

## Original Article

# Anthropometric characteristics and nutritional status based on body mass index of adult Bathudis: a tribal population of Keonjhar District, Orissa, India

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A cross-sectional study was undertaken to determine anthropometric profile and nutritional status based on body mass index (BMI) of adult Bathudis, a tribal population of Orissa, India. A total of 409 adult (aged > 18 years) Bathudis of three villages of Anandapur, Keonjhar District, Orissa, India, were studied. Anthropometric measurements including height, weight, circumferences and skinfolds as well as BMI and waist-hip ratio (WHR) were measured. Overall, the extent of undernutrition (BMI < 18.5) was found to be very high (57.9%). Moreover, there was a significant ( $\chi^2 = 8.09674$ ,  $P = 0.01745$ ) difference in the prevalence of undernutrition between men (52.7%) and women (64.5%). In conclusion, this study demonstrated that the prevalence of adult undernutrition was found to be very high among the Bathudis, a tribal population of Keonjhar District, Orissa. These rates were much higher than those found in several tribal populations from other parts of India. Therefore, immediate nutritional intervention programs are needed for implementation among Bathudis. Moreover, further research is needed not only among this ethnic group but also other tribal populations of India to fully understand the causes and consequences of adult undernutrition.

**Key Words:** tribal population, anthropometry, body mass index, nutritional status, Bathudis, West Bengal, India

## Introduction

The tribes of India comprise about 8% of the total population of the country having probably the largest number of tribal communities in the world.<sup>1</sup> Bathudis are one such tribe whose mother tongue is Panchapargania, an Indo-Aryan language. They are inhabitants of three eastern provinces of India: Orissa, Bihar and Jharkhand. Majority of the Bathudis are found in three districts of Orissa, namely, Keonjhar, Mayurbhanj and Sundargarh. Information on Bathudis is very limited<sup>2-3</sup> and there is no published data dealing with their anthropometric characteristics.

Although adult nutritional status can be evaluated in many ways,<sup>4</sup> the body mass index (BMI) is most widely used because its use is inexpensive, non-invasive and suitable for large scale surveys.<sup>5-7</sup> In general, data are scarce on the nutritional status of various tribal populations of India.<sup>8-12</sup> There is urgent need to evaluate the nutritional status of various tribes of India. In view of this, the objective of the present study was to report anthropometric characteristics and determine the nutritional status, based on BMI, of adult Bathudis. It is the first report on the anthropometric and nutritional profile of adult Bathudis.

## Materials and methods

This study was conducted in collaboration of Associated Social Service Agency (ASSA), a non-governmental organisation based at Sailongchhak, Anandapur, Keonjhar District, Orissa. Prior permission and ethical approval was

obtained from local community leaders as well as relevant authorities before commencement of the study. Information on ethnicity, age, occupation and educational status were obtained from all subjects with the help of a questionnaire. The data were collected from three villages, Gahira, Kalora Gadira and Pathurkundi in Anandapur region of Keonjhar district of Orissa, India. These villages are located approximately 75 kms from Bhubaneswar, the provincial capital of Orissa. The residents of all houses (number of houses = 152) in the three villages were contacted and a total of 409 adult (>18 years) subjects (226 men and 183 women) were included in the study. The response rates were 76% and 83%, for men and women, respectively. The vast majority of the subjects were illiterate and very low-wage earning manual labourers. Thus, they belonged to the low socio-economic class.

All anthropometric measurements were made by trained investigators using the standard techniques.<sup>4</sup> Height, weight, circumferences and skinfolds were recorded to the nearest 0.1cm, 0.5kg, and 0.1 mm, respectively. Circumferences and skinfolds were measured using measuring tape and Harpenden skinfold callipers, respectively. Errors

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of measurements were computed and they were found to be within acceptable limits.<sup>5</sup> Body mass index (BMI), waist hip ratio (WHR) and sum of skinfolds (SumSkin) were computed using the following standard equations:

$$BMI (kg/m^2) = Weight (kg) / height (m^2)$$

$$WHR = Waist circumference (cm) / hip circumference (cm)$$

$$SumSkin (mm) = biceps + triceps + subscapular + suprailiac + calf + thigh.$$

Nutritional status was evaluated using internationally accepted World Health Organization (WHO).<sup>6</sup> BMI guidelines. The following cut-off points were used:

Undernutrition: BMI < 18.5

Normal: 18.5 ≤ BMI < 25.0

Overweight: BMI ≥ 25.0.

Means and standard deviations of all anthropometric variables and indices were computed for each sex separately. Chi-square test (Fischer's exact test) was utilised to compute sex differences in nutritional status. All statistical analyses were undertaken using the Statistical Package for Social Science (SPSS) program.

### Results and Discussion

The mean ages of both sexes (men = 38.0 years, SD = 14.4; women: 35.6, SD = 13.2) were similar. The anthropometric characteristics of the Bathudis are presented in Table 1. Mean BMI of the Bathudis was significantly lower than those of other tribal populations of India as reported in several recent studies.<sup>10-12</sup> Table 2 presents the nutritional status of the subjects. Overall, the extent of undernutrition ( $N = 237$ , 57.9%) was found to be very high. Moreover, there was a significant ( $\chi^2 = 8.09674$ ,  $P = 0.01745$ ) difference in the prevalence of undernutrition between men (52.7%) and women (64.5%). The rates of undernutrition among Bathudis were much higher than those reported in recent studies among other tribal populations of India.<sup>8-12</sup>

The results of the present study indicated that the prevalence of undernutrition among adult Bathudis was very high. Most importantly, immediate nutritional intervention programs are needed for implementation among this ethnic group. The economic and health burden of high rates of adult undernutrition have been well documented.<sup>13-16</sup> The high rate of undernutrition among adult Bathudis could have severe health implications. Furthermore, there is an urgent need for further studies to ascertain the relationship of this high rate of under-nutrition with morbidity and mortality among this ethnic group. Similar studies should also be undertaken among other tribal populations in India since they constitute a sizeable portion of India's population. Moreover, since undernutrition has several underlying causes,<sup>6</sup> future investigations should aim at identifying the likely cause(s) of high rates of undernutrition among Indian tribal populations.

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**Table 1.** Anthropometric characteristics of adult Bathudis.

Variable	Men N = 226	Women N = 183
Height (cm)	159.4 (6.4)	149.2 (6.7)
Weight (kg)	46.9 (6.3)	39.8 (6.2)
Sitting Height (cm)	79.7 (4.8)	74.1 (4.9)
<i>Circumferences (cm)</i>		
Mid upper arm	23.4 (3.1)	22.2 (2.4)
Minimum waist	67.6 (6.3)	63.9 (6.8)
Maximum hip	78.8 (6.6)	78.5 (5.7)
Thigh	40.4 (4.0)	36.1 (3.9)
Calf	29.3 (2.9)	27.6 (3.2)
<i>Skinfolds (mm)</i>		
Biceps	3.6 (1.6)	4.6 (2.9)
Triceps	5.7 (2.2)	9.1 (2.4)
Subscapular	7.9 (2.6)	9.0 (2.3)
Suprailiac	7.2 (3.0)	9.8 (3.1)
Calf	6.1 (2.4)	7.8 (2.5)
Thigh	7.7 (2.9)	10.8 (3.3)
<i>Sum of skinfolds (mm)</i>	38.2 (12.5)	51.0 (13.3)
<i>Body mass index (kg/m<sup>2</sup>)</i>	18.4 (1.9)	17.9 (2.5)
<i>Waist hip ratio</i>	0.87 (0.28)	0.81 (0.06)

Standard deviations are presented in parentheses.

**Table 2.** Prevalence of undernutrition based on BMI among adult Bathudis.

Sex	Undernutrition (BMI < 18.5)	Normal (18.5 ≤ BMI < 25.0)	Overweight (BMI ≥ 25.0)
<i>Men</i>	119 (52.7)	106 (46.9)	1 (0.4)
<i>Women</i>	118 (64.5)	62 (33.9)	3 (1.6)
<i>Both sexes combined</i>	237 (57.9)	168 (41.1)	4 (1.0)

Percentages are shown in parentheses.

Gender difference:  $\chi^2_{(2)} = 8.09674$ ;  $P = 0.01745$ .

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