Meat, Fruits, Tubers, Raggi, and Rice. They are non-vegetarian. Raggi is their staple food. But now they eat Raagi, Rice, Eggs, Meat (but not beef), Sambar and Vegetables. However, regarding the nutritional situation or health status of Jenu Kurubas, relatively little information is accessible. Very few studies combine MUAC and B.M.I. to evaluate undernutrition (U.N.) among the adult tribal population. In light of this, the current study was conducted to determine the prevalence or prevalence of C.E.D. and U.N. among adult male Jenu Kurubas tribes of H D Kote Taluk based on the MUAC cut of value. It is located 36 miles southwest of Mysuru in the Indian state of Karnataka, in a remote forest area.

Materials and Methods

A cross-sectional study of adult male Jenu Kurubas tribes in the H D Kote Taluk district of Mysore, Karnataka, was conducted between December 2016 and January 2017. 145 adult male Jenu Kurubas tribes over 18 were included in the study after the H D Kote Taluk peoples were informed about it. Minor under 80 percent of people responded. Most participants were manual labourers with low socioeconomic levels who earned little money and were illiterate. The Helsinki Declaration served as a guide for ethical considerations (Goodyear et al., 2007). The goal of the fieldwork was communicated to the required district-level, local, and community administrative officials. Before each interview and measurement technique, subjects verbally agreed in their native language.

A pre-tested questionnaire collected information about age, sex, height (H) and weight (W)(anthropometry). For each individual, the basic techniques for taking anthropometric measurements, such as H, W, and MUAC, were used (Lohman et al., 1988; Weiner and Laurie, 1981). Using a traditional anthropometric instrument like, an anthropometer rod, weighing machine and fibre measuring tape, the subjects' height, weight, and MUAC were measured to the nearest 0.1 kg and 0.1 mm, respectively. B.M.I. was calculated as $W \text{ (kg)} / H^2 \text{ (m}^2\text{)}$.

Utilizing internationally recognized B.M.I. criteria, nutritional status was assessed (W.H.O., 1995):		
1	C.E.D.:	B.M.I. <18.5 kg/m ²
2	Normal:	BMI=18.5-24.99 kg/m ² ;
3	Overweight:	B.M.I.≥25.0 kg/m ²
Adopted the W.H.O. (1995) definition of low B.M.I. as a global public health issue based on adult populations.		
This classification divides prevalence into groups based on the proportion of the population having a B.M.I. under 18.5 (B.M.I. < 8.5 kg/m ²)		
1	Low - (5-9%):	Warning sign, monitoring required;
2	Medium - (10-19%):	poor situation;
3	High - (20-39%):	serious situation;
4	Very high - (≥40%):	critical situation
For assessing nutritional status research among people in the third world, the MUAC might be utilized. Among Men, the following cut-off points were used:		
1	Under-nutrition:	MUAC < 23.0 cm;
2	Normal:	MUAC ≥ 23.0 cm.

The age and anthropometric data were described using mean and standard deviation calculations, and the prevalence rates were calculated using percentages. To evaluate the significance of the prevalence rate differences or discrepancies between groups, chi-square statistics were performed. The OR (odds ratio) with a 95% CI (confidence interval) was also calculated to determine the likelihood that a specific condition, such as undernutrition, would develop. The statistical analysis was carried out using SPSS. A p-value of 0.05 or less is considered statistically significant.

Results

<i>Jenu Kurubas Tribes</i>	<i>Mean</i>	<i>±SD</i>	
<i>Age (months)</i>	35.8	14.6	
<i>Anthropometric Characteristics</i>			
Height (cm)	158.6	7.4	
Weight (kg)	46.8	6.4	
M.U.A.C. (cm)	23.1	2.2	
B.M.I (kg/m ²)	18.7	2.6	
<i>Nutritional status</i>		<i>N=145</i>	
<i>Body Mass Index (B.M.I)</i>	<i>Category</i>	<i>Frequency</i>	<i>(%)</i>
< 16.0	CED- Grade-III	19	13.1
16 - 16.99	CED- Grade-II	10	6.9
17 - 18.49	CED- Grade-I	49	33.8
18.5 - 24.99	Normal	66	45.5
≥25.0	Overweight	01	0.7
≥ 30.0	Obese	00	00
<i>MUAC (cm)</i>			
<23.0	Under-nutrition	70	48.3
≥23.0	Normal	75	51.7
<i>Relationship between B.M.I. and MUAC (N (%))</i>			
Nutritional condition by B.M.I. (row) and MUAC (column)	Under-nutrition B.M.I.< 18.5 kg/m ²	Normal B.M.I.≥ 18.5 kg/m ²	Total
Under-nutrition: UN (MUAC <23 cm)	57(81.4)	13(18.6)	70 (48.3)
Normal (MUAC≥23 cm)	21(28.0)	54(72.0)	75 (51.7)
Total	78 (53.8)	67 (46.2)	145 (100)
Chi-square = 56.84, p <0.001. OR=10.84 (95%CI: 5.26 -22.59)			

Table 1: Distribution of adult male Jenu Kurubas tribes According to Their Age, Anthropometric Characteristics (A.C.) and Nutritional status.

The distribution of adult male Jenu Kurubas tribes is shown in the table, along with the tribes' ages, anthropometric characteristics (A.C.), and nutritional conditions. MUAC and B.M.I. had mean and standard deviations of 23.1±2.2 cm and 18.7±2.2 kg/m², respectively. Based on MUAC, the nutritional condition of the participants showed that 54.5% were malnourished, with 53.8% being undernourished. C.E.D.-Grade III, II, and I prevalence rates were 13.1%, 6.9%, and 33.8%, respectively. As for the participants' nutritional condition, according to the MUAC, undernutrition rates are 48.3%, while normal rates are 51.7%. The rates of low B.M.I. are closest to it (53.8%).

However, the prevalence of C.E.D. and undernutrition are correlated, as measured by B.M.I. and MUAC. Undernutrition was 48.3% based on MUAC and 53.8% based on B.M.I. According to B.M.I., the rates of undernutrition are higher among those with low MUAC (<23 cm) than they are for people with normal MUAC (81.4% vs 18.6%). With a low B.M.I., this low MUAC was statistically significant ($\chi^2=57.84$, $p<0.01$). The findings show that chronic energy deficiencies were 10.84 times more likely in people with low MUAC.

Discussion

Undernutrition among the tribal community is a severe problem for public health in many underdeveloped countries, including India. It is well recognized that those less fortunate on both a social and economic level are more likely to be malnourished than others. In India, tribal populations are considered economically and socially disadvantaged (Jaiswal 2013).

B.M.I. has been used in several recent kinds of research related to India to examine the undernutrition of tribal groups (Jaiswal and Rajan, 2021; Ghosh and Bose, 2015; Jaiswal, 2013; Bose et al., 2006; Bose and Chakrabarty, 2005; Sahani, 2003; Gogoi and Sengupta, 2002; Yadav et al., 1999). Therefore, the WHO's recommendation to adopt B.M.I. and associated cut-off criteria for C.E.D. evaluation is valid for usage among Indian tribal communities. High rates of adult C.E.D. carry a heavy financial and health burden, which has been well-documented (Jaiswal and Rajan, 2021; Ghosh and Bose, 2015; Khongsdier, 2005; Naidu & Rao, 1994; Cambell et al., 1994; James et al., 1994; Ferro-Luzzi et al., 1992). It has already been demonstrated that a high frequency of C.E.D. has functional and economic implications. Therefore, it is essential to work to understand how functional limitations typically associated with low B.M.I. affect various ethnic groups. Determining the link between the high frequency of U.N. (undernutrition) and adult mortality and morbidity is also crucial.

The results of the current study made it abundantly evident that, based on either B.M.I. (53.8%) or MUAC (48.3%), the prevalence of C.E.D. among male Jenu Kurubas tribes in the H D Kote Taluk in the district of Mysuru, Karnataka, was extremely high. According to WHO recommendations, these percentages are more than 40%, placing the population in a dangerous position, i.e. in a critical situation. Other tribal communities in India have also been shown to have a high prevalence of C.E.D. (Jaiswal and Rajan, 2021; Ghosh and Bose, 2015; Jaiswal, 2013; Bose et al., 2006; Bose and Chakrabarty, 2005; Sahani, 2003; Gogoi & Sengupta, 2002; Yadav et al., 1999). The WHO classifies these numbers as high (20 to 39%) to incredibly high (>40%) rates because the rates of C.E.D. ranged from 30.6 to 55%, while the mean B.M.I. was between 18.4 and 19.5. (1995). These findings showed that these tribes' adult males were experiencing critical or severe nutritional stress.

In the current investigation, the likelihood of undernutrition (MUAC <23 cm) was considerably greater, i.e. significantly higher among those with C.E.D. (Chi-square=56.84, $p < 0.001$), indicating a strong correlation between these variables, i.e. well correlated. This suggests that both of these measurements might be employed to assess the nutritional condition of adult male Jenu Kurubas tribes. However, the disparity or differences between the two measures' estimates of the prevalence of C.E.D. may have public health repercussions, particularly in extensive population surveys.

Additionally, MUAC should be opted for in large-scale studies since it is much easier to measure than B.M.I. (WHO, 1995; Ulijaszek et al., 1999). Therefore, surveying the human population using MUAC may be appropriate given resource constraints and a lack of professional labour, especially among rural communities in emerging countries. Thus, although both B.M.I. and MUAC might be used to evaluate nutritional status, MUAC might be preferred because of its simplicity.

However, it is essential to note that the limited sample size and lack of data on nutritional intake were some of the study's weaknesses. The quick implementation of suitable dietary intervention programmes within this ethnic group is crucial from a public health standpoint. Future research should focus on identifying various approaches for estimating undernutrition. Additionally, appropriate solutions should be offered to address the issue of undernourishment in India, particularly among tribal groups. The absence of information on illness was one of the study's flaws. Future research on the nutritional condition of indigenous people should take a variety of morbidity metrics into account. These studies will yield valuable data regarding the connection between sickness and undernutrition.

Conclusion

The nutritional status of the male Jenu Kurubas tribes in the H D Kote Taluk district of Mysuru, Karnataka, is critical. Improving nutritional status is essential for the tribe's well-being because undernutrition is closely linked to sickness and mortality. Despite the

possibility of using both B.M.I. and MUAC to assess nutritional status, MUAC can be preferable because of its simplicity.

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The competing interests

The author declares that there are no competing interests.

Conflict of Interest

No conflict of interest.

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