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# Nutritional Anthropometry of the Adult Juang Population in Odisha

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## Introduction

In India, the problem of under nutrition, especially in vulnerable women and children, has been the main focus of nutritional study. There is some indication that India is experiencing a changing nutritional landscape. Statistics from other emerging nations show that increasing urbanization and advances in economic development cause under- and over nutrition in the populace at the same time in many resource-poor situations (Blomgren, J. et.al. 2004). Less striking improvements have been made to the population's nutritional status (NIH, 1989). India is home to more than half of the world's undernourished people, indicating only modest progress in reducing under nutrition rates (Griffiths PL, 2001).

Counting over a billion people and having a fertility rate substantially above replacement, India continues to be among the world's poorest nations by almost every standard. Over the past ten years, there has been progress in several health metrics in India due to the country's rapid social and economic transformation (Eveleth PB, 1986).

Due in part to the country's continued high rate of under-nutrition, there is a lack of statistics for India despite the increased emphasis given to the prevalence of overweight and obesity in many developing nations (Frisancho AR., 1990). From 1950 to 1991, India's urbanization rate increased gradually; nevertheless, the fastest growth occurred in 1971, when the percentage of the population living in urban areas increased from 19 to 26%.

The prevalence of under-nutrition is high among the Juangs, a vulnerable tribal population in Odisha, India, especially among women (Goswami, M. 2013). The overall prevalence of under-nutrition based on body mass index (BMI) among the Juang population in Odisha is high, particularly among women. The extent of under-nutrition (BMI<18.5 kg/m2) among the Juangs is found to be very high, with 57.5% of the population being classified as undernourished. Some study also found that the Juang males show relatively higher mean height and weight compared to females, but there is a significant sex difference in mean BMI. In terms of anthropometric measures, the prevalence of thinness (low BMI-for-age) among Juang children and adolescents is also a concern, with an overall prevalence of 15.61%. Immediate intervention programs focused on food and health awareness are needed to address the nutritional challenges faced by the Juang population in Odisha. (Ray, A. K., Rath, E. A. 1984).

The Juang community, an indigenous tribe residing in the remote regions of India, faces significant challenges in terms of under-nutrition and food insecurity. This article delves into the prevalence of under-nutrition among the Juangs, exploring the various factors contributing to this issue, its impact

 

on the population, existing interventions and programs, as well as the challenges faced in addressing this critical issue. By understanding the unique socio-economic, cultural, and health-related factors affecting the Juang community, we can identify effective strategies and recommendations to improve nutrition outcomes and well-being within this marginalized group (Elwin, V., 1948).

Malnutrition is a significant issue in Odisha, India. The state has made progress in improving nutrition, but inequities still exist. There is considerable spatial variation in child under-nutrition at the sub-district level in Odisha, with distinct patterns in different regions (Dash, NC., 1997).

Factors such as poor sanitation, low institutional and skilled deliveries, and poor maternal health contribute to under-nutrition in specific geographic pockets. Wrong feeding practices and lack of safe drinking water are also risk factors for severe acute malnutrition (SAM) in children. Agriculture, which is the backbone of food systems in Odisha, plays a crucial role in ensuring healthy and sustainable diets for children, but the association between agriculture and nutrition status is not clear. Treatment outcomes for SAM in nutritional rehabilitation centers in Odisha have shown improvement, with significant changes occurring from admission to discharge (Goswami, M. 2012 & 2013).

Malnutrition is a significant health problem among tribal populations in India, particularly among children. The prevalence of under-nutrition, including chronic energy deficiency, is high among tribal communities. Studies have shown that tribal children have high rates of underweight, stunting, and wasting. Factors such as inadequate transport facilities, lack of health facilities, insufficient means of employment, and improper farming practices contribute to malnutrition among tribes. Additionally, socio-economic inequalities and marginalized status further exacerbate the problem. The prevalence of malnutrition is higher in certain regions, such as the northern, central, and eastern parts of India, as well as in major tribal states like Odisha & Jharkhand. Efforts are needed to address the determinants of malnutrition among tribal populations, including improving access to healthcare, education, and nutritious food (Patnaik, N. 1986).

**Materials and Methods**

The present study has been conducted in Gonasika and Kodipasa GPs (Gram Panchayats) of Banspal block in Keonjhar district of Odisha state. The first half of the field study was done Gonasika GP and second half was done in Kodipasa GP. In every case first few days was spent on rapport and scrutinizing of selected people for sample collection and for rest of the successive days' other works like collection of demographic data like name, age, sex, education etc., somatometric measurements like height, weight was done. Total sample of 274 consisting of 149 male and 125 female respondents were involved in the present study.

Only the adult age group respondents with proper consent were included for the study and the name of the respondents were drawn randomly in both GPs during data collection.

**Measurements of anthropometric Variables**

Obesity is the accumulation of excess body fat, whereas overweight is the excess amount of body weight (containing muscle, bone, fat, and water). While it is possible for someone to be overweight without also being obese, the majority of overweight people also have obesity.

Although there are other methods for calculating overweight and obesity, the most used method for estimating prevalence is body mass index, which is calculated as BMI = weight / height 2. The Asian BMI cutoff criterion is as follows: Suitable: 18.5–22.9; Underweight: <18.5; Overweight: 23-24.9; Pre-obese: 25–29.9; Obese: >30.

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Standard anthropometric techniques were used to assess each study participant's height (cm) and weight (kg) in order to calculate their BMI.

**Figure-1: Showing the Study Area**


**Analysis:** Dependent variables included BMI (weight/ height$^2$) and Asian BMI classification (i.e., normal, underweight, overweight, pre-obese and obese). Calculation of BMI mean, Standard deviation, standard error of mean, t test was calculated by statistical analysis using Statistical Package for the Social Sciences (SPSS).

**Results**

**Table-1: Characteristics of the subject participants**

| SEX | Frequency | Percent |
|---|---|---|
| FEMALE | 137 | 46.92 % |
| MALE | 155 | 53.08 % |
| Total | 292 | 100 |

**Figure-2: Characteristics of the subject participants**

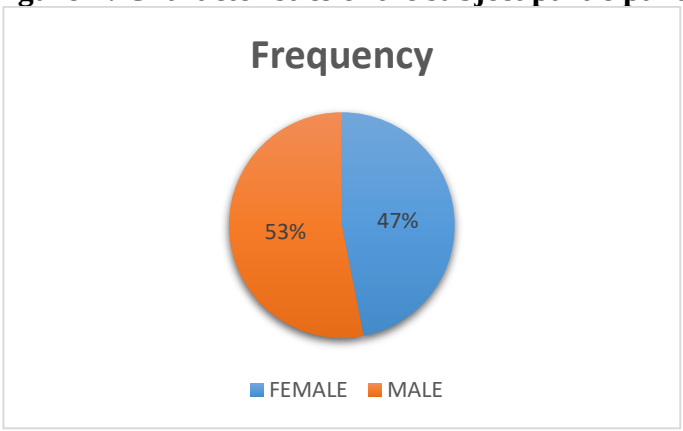


Table 1 and Figure 2, summarizes the study population. Out of total 292 respondents, Male are 155 and 137 are females who were involved in this present study. The participants from both the gender have participated after the verbal consent about the objectives of the study. The participants covers from different Juang villages, Gonasika and Kodipasa GP.

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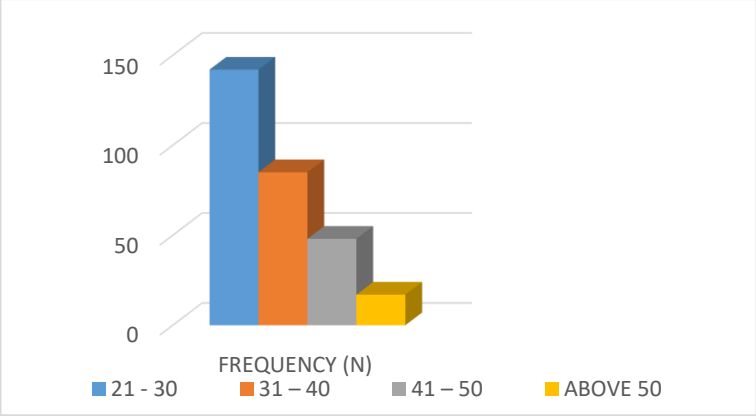
**Table-2: Age group wise distribution of the subject participants**

| AGE GROUP | FREQUENCY (N) | FREQUENCY (N %) |
|---|---|---|
| 21 - 30 | 142 | 48.63 |
| 31 – 40 | 85 | 29.11 |
| 41 – 50 | 48 | 16.44 |
| ABOVE 50 | 17 | 5.82 |
| TOTAL | 292 | 100 |

**Figure-3: Age group wise distribution of the subject participants**




From the above table and figure it has been found that most of the subject participants about 48.63% are belonging from the age group 21-30, 2911% participants from the age group 31-40, 1644% participants are from the age group 41-50 and other 5.82 % participants are from above the age of 50.

**Table-4: Descriptive Statistics of Age, Height, Weight, Waist & Hip of Adult population of the Juang people**

| VARIABLES | OVERALL (N= 292) | FEMALE (N= 137) | MALE (N= 155) |
|---|---|---|---|
| | MEAN ± SD | MEAN ± SD | MEAN ± SD |
| Age | 33.8±9.81 | 32.93±9.39 | 34.53±10.12 |
| Height(in cm) | 150.99±7.79 | 146.05±6.3 | 155.14±6.38 |
| Weight(kg) | 45.65±7.09 | 41.84±5.44 | 48.86±6.72 |
| Min. Waist circumference (cm) | 71.9±6.39 | 70.09±5.88 | 73.42±6.43 |
| Max. Hip circumference (cm) | 82.8±5.68 | 82.95±5.41 | 82.68±5.91 |
| WHR | 0.86±0.06 | 0.84±0.06 | 0.88±0.06 |

From the above table it shows the mean age, Height, Weight, Minimum waist, maximum Hip circumference of the studied adult Juang Population. The mean Waist Hip Ratio (WHR) from the present study, it has been found that all the people are having thin body with very less abdomen fat in comparison to the hip. The people are also observed less body weight in comparison with the body stature.

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**Table-5: Descriptive Statistics of body circumferences, Skinfold thickness & Bone Diameter of Adults of the Juang people**

| VARIABLES | OVERALL (N= 292) | FEMALE (N= 137) | MALE (N= 155) |
|---|---|---|---|
| | MEAN ± SD | MEAN ± SD | MEAN ± SD |
| Head circumference (cm) | 53.35±2.39 | 52.87±2.17 | 53.74±2.5 |
| MUAC (cm) | 23.78±2.73 | 23.36±2.45 | 24.14±2.9 |
| Thigh circumference (cm) | 35.64±4.02 | 34.54±3.74 | 36.57±4.02 |
| Max calf (cm) | 25.35±2.86 | 24.86±2.61 | 25.77±3 |
| Biceps (mm) | 3.19±1.39 | 3.41±1.39 | 3.01±1.37 |
| Triceps (mm) | 5.23±2.74 | 5.52±2.68 | 4.99±2.77 |
| Sub scapular (mm) | 6.16±3.29 | 6.57±3.36 | 5.81±3.2 |
| Supra Spinal | 4.13±3.08 | 4.14±3.15 | 4.11±3.03 |
| Supra iliac (mm) | 5.7±3.25 | 5.8±3.37 | 5.61±3.16 |
| Calf posterior | 5.35±3.12 | 5.45±3.24 | 5.27±3.02 |
| Calf medial | 4.22±2.42 | 4.37±2.35 | 4.1±2.47 |
| Wrist (cm) | 4.81±0.51 | 4.85±0.51 | 4.77±0.51 |
| Elbow (cm) | 5.93±1.07 | 5.98±1.11 | 5.88±1.04 |
| Knee (cm) | 7.6±0.92 | 7.59±0.92 | 7.6±0.93 |
| Ankle (cm) | 6.01±0.4 | 6.04±0.38 | 5.99±0.43 |

From the above table-5, it revealed the mean anthropometric measurements of body circumferences like Head circumferences, Mid Upper Arm Circumferences (MUAC), Thigh & Calf circumferences, Body skinfold thickness like (Biceps, Triceps, Sub-scapula, Supra-iliac, Calf-posterior, Calf-medial) and body diameters of long bones from Wrist, elbow, Knee, and Ankle. The table suggested that the females are having a low average all anthropometric measurements in comparison to the males in the studied area except few variables.

**Table-6: Descriptive Statistics of Blood Pressure, Heart rate, Pulse rate & Blood Glucose of Adults of the Juang people**

| VARIABLES | OVERALL (N= 292) | FEMALE (N= 137) | MALE (N= 155) |
|---|---|---|---|
| | MEAN ± SD | MEAN ± SD | MEAN ± SD |
| SBP (mm / hg) | 122.06±12.47 | 122.14±12.38 | 122±12.63 |
| DBP (mm / Hg) | 84.54±10.9 | 85.79±10.71 | 83.56±11.03 |
| Heart Rate / min) | 77.96±9.65 | 76.35±9.12 | 79.22±9.93 |
| Pulse Rate / min | 77.91±10.75 | 75.66±8.89 | 79.67±11.77 |
| Blood Glucose | 81.32±27.23 | 75.45±17.09 | 85.11±32.09 |

From the above Table-6, it has been found that the mean Blood Pressure, Heart rate, Pulse rate & Blood Glucose of Adults of the Juang Tribe which altered from female to male in comparison with the other anthropometric variables. From the mean blood pressure it suggest that there is few risk factor of being hypertension, but most of the people are with a normal blood pressure. Both the male and female groups are also found to be an average blood glucose level in the studied Juang adults.

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**Table-7: Mean BMI and differences**

| Sex | Mean | N | % of Total N | Std. Deviation | Std. Error of Mean | t-test (Sig.) |
|---|---|---|---|---|---|---|
| F | 19.65 | 137 | 46.92 % | 2.203 | 0.188 | 0.000 |
| M | 20.21 | 155 | 53.08 % | 2.055 | 0.165 | 0.000 |
| Total | 19.95 | 292 | 100 | 2.141 | 0.125 | 0.000 |

Table 3 shows mean, BMI of Female and male of 19.65 and 20.21 respectively and their differences by using t test. The mean BMI of male is found to be greater than the mean BMI of female data with the significance level of 0.000 ($P < 0.001$).

**Table-8: BMI Classification and distribution of Male and Female**

| BMI Classification | Female (N) | Female (N %) | Male (N) | Male (N %) | Total (N) | Total (N %) |
|---|---|---|---|---|---|---|
| Under weight | 38 | 13.01 | 23 | 7.88 | 61 | 20.89 |
| Normal | 90 | 30.82 | 120 | 41.10 | 210 | 71.92 |
| Over weight | 07 | 2.40 | 09 | 3.08 | 16 | 5.48 |
| Pre-Obese | 01 | 0.34 | 03 | 1.03 | 04 | 1.37 |
| Obese | 01 | 0.34 | 00 | 0.00 | 01 | 0.34 |
| Total | 137 | 46.92 | 155 | 53.08 | 292 | 100 |

From the above table it show that the prevalence of underweight among the adult Juang Population is about 20.89 %, where the percentage of female have more prevalence to under nutrition in comparison to the males. A few people have been found to be obese and pre obese category and only 5.48 % of people are overweight category. Only a few participants showed Pre-obese and Obese features in the studied Juang Population.

With the comparison of mean BMI with the BMI classification, it has been observed that the subject participants showed the normal BMI have also less BMI indicators in female than the males. So the Juang females are more prevalence to under nutrition than the Juang males of studied area.

## Conclusions

In the current study, it is discovered that the prevalence of the overweight category is higher in the female population due to the overall difference in BMI between male and female participants. According to earlier research, certain lifestyle factors, such as reduced leisure time, increased physical demands in the workplace, occupational shifts, and limited lifestyles, are also linked to environments that are associated with a higher risk of underweight in India's rural areas.

However, men are observed to be bigger than women in the normal and overweight categories. Health research indicates that remote rural areas have lower socioeconomic status (SES), worse living standards, less access to healthcare, and fewer job opportunities. These factors all have an impact on acute diarrheal illness and chronic malnutrition in areas with inadequate sanitation, which may also have contributed to regional variations in underweight. Developing nations like India should prioritize strengthening their current nutritional programs and health care systems in rural areas in order to reduce the burden of under-nutrition in the coming decades. These measures should be combined with more targeted policies and programs to control the epidemic of under-nutrition among the inhabitants, as well as regular monitoring systems.

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