

NUTRITIONAL ASSESSMENT: COMPARISON OF THE TWO USEFUL ANTHROPOMETRIC MEASURES OF CHRONIC ENERGY DEFICIENCY IN ADULT MALE JENE KURUBA TRIBE, KARNATAKA

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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 parameters of Chronic Energy Deficiency (C.E.D.). CED was assessed using the BMI (body mass index) and the mid-upper-arm circumference (MUAC). 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 per cent), 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.

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INTRODUCTION

Anthropometry is the scientific study of human body measurements and proportions. It involves the systematic measurement of various body dimensions, such as height, weight, length, circumference, and other physical attributes. These measurements are collected to understand the physical variations among individuals and populations, and they can provide valuable data for fields like anthropology, ergonomics, medicine, and nutrition. 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 BMI is one of the most reliable indicators of adults' nutritional health. (WHO 1995).

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Numerous studies have demonstrated that BMI (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 BMI 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 & 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 BMI, 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 BMI (James et al. 1994).

Global hunger and food shortages are significant challenges that persist in many parts of the world. Despite advancements in agricultural production and food distribution systems, numerous factors contribute to these issues. 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

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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 world's 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 are 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 for 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), Samber and Vegetables. However, regarding the nutritional situation or health status of Jenu Kurubas, relatively little information is accessible. Very few studies evaluate undernutrition (U.N.) among the adult indigenous population by combining MUAC and BMI. Like (Tanuja et al. 1995; Yadav et al. 1999; Yadu et al. 2000; Khongsdier 2005; Jaiswal 2012; Das et al 2013; Ghosh and Bose 2015; Jaiswal 2015). 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. One hundred forty five 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 per cent 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 pretested questionnaire were used to collect the demographic information and satandard Lohman et al. 1988; Weiner and Laurie 1981 technique were used to collect the anthropometric measurements, such as H, W, and MUAC like height were measured by anthropometer rod, weight was taken by using weighing machine and fibre measuring tape were used to take MUAC to the nearest 0.1 kg and 0.1 mm, respectively. BMI was calculated as $W \text{ (kg)} / H \text{ (m}^2\text{)}$.

Table 1: Internationally Recognized BMI and MUAC Criteria

| | | |
|---|----------------------------|------------------------------------|
| Utilizing internationally recognized BMI criteria, nutritional status was assessed (W.H.O., 1995): | | |
| 1 | C.E.D.: | BMI <18.5 kg/m ² |
| 2 | Normal: | BMI=18.5-24.99 kg/m ² ; |
| 3 | Overweight: | BMI ≥25.0 kg/m ² |
| Adopted the W.H.O. (1995) definition of low BMI 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 BMI under 18.5 (BMI < 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. |

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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

Table 2: Distribution of adult male Jenu Kurubas tribes According to Their Age, Anthropometric Characteristics (A.C.) and Nutritional status

| Jenu Kurubas Tribes | Mean | ±SD | |
|--|---|--|------------|
| Age (months) | 35.8 | 14.6 | |
| Anthropometric Characteristics | | | |
| 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 | |
| Nutritional status | | N=145 | |
| Body Mass Index (BMI) | Category | Frequency | (%) |
| < 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 |
| MUAC (cm) | | | |
| < 23.0 | Under-nutrition | 70 | 48.3 |
| ≥ 23.0 | Normal | 75 | 51.7 |
| Relationship between BMI and MUAC (N (%)) | | | |
| Nutritional condition by BMI (row) and MUAC (column) | Under-nutrition BMI < 18.5 kg/m ² | Normal BMI ≥ 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) | | | |

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 BMI 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 BMI are closest to it (53.8%).

However, the prevalence of C.E.D. and undernutrition are correlated, as measured by BMI and MUAC. Undernutrition was 48.3% based on MUAC and 53.8% based on BMI. According to BMI, 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 BMI, 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

BMI 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 BMI 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 BMI affect various ethnic groups. Determining the link between the high frequency of U.N. (undernutrition) and adult mortality and morbidity is also crucial. In India, tribal populations are considered economically and socially disadvantaged.

Result of study is clear in highlighting that undernutrition is a significant public health problem, particularly in underdeveloped countries like India. It is well-recognized that individuals who are socially and economically disadvantaged are more likely to experience malnutrition compared to those who are more fortunate. Various factors contribute to the higher prevalence of undernutrition among less fortunate populations. These factors include limited access to nutritious food, inadequate healthcare facilities, poor sanitation and hygiene, lack of education and awareness about proper nutrition, and limited economic opportunities. Additionally, socio-cultural factors, such as traditional practices and beliefs, can also influence dietary patterns and contribute to

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undernutrition.

Efforts to address undernutrition in tribal communities and other marginalized populations require a multi-faceted approach. This approach should encompass interventions that focus not only on improving food availability and access but also on enhancing healthcare services, promoting education and awareness, and addressing the underlying social and economic determinants of malnutrition (Jaiswal 2013).

The results of the current study made it abundantly evident that, based on either BMI (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 BMI was between 18.4 and 19.5. (1995). These findings showed that these tribes' adult males were experiencing critical or severe nutritional stress.

The investigation reveals a significant correlation between MUAC (mid-upper arm circumference) and C.E.D. (chronic energy deficiency) among adult male Jenu Kurubas tribes. The likelihood of MUAC being less than 23 cm, indicating undernutrition, was considerably higher among individuals with C.E.D. This correlation was found to be strong, as indicated by the Chi-square value of 56.84 and a p-value of less than 0.001.

These findings suggest that both MUAC and C.E.D. can be utilized as measures to assess the nutritional status of adult male Jenu Kurubas tribes. However, it is important to note that there may be disparities or differences between the two measures' estimates of the prevalence of C.E.D. These disparities could have public health implications, particularly in extensive population surveys.

Further research and analysis would be needed to understand the reasons behind the differences in estimates and their potential impact on public health interventions. It is important to

consider these disparities to ensure accurate assessment and appropriate targeting of interventions to address C.E.D. among the Jenu Kurubas tribes.

Additionally, MUAC should be opted for in large-scale studies since it is much easier to measure than BMI (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 BMI 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 BMI and MUAC to assess nutritional status, MUAC can be preferable because of its simplicity.

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Yadu, P., Reddy, B. & Rao, P.A. (2000). Body Mass Index (BMI) Among The Sugalis – A Tribal Population Of Cuddapah District, Andhra Pradesh, *Journal of Human Ecology*, 11, 409-410.

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